Department of Environmental Engineering - DTU Orbit (25/06/2018)

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Technical University of Denmark
Short name: DTU Environment

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Organisation profile
Department of Environmental Engineering (DTU Environment) works at the highest international level to develop new environmentally friendly & sustainable technologies and disseminate this knowledge to society and new generations of engineers. Our activities in research, teaching and innovation is focused on:

Air, Land & Water Resources
Environmental Fate & Effect of Chemicals
Residual Resource Engineering
Urban Water Systems
Water Technologies

Read more about the department and its activities at the department homepage.
Head of Department: Professor Thomas Højlund Christensen
Organisational unit: Department

Publications:

Microbial electrolytic disinfection process for highly efficient Escherichia coli inactivation
Water quality deterioration caused by a wide variety of recalcitrant organics and pathogenic microorganisms has become a serious concern worldwide. Bio-electro-Fenton systems have been considered as cost-effective and highly efficient water treatment platform technology. While it has been extensively studied for recalcitrant organics removal, its application potential towards water disinfection (e.g., inactivation of pathogens) is still unknown. This study investigated the inactivation of Escherichia coli in a microbial electrolysis cell based bio-electro-Fenton system (renamed as microbial electrolytic-Fenton cell) with the aim to broaden the application of microbial electrochemistry. Results showed that a 4-log reduction of Escherichia coli (10⁷ to hundreds CFU/mL) was achieved with an external applied voltage of 0.2 V, 0.3 mM Fe²⁺ and cathodic pH of 3.0. However, non-notable inactivation was observed in the control experiments without external voltage or Fe²⁺ dose. The disinfection effect was enhanced when cathode air flow rate increased from 7 to 41 mL/min and was also in proportion to the increase of Fe²⁺ concentration from 0.15 to 0.45 mmol/mL. Fatal cell membrane destruction by [rad]OH was identified as one potential mechanism for disinfection. This study successfully demonstrated the feasibility
of bio-electro-Fenton process for pathogens inactivation, which offers insight for the future development of sustainable, efficient, and cost-effective biological water treatment technology.

**General information**

State: Published

Organisations: Department of Environmental Engineering, Residual Resource Engineering, South China University of Technology, Technical University of Denmark

Authors: Zhou, S. (Ekstern), Huang, S. (Ekstern), Li, X. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)

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Main Research Area: Technical/natural sciences

**Publication information**

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- BFI (2018): BFI-level 1
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 1
- Scopus rating (2017): CiteScore 3.18
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 1
- Scopus rating (2016): CiteScore 3.16
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 1
- Scopus rating (2015): CiteScore 2.75
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 1
- Scopus rating (2014): CiteScore 2.72
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 1
- Scopus rating (2013): CiteScore 3.03
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): CiteScore 3.15
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): CiteScore 2.95
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 1
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 1
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 1
- Web of Science (2008): Indexed yes
- Web of Science (2007): Indexed yes
- Web of Science (2005): Indexed yes
- Web of Science (2003): Indexed yes
- Web of Science (2001): Indexed yes

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Advanced oxidation process, Bio-electro-Fenton reactions, Disinfection, Escherichia coli, Hydrogen peroxide, Microbial electrolysis cell

DOIs:
Applying no-depletion equilibrium sampling and full-depletion bioaccessibility extraction to 35 historically polycyclic aromatic hydrocarbon contaminated soils

Assessing the bioaccessibility of organic pollutants in contaminated soils is considered a complement to measurements of total concentrations in risk assessment and legislation. Consequently, methods for its quantification require validation with historically contaminated soils. In this study, 35 such soils were obtained from various locations in Switzerland and Cuba. They were exposed to different pollution sources (e.g., pyrogenic and petrogenic) at various distance (i.e., urban to rural) and were subject to different land use (e.g., urban gardening and forest). Passive equilibrium sampling with polyoxymethylene was used to determine freely dissolved concentrations ($C_{\text{free}}$) of polycyclic aromatic hydrocarbons (PAHs), while sorptive bioaccessibility extraction (SBE) with silicone rods was used to determine the bioaccessible PAH concentrations ($C_{\text{bioacc}}$) of these soils. The organic carbon partition coefficients of the soils were highest for skeet soils, followed by traffic, urban garden and rural soils. Lowest values were obtained from soil exposed to petrogenic sources. Applicability of SBE to quantify $C_{\text{bioacc}}$ was restricted by silicone rod sorption capacity, as expressed quantitatively by the Sorption Capacity Ratio ($\text{SCR}$); particularly for soils with very high $K_D$. The source of contamination determined bioaccessible fractions ($f_{\text{bioacc}}$). The smallest $f_{\text{bioacc}}$ were obtained with skeet soils (15%), followed by the pyrogenically influenced soils, rural soils, and finally, the petrogenically contaminated soil (71%). In conclusion, we present the potential and limitations of the SBE method to quantify bioaccessibility in real soils. These results can be used for additional development of this and similar bioaccessibility methods to guarantee sufficient sorption capacity to obtain reliable results. Freely dissolved concentrations and bioaccessible fractions of PAHs in soils depended on pollutant source and site characteristics, while the sink capacity was limiting during bioaccessibility extractions of soils with low PAH content and high $K_D$ values.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Agroscope Research Station, ETH Zurich, Universidad de La Habana
Authors: Bartolomé, N. (Ekstern), Hilber, I. (Ekstern), Sosa, D. (Ekstern), Schulin, R. (Ekstern), Mayer, P. (Intern), Bucheli, T. D. (Ekstern)
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Main Research Area: Technical/natural sciences

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ISSN (Print): 0045-6535
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.435 SNIP 1.448 CiteScore 4.62
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.39 SJR 1.447 SNIP 1.625
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.497 SNIP 1.567 CiteScore 4.04
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.59 SNIP 1.639 CiteScore 3.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.721 SNIP 1.751 CiteScore 3.92
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
How a 10-day heatwave impacts barley grain yield when superimposed onto future levels of temperature and CO₂ as single and combined factors

Heatwaves pose a threat to crop production and are predicted to increase in frequency, length and intensity as a consequence of global warming. Future heatwaves will occur in addition to the ongoing increase of mean temperature and CO₂. To test effects of heatwaves superimposed to future climate scenarios, 22 barley accessions were cultivated with elevated temperature (+5 °C) and CO₂ (700 ppm) as single factors and in combination. The control treatment mimicked ambient Scandinavian early summer conditions (19/12 °C, day/night; 400 ppm CO₂). Around flowering a 10-day heatwave of 33/28 °C (day/night) was superimposed to all treatments. The lowest average grain yield was observed when the heatwave was superimposed onto the combined elevated temperature and CO₂ treatment. Here the yield decreased by 42% compared to no heatwave and 52% compared to ambient conditions. When the heatwave was superimposed onto ambient conditions the average grain yield decreased by 37% compared to no heatwave. There was no significant difference between the relative grain yield decrease caused by the heatwave in the ambient and future climate scenarios. In contrast, the vegetative aboveground biomass increased upon heatwave exposure, leading to a strong decline in the harvest index. Our results strongly emphasize the need to produce heatwave resilient cultivars.

General information
Greenhouse gas emissions from integrated urban drainage systems: Where do we stand?

As sources of greenhouse gas (GHG) emissions, integrated urban drainage systems (IUDS) (i.e., sewer systems, wastewater treatment plants and receiving water bodies) contribute to climate change. This paper, produced by the International Working Group on Data and Models, which works under the IWA/IAHR Joint Committee on Urban Drainage, reviews the state-of-the-art and modelling tools developed recently to understand and manage GHG emissions from IUDS. Further, open problems and research gaps are discussed and a framework for handling GHG emissions from IUDSs is presented. The literature review reveals that there is a need to strengthen already available mathematical models for IUDS to take GHG into account.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Universita di Palermo, Columbia University, University of Exeter, University of New South Wales, School of Civil and Environmental Engineering, Unit for Environmental Engineering, University of Innsbruck, University of Queensland, KU Leuven, Waterways d.o.o.
Number of pages: 8
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Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.71 SJR 1.832 CiteScore 4.06
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 1.813 SNIP 1.772
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.686 SNIP 1.761 CiteScore 3.54
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.667 SNIP 1.993 CiteScore 3.45
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.714 SNIP 1.974 CiteScore 3.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.914 SNIP 1.994 CiteScore 3.38
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.742 SNIP 1.833 CiteScore 3.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.786 SNIP 1.712
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Environnementally friendly treatment of highly potent pharmaceuticals in hospital wastewater - Mermiss


Den traditionelle metode til rensning af spildevand er baseret på aktivt slam. Metoden er effektiv overfor letnedbrydelige lægemidler, men ineffektiv overfor middelsvære og svært nedbrydelige lægemidler.

Teknologien med biofilm er testet i laboratorieskala og i pilot-skala på dels råspildevand med koncentreret indhold af lægemidler fra en kræftafdeling, dels blandet råspildevand fra et hospital, dels almendigt råspildevand fra Herning Vand, og dels på udløbsvand fra Viby renseanlæg. Over 95% af den samlede belastning med lægemidler i miljøet kommer i dag fra almendigt husspildevand, både fra håndkøbsmedicin og fra patienter i ambulant behandling.

Projektet gennemførte således en benchmarking af lægemiddelfjernelse på forskellige typer af spildevand, og kunne på den baggrund demonstrere, at en biofilm-baseret teknologi er langt mere effektiv end den konventionelle aktiv slam behandling, som bruges i dag. Bl.a. viser projektet, at teknologien med fordel kan anvendes til at efterpolere allerede renset spildevand, og at driftsomkostningerne til teknologien er relativt lave.

Resultaterne af projektet er så lovende, at de allerede er anvendt til at starte et nyt MUDP-projekt, MerEff, der tester teknologien til at efterpolere renset spildevand i større skala på Herning Vands renseanlæg.

General information

State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Municipality of Århus, Henning Municipality, Aarhus University Hospital, Air Liquide, Krüger A/S, Aarhus University, Teknologisk Institut, Danish Technological Institute
Number of pages: 86
Publication date: 13 Mar 2018
Determining Biodegradation Kinetics of Hydrocarbons at Low Concentrations: Covering 5 and 9 Orders of Magnitude of Kow and Kaw

A partitioning-based experimental platform was developed and applied to determine primary biodegradation kinetics of 53 hydrocarbons at ng/L to μg/L concentrations covering C8-C20, 11 structural classes, and several orders of magnitude in hydrophobicity and volatility: (1) Passive dosing from a loaded silicone donor was used to set the concentration of each hydrocarbon in mixture stock solutions; (2) these solutions were combined with environmental water samples in gastight auto sampler vials for 1-100 days incubation, and (3) automated solid phase microextraction (SPME) coupled to GC-MS was applied directly on these test systems for measuring primary biodegradation relative to abiotic controls. First order biodegradation kinetics were obtained for 40 hydrocarbons in activated sludge filtrate, 18 in seawater, and 21 in lake water. Water phase half-lives in seawater and lake water were poorly related to hydrophobicity and volatility but were, with a few exceptions, within a factor of 10 or shorter than BioHCwin predictions. The most persistent hydrocarbons, 1,1,4,4,6-pentamethyldecalin, perhydropyrene, 1,2,3,6,7,8-hexahydropyrene, and 2,2,4,4,6,8,8-heptamethylnonane, showed limited or inconsistent degradation in all three environmental media. This biodegradation approach can cover a large chemical space at low substrate concentrations, which makes it highly suited for optimizing predictive models for environmental biodegradation.
Column leaching from a Danish forest soil amended with wood ashes: fate of major and trace elements

Application of wood ashes onto two Danish forest soil horizons (A- and O-horizons) was investigated through a series of column experiments for ash dosages of 3, 9 and 30 Mg ha$^{-1}$. Developments in the composition of the percolating soil solutions were investigated both in a short- (below 0.5 m$^3$ m$^{-2}$ of infiltrating water) and long-term perspective (until 2.0 m$^3$ m$^{-2}$ of infiltrating water). The higher the ash dosage, the higher the percolation of readily soluble elements (K, Cl, Mg and S) occurred within a short-term perspective. This initial washout of soluble elements resulted in the exchange of ions in the soil, thereby causing other soil bound elements to be released and the pH to decrease temporarily. Wood ash application also promoted an increase in the long-term leaching of As, Cu, K, P and Si beyond the O-horizon layer (until $\sim$2.0 m$^3$ m$^{-2}$), while the migration of trace elements through this soil horizon appeared to be of limited concern compared with Danish groundwater quality criteria. Relatively similar effects were observed for both the use of 3 and 9 Mg ha$^{-1}$ dosages on the
composition of the percolating soil solutions. Low mobility of Cd, Co, Cr, Cu, Mo, Ni, Pb, Se, V and Zn was observed. The released amounts were generally limited to a few percentage points of their total contents in the columns. The potential accumulation of trace elements within the forest soil should be evaluated with respect to the specific case, if high ash dosages are intended for spreading.

**General information**

State: Published
Organisations: Residual Resource Engineering, Department of Environmental Engineering, University of Copenhagen
Authors: Maresca, A. (Intern), Hansen, M. (Ekstern), Ingerslev, M. (Ekstern), Fruergaard Astrup, T. (Intern)
Pages: 91-99
Publication date: 1 Feb 2018
Main Research Area: Technical/natural sciences
A call for action: Improve reporting of research studies to increase the scientific basis for regulatory decision-making

This is a call for action to scientific journals to introduce reporting requirements for toxicity and ecotoxicity studies. Such reporting requirements will support the use of peer-reviewed research studies in regulatory decision-making. Moreover, this could improve the reliability and reproducibility of published studies in general and make better use of the resources spent in research.

General information
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Publication date: 2018
Main Research Area: Technical/natural sciences
Acclimation to extremely high ammonia levels in continuous biomethanation process and the associated microbial community dynamics

Acclimated anaerobic communities to high ammonia levels can offer a solution to the ammonia toxicity problem in biogas reactors. In the current study, a stepwise acclimation strategy up to 10 g NH4+-N L⁻¹, was performed in mesophilic (37 ± 1 °C) continuously stirred tank reactors. The reactors were co-digesting (20/80 based on volatile solid) cattle slurry and microalgae, a protein-rich, 3rd generation biomass. Throughout the acclimation period, methane production was stable...
with more than 95% of the uninhibited yield. Next generation 16S rRNA gene sequencing revealed a dramatic microbiome change throughout the ammonia acclimation process. Clostridium ultunense, a syntrophic acetate oxidizing bacteria, increased significantly alongside with hydrogenotrophic methanogen Methanoculleus spp., indicating strong hydrogenotrophic methanogenic activity at extreme ammonia levels (>7 g NH4+-N L−1). Overall, this study demonstrated for the first time that acclimation of methanogenic communities to extreme ammonia levels in continuous AD process is possible, by developing a specialised acclimation AD microbiome.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Zagazig University, IMDEA Energy
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Main Research Area: Technical/natural sciences

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BFI (2018): BFI-level 2
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BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.029 SNIP 1.799 CiteScore 6.28
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.308 SNIP 2.507 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.089 SNIP 2.344
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.915 SNIP 2.236
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.736 SNIP 2.74
Web of Science (2008): Indexed yes
A Chemical Activity Approach to Exposure and Risk Assessment of Chemicals

To support the goals articulated in the vision for exposure and risk assessment in the twenty-first century, we highlight the application of a thermodynamic chemical activity approach for the exposure and risk assessment of chemicals in the environment. The present article describes the chemical activity approach, its strengths and limitations, and provides examples of how this concept may be applied to the management of single chemicals and chemical mixtures. The examples demonstrate that the chemical activity approach provides a useful framework for 1) compiling and evaluating exposure and toxicity information obtained from many different sources, 2) expressing the toxicity of single and multiple chemicals, 3) conducting hazard and risk assessments of single and multiple chemicals, 4) identifying environmental exposure pathways, and 5) reducing error and characterizing uncertainty in risk assessment. The article further illustrates that the chemical activity approach can support an adaptive management strategy for environmental stewardship of chemicals where “safe” chemical activities are established based on toxicological studies and presented as guidelines for environmental quality in various environmental media that can be monitored by passive sampling and other techniques.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Simon Fraser University, ExxonMobil Biomedical Sciences, U.S. Environmental Protection Agency, TG Environmental Research, Radboud University Nijmegen
Authors: Gobas, F. A. P. C. (Ekstern), Mayer, P. (Intern), Parkerton, T. F. (Ekstern), Burgess, R. M. (Ekstern), Van de Meent, D. (Ekstern), van de Meent, D. (Ekstern), Gouin, T. (Ekstern)
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.018 SJR 1.178 CiteScore 2.87
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.74 SJR 1.231 SNIP 1.021
A comparison of land use change accounting methods: seeking common grounds for key modeling choices in biofuel assessments

Five currently used methods to account for the global warming (GW) impact of the induced land-use change (LUC) greenhouse gas (GHG) emissions have been applied to four biofuel case studies. Two of the investigated methods attempt to avoid the need of considering a definite occupation -thus amortization period by considering ongoing LUC trends as a dynamic baseline. This leads to the accounting of a small fraction (0.8%) of the related emissions from the assessed LUC, thus their validity is disputed. The comparison of methods and contrasting case studies illustrated the need of clearly distinguishing between the different time horizons involved in life cycle assessments (LCA) of land-demanding products like biofuels. Absent in ISO standards, and giving rise to several confusions, definitions for the following time horizons have been proposed: technological scope, inventory model, impact characterization, amortization/occupation, plantation lifetime and harvesting frequency. It is suggested that the anticipated technical lifetime of biorefineries using energy crops as feedstock stands as the best proxy for the cut-off criterion of land's occupation period and the inventory modeling period. Top-down LUC models are suggested as a gross reference benchmark to evaluate LUC results from bottom-up models, since the former represent average GHG emissions from deforestation statistics at different spatial resolutions. Reporting LUC emissions per area and implementing a corporate accounting system that ascribes deforestation emissions to responsible companies could avoid the critical uncertainty related to yield estimations.

General information
State: Published
Organisations: Department of Environmental Engineering, Department of Management Engineering, Quantitative Sustainability Assessment, Air, Land & Water Resources, Hamelinlab
Authors: de Bikuna Salinas, K. S. (Intern), Hamelin, L. (Ekstern), Hauschild, M. Z. (Intern), Pilegaard, K. (Intern), Ibrom, A. (Intern)
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.467 SNIP 2.194 CiteScore 5.79
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.83 SJR 1.659 SNIP 2.502
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.635 SNIP 2.375 CiteScore 5.57
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.665 SNIP 2.481 CiteScore 4.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.618 SNIP 2.527 CiteScore 4.47
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.672 SNIP 2.296 CiteScore 4.07
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.454 SNIP 1.823 CiteScore 3.19
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.409 SNIP 1.723
A critical perspective on early communications concerning human health aspects of microplastics

Microplastic research in recent years has shown that small plastic particles are found almost everywhere we look. Besides aquatic and terrestrial environments, this also includes aquatic species intended for human consumption and several studies have reported their prevalence in other food products and beverages. The scientific as well as public debate has therefore increasingly focused on human health implications of microplastic exposure. However, there is a big discrepancy between the magnitude of this debate and actual scientific findings, which have merely shown the presence of microplastics in certain products. While plastics can undoubtedly be hazardous to human health due to toxicity of associated chemicals or as a consequence of particle toxicity, the extent to which microplastics in individual food products and beverages contribute to this is debatable. Considering the enormous use of plastic materials in our everyday lives, microplastics from food products and beverages likely only constitute a minor exposure pathway for plastic particles and associated chemicals to humans. But as this is rarely put into perspective, the recent debate has created a skewed picture of human plastic exposure. We risk pulling the focus away from the root of the problem: the way in which we consume, use and dispose of plastics leading to their widespread presence in our everyday life and in the environment. Therefore we urge for a more careful and balanced discussion which includes these aspects.
Contamination, Food products, Plastic additives, Chemical toxicity, Particle toxicity

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Source: FindIt
Source-ID: 2396014443
Adaptation tipping points of a wetland under a drying climate

Wetlands experience considerable alteration to their hydrology, which typically contributes to a decline in their overall ecological integrity. Wetland management strategies aim to repair wetland hydrology and attenuate wetland loss that is associated with climate change. However, decision makers often lack the data needed to support complex social environmental systems models, making it difficult to assess the effectiveness of current or past practices. Adaptation Tipping Points (ATPs) is a policy-oriented method that can be useful in these situations. Here, a modified ATP framework is presented to assess the suitability of ecosystem management when rigorous ecological data are lacking. We define the effectiveness of the wetland management strategy by its ability to maintain sustainable minimum water levels that are required to support ecological processes. These minimum water requirements are defined in water management and environmental policy of the wetland. Here, we trial the method on Forrestdale Lake, a wetland in a region experiencing a markedly drying climate. ATPs were defined by linking key ecological objectives identified by policy documents to threshold values for water depth. We then used long-term hydrologic data (1978-2012) to assess if and when thresholds were breached. We found that from the mid-1990s, declining wetland water depth breached ATPs for the majority of the wetland objectives. We conclude that the wetland management strategy has been ineffective from the mid-1990s, when the region's climate dried markedly. The extent of legislation, policies, and management authorities across different scales and levels of governance need to be understood to adapt ecosystem management strategies. Empirical verification of the ATP assessment is required to validate the suitability of the method. However, in general we consider ATPs to be a useful desktop method to assess the suitability of management when rigorous ecological data are lacking.

General information
State: Published
Organisations: Department of Environmental Engineering, University of Western Australia, Cooperative Research Centre for Water Sensitive Cities
Authors: Nanda, A. (Ekstern), Beesley, L. (Ekstern), Locatelli, L. (Intern), Gersonius, B. (Ekstern), Hipsey, M. R. (Ekstern), Ghadouani, A. (Ekstern)
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Main Research Area: Technical/natural sciences

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BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.007 SJR 0.634 CiteScore 2.29
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.05 SJR 0.576 SNIP 1.137
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.53 SNIP 1.057 CiteScore 1.96
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.518 SNIP 0.96 CiteScore 1.45
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.313 SNIP 0.621 CiteScore 1
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.289 SNIP 0.856
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
AERMOD as a Gaussian dispersion model for planning tracer gas dispersion tests for landfill methane emission quantification

The measurement of methane emissions from landfills is important to the understanding of landfills' contribution to greenhouse gas emissions. The Tracer Dispersion Method (TDM) is becoming widely accepted as a technique, which allows landfill emissions to be quantified accurately provided that measurements are taken where the plumes of a released tracer-gas and landfill-gas are well-mixed. However, the distance at which full mixing of the gases occurs is generally unknown prior to any experimental campaign. To overcome this problem the present paper demonstrates that, for any specific TDM application, a simple Gaussian dispersion model (AERMOD) can be run beforehand to help determine the distance from the source at which full mixing conditions occur, and the likely associated measurement errors. An AERMOD model was created to simulate a series of TDM trials carried out at a UK landfill, and was benchmarked against the experimental data obtained. The model was used to investigate the impact of different factors (e.g. tracer cylinder placements, wind directions, atmospheric stability parameters) on TDM results to identify appropriate experimental set ups for different conditions. The contribution of incomplete vertical mixing of tracer and landfill gas on TDM measurement error was explored using the model. It was observed that full mixing conditions at ground level do not imply full mixing over the entire plume height. However, when full mixing conditions were satisfied at ground level, then the error introduced by variations in mixing higher up were always less than 10%.

General information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, University College Dublin, Politecnico di Torino, University of Southampton
Authors: Matacchiera, F. (Ekstern), Manes, C. (Ekstern), Beaven, R. P. (Ekstern), Rees-White, T. C. (Ekstern), Boano, F. (Ekstern), Mønster, J. (Intern), Scheutz, C. (Intern)
Number of pages: 13
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Main Research Area: Technical/natural sciences

Publication information
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BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.456 SNIP 2.059 CiteScore 4.94
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.407 SNIP 2.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.732 SNIP 2.263 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.763 SNIP 2.49 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.815 SNIP 2.413 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.59 SNIP 2.18 CiteScore 2.91
A framework for performing comparative LCA between repairing flooded houses and construction of dikes in non-stationary climate with changing risk of flooding

Sustainable flood management is a basic societal need. In this article, life cycle assessment is used to compare two ways to maintain the state of a coastal urban area in a changing climate with increasing flood risk. On one side, the construction of a dike, a hard and proactive scenario, is modelled using a bottom up approach. On the other, the systematic repair of houses flooded by sea surges, a post-disaster measure, is assessed using a Monte Carlo simulation allowing for aleatory uncertainties in predicting future sea level rise and occurrences of extreme events. Two metrics are identified, normalized mean impacts and probability of dike being most efficient. The methodology is applied to three case studies in Denmark representing three contrasting areas, Copenhagen, Frederiksværk, and Esbjerg. For all case studies the distribution of the calculated impact of repairing houses is highly right skewed, which in some cases has implications for the comparative LCA. The results show that, in Copenhagen, the scenario of the dike is overwhelmingly favorable for the environment, with a 43 times higher impact for repairing houses and only 0% probability of the repairs being favorable. For Frederiksværk and Esbjerg the corresponding numbers are 5 and 0.9 times and 85% and 32%, respectively. Hence constructing a dike at this point in time is highly recommended in Copenhagen, preferable in Frederiksværk, and probably not recommendable in Esbjerg.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Management Engineering, Quantitative Sustainability Assessment
Authors: Hennequin, T. (Intern), Sørup, H. J. D. (Intern), Dong, Y. (Intern), Arnbjerg-Nielsen, K. (Intern)
The toxicity towards the algal species *Pseudokirchneriella subcapitata* of 425 organic chemical substances was tested in a growth inhibition test. Precautions were taken to prevent loss of the compounds from the water phase and the test system (closed test system, low biomass, shorter test duration, silanized glass) and to keep pH constant by applying a higher alkalinity. Chemical phase distribution was modelled taking ionization, volatilisation, and adsorption to glass and biomass into consideration. If the modelled water concentration was below 90% of the nominal concentration the calculated EC values were corrected accordingly. The model helped to identify substances, where the calculated water concentration was too uncertain. Substances covering a wide range of physical-chemical properties and different modes of action were tested. Median effect concentrations (EC$_{50}$) lower than 1000mg/L were found for 310 substances; 216 of these were in the range from 1 to 1000mg/L and 94 substances had EC$_{50}$s below 1mg/L and should be classified as “Very toxic”. 36 substances fell in the group with EC$_{50}$>1000mg/L. An EC$_{50}$ could not be established for 79 substances. These 425 different organic substances were tested under uniform conditions and thus considered a valuable source of information for administrators, industry, risk assessors and QSAR modellers.

**General information**

State: Published  
Organisations: Department of Environmental Engineering  
Authors: Kusk, K. O. (Intern), Christensen, A. M. (Intern), Nyholm, N. (Intern)  
Pages: 405-412  
Publication date: 2018  
Main Research Area: Technical/natural sciences
Amino acids production focusing on fermentation technologies – A review

Amino acids are attractive and promising biochemicals with market capacity requirements constantly increasing. Their applicability ranges from animal feed additives, flavour enhancers and ingredients in cosmetic to specialty nutrients in pharmaceutical and medical fields.

This review gives an overview of the processes applied for amino acids production and points out the main advantages and disadvantages of each.

Due to the advances made in the genetic engineering techniques, the biotechnological processes, and in particular the fermentation with the aid of strains such as Corynebacterium glutamicum or Escherichia coli, play a significant role in the industrial production of amino acids. Despite the numerous advantages of the fermentative amino acids production, the process still needs significant improvements leading to increased productivity and reduction of the production costs.

Although the production processes of amino acids have been extensively investigated in previous studies, a comprehensive overview of the developments in bioprocess technology has not been reported yet. This review states the importance of the fermentation process for industrial amino acids production, underlining the strengths and the weaknesses of the process. Moreover, the potential of innovative approaches utilizing macro and microalgae or bacteria...
are presented.

**General information**

State: Published  
Organisations: Department of Environmental Engineering, Residual Resource Engineering  
Authors: D'Este, M. (Intern), Alvarado-Morales, M. (Intern), Angelidaki, I. (Intern)  
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Main Research Area: Technical/natural sciences

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Journal: Biotechnology Advances  
Volume: 36  
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ISSN (Print): 0734-9750  
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BFI (2018): BFI-level 2  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 2  
Scopus rating (2017): SJR 3.006 SNIP 3.531 CiteScore 12.05  
Web of Science (2017): Indexed yes  
BFI (2016): BFI-level 2  
Scopus rating (2016): CiteScore 11.05 SJR 2.747 SNIP 3.141  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 2  
Scopus rating (2015): SJR 2.915 SNIP 3.396 CiteScore 10.56  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 2  
Scopus rating (2014): SJR 2.941 SNIP 3.738 CiteScore 10.24  
Web of Science (2014): Indexed yes  
BFI (2013): BFI-level 2  
Scopus rating (2013): SJR 2.951 SNIP 4.017 CiteScore 10.71  
ISI indexed (2013): ISI indexed yes  
Web of Science (2013): Indexed yes  
BFI (2012): BFI-level 2  
Scopus rating (2012): SJR 3.456 SNIP 5.153 CiteScore 11.65  
ISI indexed (2012): ISI indexed yes  
BFI (2011): BFI-level 2  
Scopus rating (2011): SJR 3.118 SNIP 4.667 CiteScore 10.75  
ISI indexed (2011): ISI indexed yes  
Web of Science (2011): Indexed yes  
BFI (2010): BFI-level 2  
Scopus rating (2010): SJR 2.938 SNIP 3.925  
Web of Science (2010): Indexed yes  
BFI (2009): BFI-level 2  
BFI (2008): BFI-level 2  
Scopus rating (2008): SJR 2.267 SNIP 3.153  
Scopus rating (2006): SJR 1.715 SNIP 3.121  
Scopus rating (2005): SJR 1.615 SNIP 2.919  
Web of Science (2005): Indexed yes  
Scopus rating (2004): SJR 1.073 SNIP 2.201  
Scopus rating (2003): SJR 1.219 SNIP 2.097  
Scopus rating (2002): SJR 0.929 SNIP 1.821  
Scopus rating (2001): SJR 0.566 SNIP 1.009
Animal Testing for Acute Inhalation Toxicity: A Thing of the Past?

According to REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals), testing for acute inhalation toxicity is required for chemicals manufactured or imported at tonnages ≥10 tons per year. Three OECD test guidelines for acute inhalation toxicity in vivo are adopted (TG 403, TG 436, and TG 433). Since animal testing is ethically, scientifically and economically questionable, adoption of alternative methods by the European Union and the OECD is needed. An in vitro system based on the study of lung surfactant function is introduced.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, National Research Center for Working Environment
Authors: Da Silva, E. (Intern), Sørli, J. B. (Ekstern)
Number of pages: 2
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Main Research Area: Technical/natural sciences

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Issue number: 2
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Original language: English
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Source: FindIt
Source-ID: 2397656597
Publication: Research - peer-review › Journal article – Annual report year: 2018

A novel process for volatile fatty acids production from syngas by integrating with mesophilic alkaline fermentation of waste activated sludge

The present study proposed and demonstrated a novel process for the bioconversion of syngas (mainly CO and H2) to valuable volatile fatty acids (VFA) by integrating with mesophilic alkaline fermentation of waste activated sludge (WAS). The results showed that although pH 9 was suitable for VFA production from WAS, 62.5% of the consumed CO was converted to methane due to the presence of hydrogenogenic pathway for CO conversion. The increase of pH from 9 to 9.5 inhibited the methane production from CO because of the possible presence of only acetogenic pathway for CO conversion. However, methane was still produced from H2 contained in syngas through hydrogenotrophic methanogenesis, and around 32–34% of the consumed syngas was converted to methane. At both pH 9 and 9.5, methane was produced by hydrogenotrophic methanogens Methanobacteriales. Further increase of pH to 10 effectively inhibited methane production from syngas, and efficient VFA (mainly acetate with the concentration of around 135mM) production by simultaneous conversion of syngas and WAS was achieved. High acetate concentrations (>150mM) were shown to have serious negative effects on the conversion of syngas. The addition of syngas to the mesophilic alkaline fermentation of WAS at pH 10 not only resulted in the enrichment of some known bacteria related with syngas conversion, but also changed the microbial community compositions for the fermentation of WAS.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Fudan University, Tongji University
Authors: Rao, Y. (Ekstern), Wan, J. (Ekstern), Liu, Y. (Ekstern), Angelidaki, I. (Intern), Zhang, S. (Ekstern), Zhang, Y. (Ekstern), Luo, G. (Ekstern)
Pages: 372-380
Publication date: 2018
Main Research Area: Technical/natural sciences
Applicability of disulfide-polymer particles surface embedded on alginate beads for cadmium removal from airport derived stormwater

Stormwater runoff derived from airports causes severe cadmium contamination in excess of the maximum limit level and is difficult to treat due to the irregular contamination levels from scattered rainfall. To overcome this and remove cadmium from runoff, a new reactive filtration column is introduced. Sulfur functionalized polymer particles were successfully embedded onto the surface of alginate bead (DiS-algi) and simulated a real stormwater treatment filtration column. The DiS-algi shows 22.3mg/g of batch and 877μg/g of continuous flow sorption capacity. Also, the results for the new sorption material show that within 6 mins half of the cadmium was removed with 31L/mg of Langmuir sorption affinity, outperforming an activated carbon filter. From a breakthrough test the reactive column shows complete uptake of cadmium from a contaminated flow, lasting two hours until reaching the breakthrough point. Furthermore, regeneration tests of the column verified its reusability. DiS-algi appears to be a viable new cadmium sorption material for airport derived stormwater runoff filtration systems.

Application of forward osmosis technology in crude glycerol fermentation biorefinery-potential and challenges

Forward osmosis (FO) is a low energy-intensive process since the driving force for water transport is the osmotic pressure difference, Δπ, between the feed and draw solutions, separated by the FO membrane, where πdraw > πfeed. The potential of FO in wastewater treatment and desalination have been extensively studied; however, regeneration of the draw solution (thereby generating clean water) requires application of an energy-intensive process step like reverse osmosis (RO). In this study, the potential of applying FO for direct water recirculation from diluted fermentation effluent to concentrated feedstock, without the need for an energy-intensive regeneration step (e.g. RO), has been investigated. Butanol production during crude glycerol fermentation by Clostridium pasteurianum, has been selected as a model process and the effect of cross-flow velocity and the dilution of draw solution on the water flux during short-term experiments (200 min),
were investigated. Statistical analysis revealed that the dilution of the draw solution is the most influential factor for the water flux. Subsequent modelling of an integrated FO-fermentation process showed that water recoveries could lead to substantial financial benefits, although the integrated FO-fermentation process demonstrated lower water flux than expected. FTIR analyses of the membrane surface implied that the decrease in water flux was due to the presence of proteins, polysaccharides and other extracellular polymeric substances on the membrane active layer, indicating the presence of a fouling layer. Based on these findings, possible fouling alleviation strategies and future research directions are discussed and proposed.

General information
State: Accepted/In press
Organisations: Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering, PILOT PLANT, Department of Environmental Engineering, Water Technologies, Aquaporin A/S
Authors: Kalafatakis, S. (Intern), Braekevelt, S. (Ekstern), Lymperatou, A. (Intern), Zarebska, A. (Intern), Hélix-Nielsen, C. (Intern), Lange, L. (Intern), Skiadas, I. V. (Intern), Gavala, H. N. (Intern)
Number of pages: 13
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Bioprocess and Biosystems Engineering
ISSN (Print): 1615-7605
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.829 SJR 0.64 CiteScore 2.22
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.96 SJR 0.679 SNIP 0.96
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.692 SNIP 0.882 CiteScore 1.97
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.699 SNIP 0.964 CiteScore 1.95
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.796 SNIP 1.079 CiteScore 2.16
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.752 SNIP 1.102 CiteScore 2.14
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.715 SNIP 0.888 CiteScore 1.92
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.823 SNIP 1.015
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.673 SNIP 0.926
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.588 SNIP 0.881
Scopus rating (2007): SJR 0.622 SNIP 0.815
Scopus rating (2006): SJR 0.546 SNIP 0.958
Scopus rating (2005): SJR 0.383 SNIP 0.742
Scopus rating (2004): SJR 0.46 SNIP 0.912
Scopus rating (2003): SJR 0.435 SNIP 0.87
Scopus rating (2002): SJR 0.375 SNIP 0.619
Application of new point measurement device to quantify groundwater-surface water interactions

The Streambed Point Velocity Probe (SBPVP) measures in situ groundwater velocities at the groundwater-surface water interface without reliance on hydraulic conductivity, porosity, or hydraulic gradient information. The tool operates on the basis of a mini-tracer test that occurs on the probe surface. The SBPVP was used in a meander of the Grindsted Å (stream), Denmark, to determine the distribution of flow through the streambed. These data were used to calculate the contaminant mass discharge of chlorinated ethenes into the stream. SBPVP data were compared with velocities estimated from hydraulic head and temperature gradient data collected at similar scales. Spatial relationships of water flow through the streambed were found to be similar by all three methods, and indicated a heterogeneous pattern of groundwater-surface water exchange. The magnitudes of estimated flow varied to a greater degree. It was found that pollutants enter the stream in localized regions of high flow which do not always correspond to the locations of highest pollutant concentration. The results show the combined influence of flow and concentration on contaminant discharge and illustrate the advantages of adopting a flux-based approach to risk assessment at the groundwater-surface water interface. Chlorinated ethene mass discharges, expressed in PCE equivalents, were determined to be up to 444kg/yr (with SBPVP data) which compared well with independent estimates of mass discharge up to 438kg/yr (with mini-piezometer data from the streambed) and up to 372kg/yr crossing a control plane on the streambank (as determined in a previous, independent study).

General information

State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, University of Kansas
Authors: Cremeans, M. (Ekstern), Devlin, J. (Ekstern), McKnight, U. S. (Intern), Bjerg, P. L. (Intern)
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Main Research Area: Technical/natural sciences

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Journal: Journal of Contaminant Hydrology
Volume: 211
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SJR 0.891 SNIP 1.003 CiteScore 2.36
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.26 SJR 1.037 SNIP 1.077
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.941 SNIP 1.073 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.293 SNIP 1.516 CiteScore 2.4
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.51 SNIP 1.457 CiteScore 3.04
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Application of the NDHA model to describe $\text{N}_2\text{O}$ dynamics in activated sludge mixed culture biomass

A pseudo-mechanistic model describing three biological nitric oxide (NO) and nitrous oxide (N2O) production pathways was calibrated for an activated sludge mixed culture biomass treating municipal wastewater with laboratory-scale experiments. The model (NDHA) comprehensively describes N2O producing pathways by both autotrophic ammonium oxidizing and heterotrophic bacteria. Extant respirometric assays and anaerobic batch experiments were designed to calibrate the endogenous, heterotrophic denitrification and autotrophic ammonium/nitrite oxidation processes together with the associated net N2O production. Ten parameters describing heterotrophic processes and seven for autotrophic processes were estimated accurately (variance/mean < 25%). The model predicted the N2O and NO dynamics at varying dissolved oxygen, ammonium and nitrite levels and was validated with a different set of batch experiments with the same biomass. Aerobic ammonium oxidation experiments at two oxygen levels used for model evaluation (2 and 0.5 mg/L) indicated that the nitrifier denitrification (42, 64%) and heterotrophic denitrification (7, 17%) pathways increased and dominated the total N2O production at high nitrite and low oxygen concentrations; while the nitrifier nitrification pathway showed the largest contribution at high dissolved oxygen levels (51, 19%). The uncertainty of the biological parameter estimates was propagated to N2O model outputs via Monte Carlo simulations as 95% confidence intervals. The accuracy of the estimated parameters corresponded to a low uncertainty of the N2O emission factors (4.6 ± 0.6% and 1.2 ± 0.1%).

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
A proposed mechanism for the ammonia-LCFA synergetic co-inhibition effect on anaerobic digestion process

Ammonia and long chain fatty acids (LCFA) are two major inhibitors of the anaerobic digestion (AD) process. The individual inhibitory effect of each of these two inhibitors is well established; however, the combined co-inhibition effect has not been thoroughly assessed yet. In the current study, the ammonia-LCFA synergetic co-inhibition effect was investigated in both batch and continuous experiments. In the batch experiments, a clear ammonia-LCFA synergetic co-inhibitory effect was identified when the LCFA concentrations were higher than 0.05 g oleate L-1 and ammonia levels between 4.0 and 7.0 NH4+-N L-1. This synergetic effect for LCFA and ammonia levels above 1.1 g oleate L-1 and 4.5 NH4+-N L-1, respectively, was validated in continuous reactors experiments. Nevertheless, adaptation of the AD microbiome to this synergetic co-inhibition could occur after a period of continuous operation. A potential mechanism to explain the synergetic co-inhibition lies on the initial inhibition of methanogens caused by ammonia resulting in increased VFA and hydrogen concentrations, which in turn renders β-oxidation of LCFA thermodynamically unfavourable and thereby brings about further excess accumulation of LCFA and consequently higher unspecific toxicity of all AD steps. This is a vicious cycle, which makes the combined inhibition of the two toxicants more severe, compared to the sum of their individual inhibition effects at the same operational conditions.

General information

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering
Authors: Tian, H. (Intern), Karachalios, P. (Intern), Angelidaki, I. (Intern), Fotidis, I. (Intern)
Pages: 574-580
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Main Research Area: Technical/natural sciences

Publication information

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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.18
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.16
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.75
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.72
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.03
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Are we speaking the same language? Towards a definition and categorization framework for environmental plastic debris

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Norwegian University of Science and Technology, University of Vienna, University of Gothenburg, University of Plymouth, National Institute of Public Health and the Environment
Authors: Wagner, M. (Ekstern), Hartmann, N. B. (Intern), Verschoor, A. (Ekstern), Hüffer, T. (Ekstern), Hassellöv, M. (Ekstern), Thompson, R. C. (Ekstern)
Number of pages: 2
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Main Research Area: Technical/natural sciences
Electronic versions:
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Assessing PCB pollution in the Baltic Sea - An equilibrium partitioning based study
Sediment cores and bottom water samples from across the Baltic Sea region were analyzed for freely dissolved concentrations (Cfree), total sediment concentrations (CT) and the dissolved aqueous fraction in water of seven indicator PCBs. Ex-situ equilibrium sampling of sediment samples was conducted with polydimethylsiloxane (PDMS) coated glass fibers that were analyzed by automated thermal desorption GC-MS, which yielded PCB concentrations in the fiber coating (CPDMS). Measurements of CPDMS and CT were then applied to determine (i) spatially resolved freely dissolved PCB concentrations; (ii) baseline toxicity potential based on chemical activities (a); (iii) site specific mixture compositions; (iv) diffusion gradients at the sediment water interface and within the sediment cores; and (vi) site specific distribution ratios (KD). The contamination levels were low in the Gulf of Finland and moderate to elevated in the Baltic Proper, with the highest levels observed in the western Baltic Sea. The SPME method has been demonstrated to be an appropriate and sensitive tool for area surveys presenting new opportunities to study the in-situ distribution and thermodynamics of hydrophobic organic chemicals at trace levels in marine environments.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Hamburg University of Applied Sciences, University of the West of Scotland, Helmholtz-Zentrum Geesthacht, Leibniz-Institute for Baltic Sea Research
Assessing spatial correlations of sea surges around Copenhagen

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, National Food Institute, Research Group for Risk-Benefit, Department of Environmental Engineering, Urban Water Systems, Statistics and Data Analysis
Authors: Georgiadis, S. (Intern), Sørup, H. J. D. (Intern), Nielsen, B. F. (Intern), Arnbjerg-Nielsen, K. (Intern)
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Electronic versions:
Abstract book
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2018

Assessment of a landfill methane emission screening method using an unmanned aerial vehicle mounted thermal infrared camera – A field study

An unmanned aerial vehicle (UAV)-mounted thermal infrared (TIR) camera’s ability to delineate landfill gas (LFG) emission hotspots was evaluated in a field test at two Danish landfills (Hedeland landfill and Audebo landfill). At both sites, a test area of 100m² was established and divided into about 100 measuring points. The relationship between LFG emissions and soil surface temperatures were investigated through four to five measuring campaigns, in order to cover different atmospheric conditions along with increasing, decreasing and stable barometric pressure. For each measuring campaign, a TIR image of the test area was obtained followed by the measurement of methane (CH₄) and carbon dioxide (CO₂) emissions at each measuring point, using a static flux chamber. At the same time, soil temperatures measured on the surface, at 5cm and 10cm depths, were registered. At the Hedeland landfill, no relationship was found between LFG emissions and surface temperatures. In addition, CH₄ emissions were very limited, on average 0.92–4.52g CH₄m⁻²d⁻¹, and only measureable on the two days with decreasing barometric pressure. TIR images from Hedeland did not show any significant temperature differences in the test area. At the Audebo landfill, an area with slightly higher surface temperatures was found in the TIR images, and the same pattern with slightly higher temperatures was found at a depth of 10cm. The main LFG emissions were found in the area with the higher surface temperatures. LFG emissions at Audebo were influenced significantly by changes in barometric pressure, and the average CH₄ emissions varied between 111gm⁻²d⁻¹ and 314gm⁻²d⁻¹, depending on whether the barometric pressure gradient had increased or decreased, respectively. The temperature differences observed in the TIR images from both landfills were limited to between 0.7°C and 1.2°C. The minimum observable CH₄ emission for the TIR camera to identify an emission hotspot was 150g CH₄m⁻²d⁻¹ from an area of more than 1m².

General information
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Authors: Fjelsted, L. (Intern), Christensen, A. G. (Ekstern), Larsen, J. E. (Ekstern), Kjeldsen, P. (Intern), Scheutz, C. (Intern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.407 SNIP 2.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.732 SNIP 2.263 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.763 SNIP 2.49 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.815 SNIP 2.413 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.59 SNIP 2.18 CiteScore 2.91
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.694 SNIP 2.071 CiteScore 2.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.553 SNIP 1.821
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.519 SNIP 1.919
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.375 SNIP 2.145
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.998 SNIP 1.785
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.021 SNIP 1.819
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.065 SNIP 1.653
Scopus rating (2004): SJR 1.271 SNIP 1.911
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.853 SNIP 1.234
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.498 SNIP 0.903
Scopus rating (2001): SJR 0.45 SNIP 0.731
Web of Science (2001): Indexed yes
ASTA - A method for multi-criteria evaluation of water supply technologies to Assess the most SusTainable Alternative for Copenhagen

Utilities in larger cities have to make complex decisions planning future investments in urban water infrastructure. Changes are driven by physical water stress or political targets for environmental water flows e.g. through the implementation of the European water framework directive. To include these environmental, economic and social sustainability dimensions we introduce a novel multi-criteria assessment method for evaluation of water supply technologies. The method is presented and demonstrated for four alternatives for water supply based on groundwater, rain- & stormwater or seawater developed for augmenting Copenhagen's current groundwater based water supply. To identify the most sustainable technology, we applied rank order distribution weights to a multi-criteria decision analysis to combine the impact assessments of environment, economy and society. The three dimensions were assessed using 1) life-cycle assessment, 2) cost calculations taking operation and maintenance into account and 3) the multi-criteria decision analysis method Analytical hierarchy process. Specialists conducted the life-cycle assessment and cost calculations and the multi-criteria decision analyses were based on a stakeholder workshop gathering stakeholders relevant for the specific case. The workshop reached consensus on three sets of ranked criteria. Each set represented stakeholder perspectives with first priority given to one of the three sustainability dimensions or categories. The workshop reached consensus and when the highest weight was assigned to the environmental dimension of sustainability then the alternative of 'Rain- & stormwater harvesting' was the most sustainable water supply technology; when the highest weight was assigned to the economy or society dimensions then an alternative with 'Groundwater abstraction extended with compensating actions' was considered the most sustainable water supply technology. Across all three sets of ranked weights, the establishment of new well fields is considered the least sustainable alternative.
A Typology for Climate Change Adaptation: Event Magnitudes, Spatial Scale and Goals

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Management Engineering, Technology and Innovation Management
Authors: Madsen, H. M. (Intern), Andersen, M. M. (Intern), Rygaard, M. (Intern), Mikkelsen, P. S. (Intern)
Pages: 34-34
Publication date: 2018
Bedre forudsigelse af effekterne fra blødgøring

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Tang, C. (Intern), Albrechtsen, H. (Intern), Godskesen, B. (Intern)
Number of pages: 1
Pages: 59-59
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: DanskVand
Issue number: 3
ISSN (Print): 1602-3609
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
Tang2.pdf
Links:
http://www.e-pages.dk/danva/218/

Bioaccumulation of ionizable organic chemicals in fish – The quest for reliable predictors

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Technical University of Denmark, Helmholtz Centre for Environmental Research, Fraunhofer Institute for Molecular Biology and Applied Ecology IME
Authors: Polesel, F. (Intern), Zhang, Z. (Ekstern), Bittermann, K. (Ekstern), Linden, L. (Ekstern), Schlechtriem, C. (Ekstern), Goss, K. (Ekstern), Trapp, S. (Intern)
Number of pages: 2
Publication date: 2018
Event: Abstract from SETAC Europe 28th Annual Meeting, Rome, Italy.
Main Research Area: Technical/natural sciences
Electronic versions:
2._Bioaccumulation_of_ionizable_organic_chemicals_in_fish_FINAL.pdf
Source: PublicationPreSubmission
Source-ID: 148017570
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Biodegradability of pristine and weathered car tire rubber using different inocula

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Technical University of Denmark
Authors: Polesel, F. (Intern), Ahonen, T. (Ekstern), Baun, A. (Intern), Hartmann, N. B. (Intern)
Bio-Electro-Fenton process for the degradation of Non-Steroidal Anti-Inflammatory Drugs in wastewater

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are ubiquitous municipal wastewater pollutants of which several are resistant to degradation in conventional wastewater treatment, and represent a major environmental health concern worldwide. An alternative treatment, the bio-electro-Fenton process, has received increasing attention in past years. In this process the strong oxidant •HO is formed using the electrons derived from bacterial oxidation of organic substrate. In this work, a laboratory scale microbial electrolysis cell based bio-electro-Fenton process was developed for the treatment of four different NSAIDs. The system was demonstrated to remove low concentration NSAIDs from water and wastewater and all tested parameters (cathode pH, cathode air-flow, cathode Fe2+ concentration, applied voltage, NSAIDs concentration and reaction time) were found to affect the apparent first order rate constant and removal efficiency for NSAIDs. Optimum parameter values were found to be pH = 2, Fe2+ = 7.5 mM, air-flow = 8 mL min-1, applied voltage = 0.3 V; the apparent rate constant was higher for higher NSAIDs initial concentration. For reaction times of 5 hours removal efficiencies were 59%-61% for Ketoprofen, 87%-97% for Diclofenac, 80%-86% for Ibuprofen and 75%-81% for Naproxen. Prolonged reaction times lead to substantial increase in removal efficiencies for Ketoprofen and Naproxen. Finally results obtained with real wastewater show lower removal rate constants than with distilled water matrices suggesting interference from wastewater components in the NSAIDs oxidation process. The results offer insight into future developments of an efficient platform for wastewater treatment technology targeting micropollutants.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Water Technologies, University of Aveiro
Authors: Nadasí , H. (Ekstern), Li, X. (Intern), Alves , N. (Ekstern), Couras , C. (Ekstern), Andersen, H. R. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
Pages: 401-410
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Chemical Engineering Journal
Volume: 338
ISSN (Print): 1385-8947
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 7.01
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.34
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 5.66
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.92
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 4.59
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Bioethanol from corn stover – a review and technical assessment of alternative biotechnologies

Reviewing the literature from the last decade regarding the bioconverion of corn stover into ethanol, 474 references were identified containing 561 datasets. We found 144 datasets which were sufficiently consistent and detailed to address the current state of the art of corn stover conversion to bioethanol, and we were able to categorise 93% of these datasets into eight different technological configurations for the production of bioethanol, based on the pretreatment approaches used.

After pretreating, the corn stover is subject to hydrolysis and fermentation, but these two process steps were largely identical in all datasets, albeit a range of operating conditions was reported. The final distillation of the ethanol was very rarely included in the datasets. By parameterising the bioethanol production by 26 parameters, including corn stover compositions, solid loadings, operational conditions, conversion efficiencies and material consumption, we were able to quantify the material flows for each technological configuration and estimate the uncertainty of the flows. The eight technological configurations produced 11–22% ethanol from the dry solid content of the corn stover. Technologies using alkaline-, solvent or ammonia-based pretreatments produced the largest amount of ethanol (19–22%), while fungi-based pretreatment produced much less (11%). All technological configurations resulted in large flows of solid as well as liquid residues, typically containing 60 to 70% of the dry solid corn stover content. Based on the selected datasets, statistical description is provided for all parameters, including mode, median, average and deviation, within each technological configuration. Bivariate correlation analysis across and within all technological configurations indicates that some operational parameters usually considered crucial in laboratory studies, e.g. pretreatment severity, show from a statistical perspective very little correlation with the yields. The review reveals that a great deal of research has addressed the challenge of converting corn stover into bioethanol, but a significant part of these studies is of limited value in terms of scope and documentation when addressing overall material flows and key parameters in a technological context.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Water Technologies, Beijing Normal University
Authors: Zhao, Y. (Ekstern), Damgaard, A. (Intern), Christensen, T. H. (Intern)
Pages: 275-291
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Progress in Energy and Combustion Science
Volume: 67
ISSN (Print): 0360-1285
Ratings:
Biogas and its opportunities—A review

Biogas production is a well-established technology primarily for the generation of renewable energy and also for the valorization of organic residues. Biogas is the end product of a biological mediated process, the so called anaerobic digestion, in which different microorganisms, follow diverse metabolic pathways to decompose the organic matter. The process has been known since ancient times and was widely applied at domestic households providing heat and power...
for hundreds of years. Nowadays, the biogas sector is rapidly growing and novel achievements create the foundation for constituting biogas plants as advanced bioenergy factories. In this context, the biogas plants are the basis of a circular economy concept targeting nutrients recycling, reduction of greenhouse gas emissions and biorefinery purposes. This review summarizes the current state-of-the-art and presents future perspectives related to the anaerobic digestion process for biogas production. Moreover, a historical retrospective of biogas sector from the early years of its development till its recent advancements gives an outlook of the opportunities that are opening up for process optimisation.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Kougiou, P. (Intern), Angelidaki, I. (Intern)
Number of pages: 12
Publication date: 2018
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Frontiers of Environmental Science & Engineering
Volume: 12
Issue number: 3
Article number: 14
ISSN (Print): 2095-2201
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.732 SJR 0.672 CiteScore 2.08
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.84 SJR 0.608 SNIP 0.724
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.552 SNIP 0.636 CiteScore 1.49
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.578 SNIP 0.789 CiteScore 1.36
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.419 SNIP 0.807
Scopus rating (2012): SJR 0.418 SNIP 0.571
Scopus rating (2011): SJR 0.336 SNIP 0.386
Scopus rating (2010): SJR 0.311 SNIP 0.282
Scopus rating (2009): SJR 0.172 SNIP 0.211
Scopus rating (2008): SJR 0.122 SNIP 0.164
Original language: English

**Biogas upgrading and utilization: Current status and perspectives**

Biogas production is an established sustainable process for simultaneous generation of renewable energy and treatment of organic wastes. The increasing interest of utilizing biogas as substitute to natural gas or its exploitation as transport fuel opened new avenues in the development of biogas upgrading techniques. The present work is a critical review that summarizes state-of-the-art technologies for biogas upgrading and enhancement with particular attention to the emerging biological methanation processes. The review includes comprehensive description of the main principles of various biogas upgrading methodologies, scientific and technical outcomes related to their biomethanation efficiency, challenges that have to be addressed for further development and incentives and feasibility of the upgrading concepts.
Bridging Thermal Infrared Sensing and Physically-Based Evapotranspiration Modeling: From Theoretical Implementation to Validation Across an Aridity Gradient in Australian Ecosystems

Thermal infrared sensing of evapotranspiration (E) through surface energy balance (SEB) models is challenging due to uncertainties in determining the aerodynamic conductance (gA) and due to inequalities between radiometric (TR) and aerodynamic temperatures (T0). We evaluated a novel analytical model, the Surface Temperature Initiated Closure (STIC1.2), that physically integrates TR observations into a combined Penman-Monteith Shuttleworth-Wallace (PM-SW) framework for directly estimating E, and overcoming the uncertainties associated with T0 and gA determination. An evaluation of STIC1.2 against high temporal frequency SEB flux measurements across an aridity gradient in Australia revealed a systematic error of 10% – 52% in E from mesic to arid ecosystem, and low systematic error in sensible heat fluxes (H) (12% – 25%) in all ecosystems. Uncertainty in TR versus moisture availability relationship, stationarity assumption in surface emissivity, and SEB closure corrections in E were predominantly responsible for systematic E errors in arid and semi-arid ecosystems. A discrete correlation (r) of the model errors with observed soil moisture variance (r = 0.33 to 0.43), evaporative index (r = 0.77 to 0.90), and climatological dryness (r = 0.60 to 0.77) explained a strong association between ecohydrological extremes and TR in determining the error structure of STIC1.2 predicted fluxes. Being independent of any leaf-scale biophysical parameterization, the model might be an important value addition in working group (WG2) of the Australian Energy and Water Exchange (OzEWEX) research initiative which focuses on observations to evaluate and compare biophysical models of energy and water cycle components.

General information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Luxembourg Institute of Science and Technology, Roskilde University, UTS University of Technology Sydney, Aalto University, University of California, University of Melbourne, University of Western Australia
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Water Resources Research
ISSN (Print): 0043-1397
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.296 SNIP 1.555 CiteScore 4.39
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.1 SJR 2.615 SNIP 1.633
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.525 SNIP 1.593 CiteScore 4.06
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.442 SNIP 1.668 CiteScore 3.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.204 SNIP 1.751 CiteScore 3.65
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.127 SNIP 1.586 CiteScore 3.12
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.937 SNIP 1.48 CiteScore 2.92
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.053 SNIP 1.431
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.138 SNIP 1.528
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.814 SNIP 1.546
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.695 SNIP 1.44
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.794 SNIP 1.704
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.73 SNIP 1.402
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.644 SNIP 1.463
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.923 SNIP 1.758
Scopus rating (2002): SJR 1.725 SNIP 1.943
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.091 SNIP 1.635
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 2.726 SNIP 1.774
Carbon budget and cycling in a Danish willow short rotation coppice ecosystem—climate sensitivity and climate change mitigation potential

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources
Authors: Ibrom, A. (Intern), Pilegaard, K. (Intern)
Number of pages: 1
Publication date: 2018
Conference: EGU General Assembly: 2018, Vienna, Austria, 08/04/2018 - 08/04/2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Geophysical Research Abstracts
Volume: 20
Article number: EGU2018-11939
ISSN (Print): 1607-7962
Ratings:
Web of Science (2014): Indexed yes
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2009): BFI-level 1
Original language: English
Electronic versions:
EGU2018_11939.pdf
Source: PublicationPreSubmission
Source-ID: 147140925
Publication: Research - peer-review › Conference abstract in journal – Annual report year: 2018

Characterization of Irreversible Fouling after Ultrafiltration of Thermomechanical Pulp Mill Process Water

Large volumes of wastewater with dissolved wood components are treated in wastewater treatment plants at thermomechanical pulp mills. It has been shown previously that hemicelluloses in these wastewater streams can be recovered by membrane filtration. A serious obstacle when treating lignocellulose process streams is fouling of the membranes. Fouling not only increases operating costs but also reduces the operating time of the membrane plant. When optimizing the membrane cleaning method, it is important to know which compounds cause the fouling. In this work fouling of an ultrafiltration membrane was studied. The fouling propensity of untreated process water and microfiltrated process water was compared. Fouled membranes were analyzed using scanning electron microscopy and attenuated total reflection Fourier transform infrared spectrometry. Acid hydrolysis of membranes exposed to untreated process water and microfiltration permeate revealed that 508 mg/m2 and 37 mg/m2 of polysaccharides, respectively, remained on the membranes even after alkaline cleaning.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Lund University
Authors: Thuvander, J. (Ekstern), Zarebska, A. (Intern), Hélix-Nielsen, C. (Intern), Jönsson, A. (Ekstern)
Co-digestion and model simulations of source separated municipal organic waste with cattle manure under batch and continuously stirred tank reactors

This study investigates the co-digestion of source separated municipal organic waste (SSMOW), pretreated using a biopulper, and cattle manure both in batch and continuous stirred tank reactors. The optimum co-digestion feeding mixture was consisted of 90% SSMOW and 10% cattle manure on organic matter basis, yielding 443 mLCH4/gVS. The high performance of the co-digestion was explained by the fact that the efficient pulping pretreatment boosted the methane production from SSMOW and that the added livestock slurry provided the buffer capacity to avoid inhibition occurred by intermediates’ accumulation. Moreover, batch assays focused on the effect of inoculum to substrate ratio (ISR) were performed. Results showed that the reduction of ISR had slight impact on extending the lag phase, without affecting the rest kinetic parameters. The efficiency of the codigestion process in continuously fed reactor was comparable with the results obtained from the batch assay (i.e. <95% of the maximum expected value). Finally, the outputs from an applied mathematical model were in good agreement with the experimental data obtained from the continuous reactor operation, demonstrating that the BioModel can serve as a reliable tool to predict the process performance under real-scale conditions.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Tsapekos, P. (Intern), Kougias, P. (Intern), Kuthiala, S. (Ekstern), Angelidaki, I. (Intern)
Pages: 1-6
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Energy Conversion and Management
Volume: 159
ISSN (Print): 0196-8904
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 2.233 SJR 2.537 CiteScore 6.85
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 6.04 SJR 2.232 SNIP 2.109
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.023 SNIP 2.079 CiteScore 5.24
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.789 SNIP 2.791 CiteScore 5.35
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.613 SNIP 2.534 CiteScore 4.49
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.674 SNIP 2.242 CiteScore 3.72
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.24 SNIP 1.82 CiteScore 3.03
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.35 SNIP 1.735
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.302 SNIP 1.798
Coexistence of two distinct Sulfurospirillum populations respiring tetrachloroethene - genomic and kinetic considerations

Two anaerobic bacterial consortia, each harboring a distinct Sulfurospirillum population, were derived from a ten year old consortium, SL2, previously characterized for the stepwise dechlorination of tetrachloroethene (PCE) to cis-dichloroethene (cis-DCE) via accumulation of trichloroethene (TCE). Population SL2-1 dechlorinated PCE to TCE exclusively, while SL2-2 produced cis-DCE from PCE without substantial TCE accumulation. The reasons explaining the long-term coexistence of the populations were investigated. Genome sequencing revealed a novel Sulfurospirillum species, designated 'Candidatus Sulfurospirillum diekertiae', whose genome differed significantly from other Sulfurospirillum spp. (78-83% ANI). Genome-wise, SL2-1 and SL2-2 populations are almost identical, but differences in their tetrachloroethene reductive dehalogenase sequences explain the distinct dechlorination patterns. An extended series of batch cultures were performed at PCE concentrations of 2-200 μM. A model was developed to determine their dechlorination kinetic parameters. The affinity constant and maximal growth rate differ between the populations: the affinity is 6- to 8-fold higher and the growth rate 5-fold lower for SL2-2 than SL2-1. Mixed cultivation of the enriched populations at 6 and 30 μM PCE showed that a low PCE concentration could be the driving force for both functional diversity of reductive dehalogenases and niche specialization of organohalide-respiring bacteria with overlapping substrate ranges.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Ecole Polytechnique Federale de Lausanne (EPFL), Friedrich-Schiller-Universitat Jena
Authors: Buttet, G. F. (Ekstern), Murray, A. M. (Intern), Goris, T. (Ekstern), Burion, M. (Ekstern), Jin, B. (Intern), Rolle, M. (Intern), Holliger, C. (Ekstern), Maillard, J. (Ekstern)
Number of pages: 18
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Fems Microbiology Ecology
Volume: 94
Issue number: 5
Article number: fiy018
ISSN (Print): 0168-6496
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Comammox Nitrospira are abundant ammonia oxidizers in diverse groundwater-fed rapid sand filter communities

The recent discovery of completely nitrifying Nitrospira demands a re-examination of nitrifying environments to evaluate their contribution to nitrogen cycling. To approach this challenge, tools are needed to detect and quantify comammox Nitrospira. We present primers for the simultaneous quantification and diversity assessment of both comammox Nitrospira clades. The primers cover a wide range of comammox diversity, spanning all available high quality sequences. We applied these primers to 12 groundwater-fed rapid sand filters, and found comammox Nitrospira to be abundant in all filters. Clade B comammox comprise the majority (~75%) of comammox abundance in all filters. Nitrosomonadaceae were present in all filters, although at low abundance (mean = 1.8%). Ordination suggests that temperature impacts the structure of nitrifying communities, and in particular that increasing temperature favours Nitrospira. The nitrogen content of the filter material, sulfate concentration and surface ammonium loading rates shape the structure of the comammox guild in the filters. This work provides an assay for simultaneous detection and diversity assessment of clades A and B comammox.
Nitrospira, expands our current knowledge of comammox Nitrospira diversity and demonstrates a key role for comammox Nitrospira in nitrification in groundwater-fed biofilters.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Department of Micro- and Nanotechnology, Surface Engineering, Department of Applied Mathematics and Computer Science, Technical University of Denmark
Authors: Fowler, S. J. (Ekstern), Palomo, A. (Intern), Dechesne, A. (Intern), Mines, P. D. (Intern), Smets, B. F. (Intern)
Pages: 1002-1015
Publication date: 2018
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Environmental Microbiology
Volume: 20
Issue number: 3
ISSN (Print): 1462-2912
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.273 SNIP 1.823 CiteScore 6.37
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.165 SNIP 1.639 CiteScore 5.94
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.368 SNIP 1.7 CiteScore 6.1
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.775 SNIP 1.551
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.502 SNIP 1.378
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.495 SNIP 1.322
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.303 SNIP 1.498
Web of Science (2006): Indexed yes
Combining satellite data and appropriate objective functions for improved spatial pattern performance of a distributed hydrologic model

Satellite-based earth observations offer great opportunities to improve spatial model predictions by means of spatial-pattern-oriented model evaluations. In this study, observed spatial patterns of actual evapotranspiration (AET) are utilised for spatial model calibration tailored to target the pattern performance of the model. The proposed calibration framework combines temporally aggregated observed spatial patterns with a new spatial performance metric and a flexible spatial parameterisation scheme. The mesoscale hydrologic model (mHM) is used to simulate streamflow and AET and has been selected due to its soil parameter distribution approach based on pedo-transfer functions and the build in multi-scale parameter regionalisation. In addition two new spatial parameter distribution options have been incorporated in the model in order to increase the flexibility of root fraction coefficient and potential evapotranspiration correction parameterisations, based on soil type and vegetation density. These parameterisations are utilised as they are most relevant for simulated AET patterns from the hydrologic model. Due to the fundamental challenges encountered when evaluating spatial pattern performance using standard metrics, we developed a simple but highly discriminative spatial metric, i.e. one comprised of three easily interpretable components measuring co-location, variation and distribution of the spatial data. The study shows that with flexible spatial model parameterisation used in combination with the appropriate objective functions, the simulated spatial patterns of actual evapotranspiration become substantially more similar to the satellite-based estimates. Overall 26 parameters are identified for calibration through a sequential screening approach based on a combination of streamflow and spatial pattern metrics. The robustness of the calibrations is tested using an ensemble of nine calibrations based on different seed numbers using the shuffled complex evolution optimiser. The calibration results reveal a limited trade-off between streamflow dynamics and spatial patterns illustrating the benefit of combining separate observation types and objective functions. At the same time, the simulated spatial patterns of AET significantly improved when an objective function based on observed AET patterns and a novel spatial performance metric compared to traditional streamflow-only calibration were included. Since the overall water balance is usually a crucial goal in hydrologic modelling, spatial-pattern-oriented optimisation should always be accompanied by traditional discharge measurements. In such a multi-objective framework, the current study promotes the use of a novel bias-insensitive spatial pattern metric, which exploits the key information contained in the observed patterns while allowing the water balance to be informed by discharge observations.

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Geological Survey of Denmark and Greenland, Helmholtz Centre for Environmental Research, University of Copenhagen
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Main Research Area: Technical/natural sciences

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Journal: Hydrology and Earth System Sciences
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BFI (2018): BFI-level 1
Comparative genomics sheds light on niche differentiation and the evolutionary history of comammox Nitrospira
The description of comammox Nitrospira spp., performing complete ammonia-to-nitrate oxidation, and their co-occurrence with canonical β-proteobacterial ammonia oxidizing bacteria (β-AOB) in the environment, calls into question the metabolic potential of comammox Nitrospira and the evolutionary history of their ammonia oxidation pathway. We report four new comammox Nitrospira genomes, constituting two novel species, and the first comparative genomic analysis on comammox Nitrospira. Unlike canonical Nitrospira, comammox Nitrospira genomes lack genes for assimilatory nitrite.
reduction, suggesting that they have lost the potential to use external nitrite nitrogen sources. By contrast, compared to canonical Nitrospira, comammox Nitrospira harbor a higher diversity of urea transporters and copper homeostasis genes and lack cyanate hydratase genes. Additionally, the two comammox clades differ in their ammonium uptake systems. Contrary to β-AOB, comammox Nitrospira genomes have single copies of the two central ammonia oxidation pathway operons. Similar to ammonia oxidizing archaea and some oligotrophic AOB strains, they lack genes involved in nitric oxide reduction. Furthermore, comammox Nitrospira genomes encode genes that might allow efficient growth at low oxygen concentrations. Regarding the evolutionary history of comammox Nitrospira, our analyses indicate that several genes belonging to the ammonia oxidation pathway could have been laterally transferred from β-AOB to comammox Nitrospira. We postulate that the absence of comammox genes in other sublineage II Nitrospira genomes is the result of subsequent loss.
Comparing two enhancing methods for improving kitchen waste anaerobic digestion: bentonite addition and autoclaved de-oiling pretreatment

The effects of different enhancement methods, including adding bentonite (1.25%, w/w, wet substrate) and autoclaved de-oiling pretreatment (121 °C, 30 minutes), on the anaerobic digestion of kitchen waste (KW) were comparably studied. Mesophilic continuous stirred tank reactors were used under different organic loading rates (OLRs) of 1.11 to 1.84 gVS (volatile solids)L−1d−1 and two different hydraulic retention times (HRTs) (20 d and 25 d). In this study, two enhancement methods and extending HRT could prevent volatile fatty acids (VFA) accumulation and obtain a high methane production at low OLR. Owing to the effect of providing nutrients and buffering capacity, the maximum methane yield was obtained with adding bentonite at OLR of 1.39 gVS−1d−1. However, for high OLR (1.84 gVS−1d−1), a decrease of the methane yield and system breakdown occurred due to the accumulation of VFAs. Engineering design and process evaluation of a CSTR biogas plant treating with KW based on the laboratory experiment was stated.
Comparison of phosphodiesterase type V inhibitors use in eight European cities through analysis of urban wastewater

In this work a step forward in investigating the use of prescription drugs, namely erectile dysfunction products, at European level was taken by applying the wastewater-based epidemiology approach. 24-h composite samples of untreated wastewater were collected at the entrance of eight wastewater treatment plants serving the catchment within the cities of Bristol, Brussels, Castellón, Copenhagen, Milan, Oslo, Utrecht and Zurich. A validated analytical procedure with direct injection of filtered aliquots by liquid chromatography-tandem mass spectrometry was applied. The target list included the three active pharmaceutical ingredients (sildenafil, tadalafil and vardenafil) together with (bio)transformation products and other analogues. Only sildenafil and its two human urinary metabolites desmethyl- and desethylsildenafil were detected in the samples with concentrations reaching 60 ng L\(^{-1}\). The concentrations were transformed into normalized measured loads and the estimated actual consumption of sildenafil was back-calculated from these loads. In addition, national prescription data from five countries was gathered in the form of the number of prescribed daily doses and transformed into predicted loads for comparison. This comparison resulted in the evidence of a different spatial trend across Europe. In Utrecht and Brussels, prescription data could only partly explain the total amount found in wastewater; whereas in Bristol, the comparison was in agreement; and in Milan and Oslo a lower amount was found in wastewater than expected from the prescription data. This study illustrates the potential of wastewater-based epidemiology to investigate the use of counterfeit medication and rogue online pharmacy sales.

General information
State: Published
Organisations: Department of Environmental Engineering, Chemical Water Quality and Health, University of Amsterdam, Universidad Nacional de Costa Rica, Universitat Jaume I, University of South Australia, Norwegian Institute for Water Research, Istituto di Ricerche Farmacologiche Mario Negri, University of Bath, University of Antwerp, Swiss Federal Institute of Aquatic Science and Technology (Eawag), University of Queensland
Number of pages: 6
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Journal: Environment International
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Web of Science (2018): Indexed yes
Compositional analysis of seasonal variation in Danish residual household waste
Seasonal variations are considered one of the key factors affecting the generation and composition of residual waste. Despite this importance, attempts have not been made to characterize residual household waste consistently by accounting for seasonal variations in waste disposal patterns. To assess differences between seasons and within individual households, we collected residual household waste from the same 101 households in summer, autumn and winter. The waste bags were sorted individually, and residual household waste data (mass and composition) were generated for each household. In total, 3 t of waste were collected, weighed and manually sorted into nine (9) waste fractions. The result of mixed linear model indicated that for this study area, seasonal variations may introduce no significant difference to the mass and composition of residual household waste. However, residual waste generation within a household may change significantly between the seasons. The result also showed that while household size may significantly influence the generation of residual household, the difference in residual household waste composition was not significantly different between household sizes.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 2.11 SJR 1.462 CiteScore 5.31
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.73 SJR 1.211 SNIP 1.804
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.284 SNIP 1.947 CiteScore 3.98
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.324 SNIP 2.048 CiteScore 3.7
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.424 SNIP 2.228 CiteScore 3.34
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.236 SNIP 1.845 CiteScore 2.91
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.115 SNIP 1.845 CiteScore 2.62
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.16 SNIP 1.812
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Concentrating molasses distillery wastewater using biomimetic forward osmosis (FO) membranes

Treatment of sugarcane molasses distillery wastewater is challenging due to the presence of complex phenolic compounds (melanoidins and polyphenols) having antioxidant properties. Due to zero liquid discharge regulations, Indian distilleries continue to explore effective treatment options. This work examines the concentration of distillery wastewater by forward osmosis (FO) using aquaporin biomimetic membranes and magnesium chloride hexahydrate (MgCl2.6H2O) as draw solution. The operational parameters viz. feed solution and draw solution flow rate and draw solution concentration were optimized using 10% v/v melanoidins model feed solution. This was followed by trials with distillery wastewater. Under the conditions of this work, feed and draw flow rates of 1 L/min and draw solution concentration of 2M MgCl2.6H2O for melanoidins model solution and 3M MgCl2.6H2O for distillery wastewater were optimal for maximum rejection. Rejection of 90% melanoidins, 96% antioxidant activity and 84% COD was obtained with melanoidins model feed, with a corresponding water flux of 6.3 L/m2h. With as-received distillery wastewater, the rejection was similar (85–90%) to the melanoidins solution, but the water flux was lower (2.8 L/m2h). Water recovery from distillery wastewater over 24 h study period was higher with FO (70%) than reported for RO (35–45%). Repeated use of the FO membrane over five consecutive 24 h cycles with fresh feed and draw solutions and periodic cleaning showed consistent average water flux and rejection of the feed constituents.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, TERI University, University of Maribor
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BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.601 SNIP 2.358 CiteScore 7.55
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.663 SNIP 2.563
Conceptualization of flow and transport in a limestone aquifer by multiple dedicated hydraulic and tracer tests

Limestone aquifers are of great interest as a drinking water resource in many countries. They often have a complex crushed and fractured geology, which makes the analysis and description of flow and transport processes in such aquifers
a challenging task. In this study, the solute transport behavior including fracture-matrix interaction in hydrogeological units of a limestone aquifer in eastern Denmark was characterized by designing, conducting and interpreting six depth-specific tracer tests involving natural- and forced-gradient conditions with multiple tracers representing different diffusion properties. To determine flow parameters, the tracer tests were complemented by a comprehensive set of depth-specific borehole and hydraulic tests.

Based on the tests, a new and stronger conceptual understanding was developed for the different aquifer units. The investigated limestone aquifer is composed of a glacially crushed unit and two fractured units, with calcarenitic and bryozoan limestone of similar hydraulic properties. Hydraulic tests revealed, that the crushed unit has a lower hydraulic conductivity than the fractured limestone units, likely due to the crushed conditions with small limestone clusters and small-aperture fractures potentially filled with fine material.

In the fractured limestone units, a distinct preferential flow and primary transport along major horizontal fractures was inferred from the tracer tests under forced-gradient conditions. The dominant horizontal fractures were identified on impeller flow logs and appear connected between wells, having an extent of up to several hundred meters. Connectivity between the aquifer units was investigated with a long-term pumping test and tracer tests, revealing restricted vertical flow and transport. A very pronounced hydraulic conductivity contrast between major fractures and matrix could also be inferred from the borehole and hydraulic tests, which is consistent with the findings from the tracer tests. However, the difference in the matrix diffusion behavior of the simultaneously injected tracers and a long tailing in the breakthrough curves revealed that matrix diffusion has a strong influence on the solute transport in the fractured limestone.

**General information**

State: Published
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.71 SJR 1.832 CiteScore 4.06
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 1.813 SNIP 1.772
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.686 SNIP 1.761 CiteScore 3.54
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.667 SNIP 1.993 CiteScore 3.45
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.714 SNIP 1.974 CiteScore 3.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.914 SNIP 1.994 CiteScore 3.38
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.742 SNIP 1.833 CiteScore 3.16
Converting mesophilic upflow sludge blanket (UASB) reactors to thermophilic by applying axenic methanogenic culture bioaugmentation

The application of thermophilic conditions in anaerobic digesters leads to higher methane production rates and better sanitation of the effluents compared to mesophilic operation. However, an increase in operational temperature is challenging due to the tremendous selective pressure imposed on the microbial consortium. The adaptation of microbial community to a new environment or condition can be accelerated by a process known as “bioaugmentation” or “microbial community manipulation”, during which exogenous microorganisms harbouring specific metabolic activities are introduced to the reactor. The aim of the current study was to rapidly convert the operational temperature of up-flow anaerobic sludge blanket (UASB) reactors from mesophilic to thermophilic conditions by applying microbial community manipulation techniques. Three different bioaugmentation strategies were compared and it was proven that the injection of axenic methanogenic culture was the most efficient approach leading to improved biomethanation process with 40% higher methane production rate compared to the control reactor. Microbial community analyses revealed that during bioaugmentation, the exogenous hydrogenotrophic methanogen could be encapsulated in granular structures and concomitantly promote the growth of syntrophic fatty acid oxidizing bacteria. The results derived from the current study indicated that microbial community manipulation is an efficient alternative method to speed up transition of UASB reactors from mesophilic to thermophilic conditions.
Coordinating rule-based and system-wide model predictive control strategies to reduce storage expansion of combined urban drainage systems: The case study of Lundtofte, Denmark

The environmental benefits of combining traditional infrastructure solutions for urban drainage (increasing storage volume) with real time control (RTC) strategies were investigated in the Lundtofte catchment in Denmark, where an expensive traditional infrastructure expansion is planned to comply with environmental requirements. A coordinating, rule-based RTC strategy and a global, system-wide risk-based dynamic optimization strategy (model predictive control), were compared using a detailed hydrodynamic model. RTC allowed a reduction of the planned storage volume by 21% while improving the system performance in terms of combined sewer overflow (CSO) volumes, environmental impacts, and utility costs,
which were reduced by up to 10%. The risk-based optimization strategy provided slightly better performance in terms of reducing CSO volumes, with evident improvements in environmental impacts and utility costs, due to its ability to prioritize among the environmental sensitivity of different recipients. A method for extrapolating annual statistics from a limited number of events over a time interval was developed and applied to estimate yearly performance, based on the simulation of 46 events over a five-year period. This study illustrates that including RTC during the planning stages reduces the infrastructural costs while offering better environmental protection, and that dynamic risk-based optimisation allows prioritising environmental impact reduction for particularly sensitive locations.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Technical University of Denmark, Krüger A/S
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Number of pages: 15
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Journal: Water
Volume: 10
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.007 SJR 0.634 CiteScore 2.29
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.05 SJR 0.576 SNIP 1.137
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.53 SNIP 1.057 CiteScore 1.96
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.518 SNIP 0.96 CiteScore 1.45
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.313 SNIP 0.621 CiteScore 1
ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 0.289 SNIP 0.856
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Coulombic effects during conservative and reactive transport of charged solutes in homogeneous and heterogeneous porous media: Experiments and modeling

General information
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Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Geological Survey of Finland
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Number of pages: 2
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Event: Abstract from InterPore 10th Annual Meeting and Jubilee, New Orleans, United States.
Main Research Area: Technical/natural sciences

Current as an indicator of ammonia concentration during wastewater treatment in an integrated microbial electrolysis cell - Nitrification system

A key challenge for ammonia monitoring during nitrogen removal process is the extra cost and toxic reagent consuming. Herein the feasibility of current generated by an integrated microbial electrolysis cell (MEC) - nitrification reactor as an indicator of initial ammonia levels (NH3/NH4+) in wastewater was explored. In this loop system, ammonia was first oxidized to nitrate in the nitrification reactor, and then the effluent was introduced into the cathode of MEC where nitrate was reduced as electron acceptor. The correlation between current and ammonia concentration was first investigated with synthetic ammonia-rich wastewater. A good linear relationship (R²=0.9419) was observed between current (0.5130–3.906mA) and ammonia levels (0–62.1mg NH4+-N/L). Such linear relationship was always obtained regardless of the tested external power supply or wastewater pH. The external electrochemical cell was proved to be an effective pre-conditioning method to remove the disturbance from other possible electron acceptors. Finally, the integrated system was further tested with real waste streams and the results showed no significant difference (p>0.05) with measurements by conventional methods. This study, for the first time, demonstrated the potential application of the integrated MEC - nitrification system for ammonia monitoring in addition to water treatment.

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Zhao, N. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
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Publication information
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Web of Science (2018): Indexed yes
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Scopus rating (2017): SJR 1.439 SNIP 1.101 CiteScore 5.01
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.74 SJR 1.355 SNIP 1.177
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.321 SNIP 1.324 CiteScore 4.86
Web of Science (2015): Indexed yes
Deciphering the microbial ecology in bio- gas reactors for optimizing the anaerobic digestion process

Anaerobic digestion (AD) is a microbial mediated process where organic compounds are degraded to biogas (CH4 and CO2). AD occurs in many natural anoxic environments and is an essential step for global carbon circle. Engineered AD systems, i.e. biogas reactors, enhance methanogenic activity by applying empirical operational conditions, in order to accelerate the methane production for energetic purposes. In Denmark, biogas produced from AD has a considerable share in renewable energy with the expectation to expand. Thus, the more effective operation of biogas plants will significantly benefit Denmark’s sustainable development. As AD relies on complex microbial activity, a more comprehensive understanding of the AD microbial consortia and their activity provides the fundamental knowledge for process control and optimization.

In AD, the microbial metabolisms are mostly thermodynamically constrained and the obligatory syntrophy is an essential
intermediary step. Thus, the majority of AD microbiota remains uncharacterized since in the past it was mainly investigated using cultivated-based methods. The advent of more powerful sequencing technology (i.e. next generation sequencing, NGS) and newly developed bioinformatic methods enable researchers to perform in-situ analyses on uncharacterized microbial communities. The applications of NGS technology were proved to be effective tools to reveal AD microbial ecology. However, the detailed mechanisms of microbial activity are still far from fully elucidated due to the intricacy of AD process.

This Ph.D. project relied on comprehensive investigations of microbial communities in order to optimize the AD process and elucidate the fundamental metabolisms. Specifically, in the case of process optimization, 16S rRNA amplicon sequencing was used to identify, analyse and solve the operational challenges during the start-up of thermophilic up-flow anaerobic sludge blanket (UASB) reactors. To elucidate the microbial metabolisms, genome-centric metagenomics was applied to characterize methanogenic communities degrading a set of defined substrates. In addition, the Ph.D. study also expands the understanding of AD microbial ecology by proposing and characterizing a novel Candidatus species ubiquitously present in AD systems.

The start-up of thermophilic UASB reactors was investigated in lab-scale reactors inoculated with mesophilic granules. After increasing the operational temperature from mesophilic to thermophilic, volatile fatty acids (VFAs) and alcohols were found as the main digestion products. Methane production, on the other hand, only initiated after bicarbonate addition as external pH control. The dynamicity of microbial community composition in the granules during the temperature shift suggested that the majority of the mesophilic microbes could not tolerate the thermophilic conditions. Moreover, it was demonstrated that the fermentative thermophiles first evolved in the liquid phase of UASB reactor and then were encapsulated in the granular structure of the sludge. The growth of these bacteria rapidly restored the hydrolysis, acidogenesis and acetogenesis in the reactor. On the contrary, the thermophilic methanogens grew much slower than fermentative bacteria leading to severe process imbalance (i.e. accumulation of VFAs and alcohols). Thus, the evolvement of thermophilic methanogens was recognized as the biological 'bottleneck' during the temperature transition. To overcome the identified obstacle, bioaugmentation, i.e. provision of exogenous microbes, was proposed to accelerate the microbial community adaptation. The best strategy found to perform bioaugmentation was the injection of axenic methanogenic cultures. This practice significantly increased the thermophilic methane production rate by 40% compared with the control reactor (i.e. without bioaugmentation). The enhancement of methane production was attributed to the evolution of exogenous Methanothermobacter thermautotrophicus and the concomitant growth of its syntrophic partners in the granular structure. The positive effects brought by bioaugmentation were persistent in UASB reactor due to the retention of the microbes in the granular sludge.

For the investigation of the basic microbial metabolism and ecology, methanogenic microbial communities were enriched in a lab-scale continuous stirred-tank reactor (CSTR) fed with synthetic feedstocks. In the experiment, the substrates used were stepwise simplified (i.e. polysaccharide, monosaccharide, short chain fatty acids, acetate) to mimic the four steps of AD process. During the continuous operation, the microbial community was substantially simplified, because the microbes that could not metabolize the specific compounds were washed out. The overall microbial community consisted of only 35 metagenome assembled genomes (MAGs) (31 bacterial and 4 archaean). The abundance of these MAGs dramatically varied in the communities adapted to different substrates. The shifts in microbial community composition indicate that MAGs have specific functional roles in AD food chain and their roles cannot always be physiologically defined in accordance with 4 AD steps. Moreover, the explicit degradation pathways were reconstructed from the functional annotation of MAGs. It is notable that, a novel glucose degradation model was proposed with the syntrophic activity of Clostridiales sp. and Methanoculleus therophilus. In this model, acetate is not produced as intermediate compound. The genome-centric metagenomics reveals a considerable number of MAGs that could not be taxonomically assigned to characterized species. A MAG extracted from co-assembly of 8 AD metagenomes was especially emphasized due to its ubiquity in AD system and its high abundance under specific conditions. From the functional annotation and gene expression profile, it is confirmed that this MAG performs hydrogenotrophic methanogenesis in AD system and is found dominant from the reactors where H2 was added. This genome is present in 40 different samples from both full-scale and lab-scale AD reactors. The MAG was found in higher abundance during thermophilic reactor operations with relatively short hydraulic retention times. The phylogenetic assignment was based on 400 conserved genes and on 16S rRNA genes. The two methods concordantly showed that this MAG is closely related to Methanoculleus bourgensis MS2T. However, the average nucleotide identity between M. bourgensis MS2T and the selected MAG was only 89%, which is too low similarity to assign the MAG at the species level. Thus, we propose a novel Candidatus species inside the Methanoculleus genus. According to the metabolic traits, it is named as Candidatus Methanoculleus thermohydrogenotrophicum, sp. nov.

Overall, the results from this Ph.D. study bring new knowledge on the AD process based on NGS technology. Practically, the gained information regarding microbial community composition and dynamicity was directly used to solve technical challenges in AD operations. Fundamentally, deeper insights into the microbial metabolisms and ecology substantially expanded the current understanding of AD. The revealed knowledge provides pivotal prerequisites for future AD process control and optimization.

General information
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Publication information
Decolourisations and biodegradations of model azo dye solutions using a sequence batch reactor, followed by ultrafiltration

The main objective of this study was to investigate the efficiency of biological treatment of azo dye-containing wastewater with a sequencing batch reactor system, followed by ultrafiltration. The performance of the system was quantified by measuring the chemical oxygen demand and azo dye concentration. The biodegradation was carried out under combined alternating anaerobic and aerobic conditions with Nyllosan Yellow E2RL SGR as a model azo dye contaminant. The bioprocess revealed a maximal reduction in chemical oxygen demand and dye removal efficiency of 91 and 85%, respectively. After ultrafiltration of effluent from the biological treatment, the efficiency increased to 94% for chemical oxygen demand and to 97% for the azo dye decolourisation. Samples of activated sludge from the bioprocess were collected for microbial characterisation. Bacteria and fungi were isolated and identified by 16S rRNA gene and ITS1-5.8S rDNA-ITS2 sequence analysis, respectively. Serratia marcescens and Klebsiella oxytoca were the most common bacteria with the highest number present during the aerobic and anaerobic phases of the bioprocess. In addition, a high number of Elizabethkingia miricola, Morganella morgani, Comamonas testosteroni, Trichosporon sp. and Galactomyces sp. were detected. Taken together, our results demonstrated that the sequencing batch reactor system combined with ultrafiltration is an efficient technique for treatment of wastewater containing azo dye. Moreover, the ultrafiltration effectively removes the microbiota from the final effluent resulting in stable product water.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, University of Maribor
Authors: Korenak, J. (Ekstern), Ploder, J. (Ekstern), Trček, J. (Ekstern), Hélix-Nielsen, C. (Intern), Petrinic, I. (Ekstern)
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Journal: International Journal of Environmental Science and Technology
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Web of Science (2018): Indexed yes
Scopus rating (2017): SNIP 0.904 SJR 0.6 CiteScore 2.18
Web of Science (2017): Indexed Yes
Scopus rating (2016): CiteScore 2.11 SJR 0.592 SNIP 0.977
Scopus rating (2015): SJR 0.568 SNIP 1.035 CiteScore 1.95
Scopus rating (2014): SJR 0.77 SNIP 1.558 CiteScore 2.2
Web of Science (2014): Indexed yes
Scopus rating (2013): SJR 0.754 SNIP 1.869 CiteScore 2.15
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.84 SNIP 1.717 CiteScore 2.13
ISI indexed (2012): ISI indexed yes
Scopus rating (2011): SJR 1.268 SNIP 1.875 CiteScore 4.13
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.801 SNIP 1.697
Scopus rating (2009): SJR 0.552 SNIP 1.031
Scopus rating (2008): SJR 0.275 SNIP 0.415
Scopus rating (2007): SJR 0.209 SNIP 0.633
Dermal transfer quantification of nanoparticles from nano-enabled surfaces

Engineered nanoparticles are used in various applications due to their unique properties, which have led to their widespread use in consumer products. Silver, titanium, and copper-based nanoparticles (NPs) are a few of the commonly used nanomaterials in surface coatings, mainly due to their biocidal, optical, or photocatalytical properties. The knowledge concerning potential dermal exposure to nanoparticles from nanoparticle-enabled surfaces is currently lacking, partly due to analytical challenges. The aim of this study is to perform dermal wiping tests on nano-enabled surfaces and characterize NP release from keyboard covers and freshly painted surfaces, in terms of mass and number concentration, as well as released particle size distribution through the use of spICP-MS. Three types of NPs were selected for method validation testing, Ag, TiO2, and CuO; and, the particle extraction from wipes was found to be efficient for Ag and CuO, but not for TiO2 particles. Thereafter, potential dermal transfer was tested by wipe sampling for two nanoAg-containing silicon keyboard covers, and wood painted with nanoCuO-containing paint. AgNP release was observed for one of the keyboard cover types, with around 5000 particles/cm² (corresponding to 0.002 ng/cm²) dislodged from the matrix after 3 wiping events. CuO NP release was 20,000 particles/cm² (0.885 ng/cm²) from the freshly painted surface, and magnitudes higher after the paint were subjected to wear, reaching 1.4 million particles/cm² (2.5 ng/cm²). The dermal transfer testing by wipe sampling and analytical approach used in this study demonstrates that wipe testing in combination with spICP-MS analysis can provide both qualitative data in terms of mass and number-based NP release, as well as particle characterization in terms of NP size distribution. Obtaining nano-specific release data can aid in providing a better understanding of dermal exposure to NPs from nano-enabled surfaces.

General information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Department of Micro- and Nanotechnology, Surface Engineering
Authors: Mackevica, A. (Intern), Olsson, M. E. (Intern), Mines, P. D. (Intern), Heggelund, L. R. (Intern), Foss Hansen, S. (Intern)
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: NanoImpact
ISSN (Print): 2452-0748
Ratings:
Scopus rating (2017): SJR 0.872 SNIP 0.634 CiteScore 3.61
Web of Science (2017): Indexed yes
Original language: English
Dermal exposure, Release, Nano-enabled surfaces, Consumer products, Wipe testing
DOIs:
10.1016/j.impact.2018.06.001
Source: FindIt
Source-ID: 2435396600
Publication: Research - peer-review › Journal article – Annual report year: 2018

Determination of gas recovery efficiency at two Danish landfills by performing downwind methane measurements and stable carbon isotopic analysis

In this study, the total methane (CH4) generation rate and gas recovery efficiency at two Danish landfills were determined by field measurements. The landfills are located close to each other and are connected to the same gas collection system. The tracer gas dispersion method was used for quantification of CH4 emissions from the landfills, while the CH4 oxidation efficiency in the landfill cover layers was determined by stable carbon isotopic technique. The total CH4 generation rate was estimated by a first-order decay model (Afvalzorg) and was compared with the total CH4 generation rate determined by field measurements. CH4 emissions from the two landfills combined ranged from 29.1 to 49.6 kg CH4/h. The CH4 oxidation efficiency was 6–37%, with an average of 18% corresponding to an average CH4 oxidation rate of 8.1 kg CH4/h. The calculated gas recovery efficiency was 59–76%, indicating a high potential for optimization of the gas collection system. Higher gas recovery efficiencies (73–76%) were observed after the commencement of gas extraction from a new section of one of the landfills. A good agreement was observed between the average total CH4 generation rates determined by field measurements (147 kg CH4/h) and those estimated by the Afvalzorg model (154 kg CH4/h).
Determination of required ozone dosage in freshwater pilot recirculating aquaculture systems and ozone effect on water quality parameters

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, National Institute of Aquatic Resources, Section for Aquaculture
Authors: Spiliotopoulou, A. (Intern), Rojas-Tirado, P. A. (Ekstern), Martin, R. (Ekstern), Pedersen, L. (Intern), Andersen, H. R. (Intern)
Number of pages: 1
Publication date: 2018
Main Research Area: Technical/natural sciences
Electronic versions:
DETERMINATION_OF_REQUIRED_OZONE DOSAGE_IN_FRESHWATER_PILOT_RECIRCULATING_AND_OZONE_EFFECT_ON_WATER_QUALITY_PARAMETERSLFP_PART_comm.pdf
Source: PublicationPreSubmission
Source-ID: 148419883
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Development and implementation of a screening method to categorise the greenhouse gas mitigation potential of 91 landfills
A cost-effective screening method for assessing methane emissions was developed and employed to categorise 91 older Danish landfills into three categories defined by the magnitude of their emissions. The overall aim was to assess whether these landfills were relevant or irrelevant with respect to methane emission mitigation through the construction of biocovers. The method was based on downwind methane concentration measurements, using a van-mounted cavity ring-down spectrometer combined with inverse dispersion modelling to estimate whole-site methane emission rates. This method was found to be less accurate than the more labour-intensive tracer gas dispersion method, and therefore cannot be recommended if a high degree of accuracy is required. However, it is useful if a less accurate examination is sufficient. A sensitivity analysis showed the dispersion model used to be highly sensitive to variations in input parameters. Of the 91 landfills in the survey, 25 were found to be relevant for biocover construction when the methane emission threshold was set at 2kg CH4 h−1.

General information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Residual Resource Engineering, FORCE Technology
Authors: Fredenslund, A. M. (Intern), Mønster, J. (Ekstern), Kjeldsen, P. (Intern), Scheutz, C. (Intern)
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Waste Management
ISSN (Print): 0956-053X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Diagnostics, Monitoring and Mitigation of N2O Emissions from Wastewater Treatment Operations – Outcomes of the LAGAS project
**Diffusive isotope fractionation of deuterated benzene and toluene in aqueous systems**

**General information**
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Chinese Academy of Sciences
Authors: Jin, B. (Ekstern), Rolle, M. (Intern)
Number of pages: 2
Publication date: 2018
Main Research Area: Technical/natural sciences
Groundwater, Organic contaminants, Diffusion and isotope fractionation

Electronic versions:
CMWR2018_paper_200_Biao.pdf
Source: PublicationPreSubmission
Source-ID: 149076526
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

**Disaggregation of SMOS soil moisture over West Africa using the Temperature and Vegetation Dryness Index based on SEVIRI land surface parameters**

The overarching objective of this study was to produce a disaggregated SMOS Soil Moisture (SM) product using land surface parameters from a geostationary satellite in a region covering a diverse range of ecosystem types. SEVIRI data at 15 minute temporal resolution were used to derive the Temperature and Vegetation Dryness Index (TVDI) that served as SM proxy within the disaggregation process. West Africa (3 N, 26 W; 28 N, 26 E) was selected as a case study as it presents both an important North-South climate gradient and a diverse range of ecosystem types. The main challenge was to set up a methodology applicable over a large area that overcomes the constraints of SMOS (low spatial resolution) and TVDI (requires similar atmospheric forcing and triangular shape formed when plotting morning rise temperature versus fraction of vegetation cover) in order to produce a 0.05 degree resolution disaggregated SMOS SM product at sub-continental scale. Consistent cloud cover appeared as one of the main constraints for deriving TVDI, especially during the rainy season and in the southern parts of the region and a large adjustment window (105x105 SEVIRI pixels) was therefore deemed necessary. Both the original and the disaggregated SMOS SM products described well the seasonal dynamics observed at six locations of in situ observations. However, there was an overestimation in both products for sites in the humid southern regions; most likely caused by the presence of forest. Both TVDI and the associated disaggregated SM product was found to be highly sensitive to algorithm input parameters; especially of conditions of high fraction of vegetation cover. Additionally, seasonal dynamics in TVDI did not follow the seasonal patterns of SM. Still, its spatial heterogeneity was found to be a good proxy for disaggregating SMOS SM data; main river networks and spatial patterns of SM extremes (i.e. droughts and floods) not seen in the original SMOS SM product were revealed in the disaggregated SM product for a test case of July-September 2012. The disaggregation methodology thereby successfully increased the spatial resolution of SMOS SM, with potential application for local drought/flood monitoring of importance for the livelihood of the population of West Africa.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, University of Copenhagen, University of Leicester, University of Reading, IRTA
Distinguishing high and low flow domains in urban drainage systems 2 days ahead using numerical weather prediction ensembles

Precipitation constitutes a major contribution to the flow in urban storm- and wastewater systems. Forecasts of the anticipated runoff flows, created from radar extrapolation and/or numerical weather predictions, can potentially be used to optimize operation in both wet and dry weather periods. However, flow forecasts are inevitably uncertain and their use will ultimately require a trade-off between the value of knowing what will happen in the future and the probability and consequence of being wrong.

In this study we examine how ensemble forecasts from the HIRLAM-DMI-S05 numerical weather prediction (NWP) model subject to three different ensemble post-processing approaches can be used to forecast flow exceedance in a combined sewer for a wide range of ratios between the probability of detection (POD) and the probability of false detection (POFD). We use a hydrological rainfall-runoff model to transform the forecasted rainfall into forecasted flow series and evaluate three different approaches to establishing the relative operating characteristics (ROC) diagram of the forecast, which is a plot of POD against POFD for each fraction of concordant ensemble members and can be used to select the weight of evidence that matches the desired trade-off between POD and POFD. In the first approach, the rainfall input to the model is calculated for each of 25 ensemble members as a weighted average of rainfall from the NWP cells over the catchment where the weights are proportional to the areal intersection between the catchment and the NWP cells. In the second approach, a total of 2825 flow ensembles are generated using rainfall input from the neighbouring NWP cells up to approximately 6 cells in all directions from the catchment. In the third approach, the first approach is extended spatially by successively increasing the area covered and for each spatial increase and each time step selecting only the cell with the highest intensity resulting in a total of 175 ensemble members. While the first and second approaches have the disadvantage of not covering the full range of the ROC diagram and being computationally heavy, respectively, the third approach leads to a broad coverage of the ROC diagram range at a relatively low computational cost. A broad coverage of the ROC diagram offers a larger selection of prediction skill to choose from to best match to the prediction purpose.

The study distinguishes itself from earlier research in being the first application to urban hydrology, with fast runoff and small catchments that are highly sensitive to local extremes. Furthermore, no earlier reference has been found on the highly efficient third approach using only neighbouring cells with the highest threat to expand the range of the ROC diagram. This study provides an efficient and robust approach to using ensemble rainfall forecasts affected by bias and misplacement errors for predicting flow threshold exceedance in urban drainage systems.
Urban hydrology, Numerical Weather Prediction (NWP), Ensemble Prediction System (EPS), Probability of Detection (POD), Probability of False Detection (POFD), Relative operating characteristic (ROC)

DOIs:
10.1016/j.jhydrol.2016.08.015
Disulfide polymer grafted porous carbon composites for heavy metal removal from stormwater runoff

The emerging concern of heavy metal pollution derived from stormwater runoff has triggered a demand for effective heavy metal sorbents. To be an effective sorbent, high affinity along with rapid sorption kinetics for environmental relevant concentrations of heavy metals is important. Herein, we have introduced a new composite suitable for trace metal concentration removal, which consists of cheap and common granular activated carbon covered with polymers containing soft bases, thiols, through acyl chlorination (DiS-AC). Material characterization demonstrated that the polymer was successfully grafted and grown onto the surface of the carbon substrate. The distribution coefficient for Cd\(^{2+}\) bonding was 89·10\(^3\) L/kg at a solution concentration of 0.35 mg/L, which is notably higher than sorption affinities for Cd\(^{2+}\) seen in conventional sorbents. The sorption isotherm is well described by the Freundlich isotherm and within an hour, half of the initial trace (0.2 mg/L) concentration of Cd\(^{2+}\) was removed by the DiS-AC at a sorbent loading of 2 g/L. Therefore, the novel material DiS-AC promises to be an ideal candidate for filters treating stormwater runoff.

General information

State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Department of Micro- and Nanotechnology, Surface Engineering, Korean Advanced Institute of Science and Technology (KAIST), University of Copenhagen
Pages: 685-692
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Main Research Area: Technical/natural sciences

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Volume: 348
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  BFI (2018): BFI-level 1
  Web of Science (2018): Indexed yes
  BFI (2017): BFI-level 1
  Scopus rating (2017): CiteScore 3.18
  Web of Science (2017): Indexed yes
  BFI (2016): BFI-level 1
  Scopus rating (2016): CiteScore 3.16
  Web of Science (2016): Indexed yes
  BFI (2015): BFI-level 1
  Scopus rating (2015): CiteScore 2.75
  Web of Science (2015): Indexed yes
  BFI (2014): BFI-level 1
  Scopus rating (2014): CiteScore 2.72
  Web of Science (2014): Indexed yes
  BFI (2013): BFI-level 1
  Scopus rating (2013): CiteScore 3.03
  ISI indexed (2013): ISI indexed yes
  Web of Science (2013): Indexed yes
  BFI (2012): BFI-level 1
  Scopus rating (2012): CiteScore 3.15
  ISI indexed (2012): ISI indexed yes
  Web of Science (2012): Indexed yes
  BFI (2011): BFI-level 1
  Scopus rating (2011): CiteScore 2.95
  ISI indexed (2011): ISI indexed yes
  Web of Science (2011): Indexed yes
  BFI (2010): BFI-level 1
Does universal 16S rRNA gene amplicon sequencing of environmental communities provide an accurate description of nitrifying guilds?

Universal (i.e., targeting most bacteria/prokaryotes) 16S rRNA gene based amplicon sequencing is widely used for assessing microbial communities due to its low cost, time efficiency, and ability to provide a full overview of the community. However, it is currently unclear if it can yield reliable information on specific microbial guilds, which can be obtained by using primer sets targeting functional genes or specific 16S rRNA gene sequences. Here, we compared the relative abundance, diversity, richness, and composition of selected guilds (nitrifiers), obtained from universal 16S rRNA gene based amplicon sequencing and from guild targeted approaches. The universal amplicon sequencing provided 1) accurate estimates of nitrifier composition, 2) clustering of the samples based on these compositions consistent with sample origin, 3) estimates of the relative abundance of the guilds correlated with those obtained from the targeted approaches and within ~1.2 orders of magnitude of them, but with measurable bias that should be considered when comparing estimates from both approaches. In contrast, the diversity and richness estimations using the universal 16S rRNA based amplicon sequencing were likely limited by the sequencing depth; therefore, we suggest preferring targeted approaches for assessing nitrifiers diversity and richness or using sequencing depth larger than those currently typically practiced.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Urban Water Systems
Authors: Diwan, V. (Intern), Albrechtsen, H. (Intern), Smets, B. F. (Intern), Dechesne, A. (Intern)
Pages: 28-34
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Microbiological Methods
Volume: 151
ISSN (Print): 0167-7012
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SJR 0.696 SNIP 0.781 CiteScore 1.95
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.05 SJR 0.742 SNIP 0.817
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.819 SNIP 0.86 CiteScore 2.04
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.91 SNIP 1.032 CiteScore 2.28
Draft genome sequences of three virulent Streptococcus thermophilus bacteriophages isolated from the dairy environment in the Veneto region of Italy

Streptococcus thermophilus, a very important dairy species, is constantly threatened by phage infection. We report the genome sequences of three S. thermophilus bacteriophages isolated from a dairy environment in the Veneto region of Italy. These sequences will be used for the development of new strategies to detect and control phages in dairy environments.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Federal University of Viçosa, University of Padova
Dynamics of bisphenol A (BPA) and bisphenol S (BPS) in the European paper cycle: Need for concern?

Bisphenol A (BPA) is an industrial chemical used as an additive in conventional point-of-sale thermal paper receipts. Due to BPA being an endocrine disruptor and a substance of very high concern, the European Union (EU) has proposed to ban its use in thermal paper from 2020. Potential similarities in toxicological profiles have raised concerns that the use of bisphenol S (BPS) as a substitute for BPA may result in yet another situation of a problematic chemical being distributed in consumer products. This study provides a comprehensive evaluation of the current knowledge of BPA and BPS use in thermal paper and, based on dynamic material and substance flow modeling, quantifies potential effects of the BPA ban on future BPA and BPS flows within the European paper cycle. Based on available data and the modeling of BPA and BPS flows, approximately 200 t of BPS are estimated to be present in the current European paper cycle. The modeling further demonstrated that by substituting 50% of BPA, BPS amounts in the European paper cycle would increase more than fivefold over a modeling period of 60 years. In the same time, more than 90 t of BPA would still be circulated in European paper products. BPA alternatives other than BPS should receive additional attention, as very limited quantitative data currently exist. The results of this study quantitatively demonstrate that chemical bans alone are not sufficient to ensure clean material cycles, and so the effective regulation of potential substitutes needs to be implemented in parallel.
Eco-efficiency of introducing water efficiency at the chicken feet processing line at the chicken slaughtering house HK Scan in Vinderup Denmark

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Technical University of Denmark
Authors: Godskesen, B. (Intern), Zhan, X. (Ekstern), Rygaard, M. (Intern)
Effect of anisotropy structure on plume dilution and reaction enhancement in helical flows

Plume dilution and reactive mixing can be considerably enhanced by helical flows occurring in three-dimensional anisotropic porous media. In this study, we perform conservative and reactive transport simulations considering different anisotropy structures of a single inclusion with the objective of exploring the effect of the inclusion’s geometry and orientation on the patterns of twisted streamlines and on the overall dilution and reaction of solute plumes. We analyzed 100 different scenarios by varying key parameters such as the angle of the anisotropic structures with respect to the average flow velocity, the spacing between alternated heterogeneous zones of coarse and fine materials, the permeability contrast between such matrices, and the magnitude of the seepage velocity. Entropy conservation equations and entropy-based metrics for both conservative and reactive species were adopted to quantify dilution, reactive mixing and their interactions with the helical flow patterns in the considered three-dimensional anisotropic setups. The results allowed identifying optimal anisotropic configurations maximizing mixing and reactions, and yielding enhancement factors up to 15 times the outcomes of analogous simulations in homogeneous media. Furthermore, the effects of compound-specific diffusive/dispersive properties of the transported species were found to be relevant for both plume dilution and reactive mixing in helical flows.

Effect of Anisotropy Structure on Plume Entropy and Reactive Mixing in Helical Flows

Plume dilution and reactive mixing can be considerably enhanced by helical flows occurring in three-dimensional anisotropic porous media. In this study, we perform conservative and reactive transport simulations considering different anisotropy structures of a single inclusion with the objective of exploring the effect of the inclusion’s geometry and orientation on the patterns of twisted streamlines and on the overall dilution and reaction of solute plumes. We analyzed 100 different scenarios by varying key parameters such as the angle of the anisotropic structures with respect to the average flow velocity, the spacing between alternated heterogeneous zones of coarse and fine materials, the permeability contrast between such matrices, and the magnitude of the seepage velocity. Entropy conservation equations and entropy-based metrics for both conservative and reactive species were adopted to quantify dilution, reactive mixing and their interactions with the helical flow patterns in the considered three-dimensional anisotropic setups. The results allowed identifying optimal anisotropic configurations maximizing mixing and reactions, and yielding enhancement factors up to 15 times the outcomes of analogous simulations in homogeneous media. Furthermore, the effects of compound-specific diffusive/dispersive properties of the transported species were found to be relevant for both plume dilution and reactive mixing in helical flows.
Effect of different ammonia sources on aceticlastic and hydrogenotrophic methanogens

Ammonium chloride (NH₄Cl) was usually used as a model ammonia source to simulate ammonia inhibition during anaerobic digestion (AD) of nitrogen-rich feedstocks. However, ammonia in AD originates mainly from degradation of proteins, urea and nucleic acids, which is distinct from NH₄Cl. Thus, in this study, the inhibitory effect of a "natural" ammonia source (urea) and NH₄Cl on four pure methanogenic strains (aceticlastic: Methanosarcina thermophila, Methanosarcina barkeri; hydrogenotrophic: Methanoculleus bourgensis, Methanoculleus thermophilus), was assessed under mesophilic (37°C) and thermophilic (55°C) conditions. The results showed that urea hydrolysis increased pH significantly to unsuitable levels for methanogenic growth, while NH₄Cl had a negligible effect on pH. After adjusting initial
pH to 7 and 8, urea was significantly stronger inhibitor with longer lag phases to methanogenesis compared to NH$_4$Cl. Overall, urea seems to be more toxic on both acetotrophic and hydrogenotrophic methanogens compared to NH$_4$Cl under the same total and free ammonia levels.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Tian, H. (Intern), Fotidis, I. (Intern), Kissas , K. (Ekstern), Angelidaki, I. (Intern)
Pages: 390-397
Publication date: 2018
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Bioresource Technology
Volume: 250
ISSN (Print): 0960-8524
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
Scopus rating (2017): SJR 2.029 SNIP 1.799 CiteScore 6.28
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.308 SNIP 2.507 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.089 SNIP 2.344
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.915 SNIP 2.236
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.736 SNIP 2.74
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.403 SNIP 2.396
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.314 SNIP 2.003
Electricity generation and microbial communities in microbial fuel cell powered by macroalgal biomass

The potential of macroalgae Laminaria digitata as substrate for bioelectricity production was examined in a microbial fuel cell (MFC). A maximum voltage of 0.5V was achieved without any lag time due to the high concentration of glucose and mannitol in the hydrolysate. Total chemical oxygen demand removal efficiency reached over 95% at the end of batch run. Glucose and mannitol were degraded through isobutyrate as intermediate. The 16S rRNA gene high throughout sequencing analysis of anodic biofilm revealed complex microbial composition dominated by Bacteroidetes (39.4%), Firmicutes (20.1%), Proteobacteria (11.5%), Euryarchaeota (3.1%), Deltaproteobacteria (1.3%), Spirochaetes (1.0%), Chloroflexi (0.7%), Actinobacteria (0.5%), and others (22.4%). The predominance of Bacteroidetes, Firmicutes and Proteobacteria demonstrated their importance for substrate degradation and simultaneous power generation. These results demonstrate that macroalgae hydrolysate can be used as a renewable carbon source of microbial electrochemical systems for various environmental applications.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Zhao, N. (Intern), Jiang, Y. (Ekstern), Alvarado-Morales, M. (Intern), Treu, L. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
Pages: 145-149
Publication date: 2018
Main Research Area: Technical/natural sciences

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Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 1.072 SJR 0.85 CiteScore 4.06
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.45 SJR 0.75 SNIP 1.003
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.817 SNIP 1.373 CiteScore 3.76
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.113 SNIP 1.376 CiteScore 4.25
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Emission quantification using the tracer gas dispersion method: The influence of instrument, tracer gas species and source simulation

The tracer gas dispersion method (TDM) is a remote sensing method used for quantifying fugitive emissions by relying on the controlled release of a tracer gas at the source, combined with concentration measurements of the tracer and target gas plumes. The TDM was tested at a wastewater treatment plant for plant-integrated methane emission quantification, using four analytical instruments simultaneously and four different tracer gases. Measurements performed using a combination of an analytical instrument and a tracer gas, with a high ratio between the tracer gas release rate and instrument precision (a high release-precision ratio), resulted in well-defined plumes with a high signal-to-noise ratio and a high methane-to-tracer gas correlation factor. Measured methane emission rates differed by up to 18% from the mean value when measurements were performed using seven different instrument and tracer gas combinations. Analytical instruments with a high detection frequency and good precision were established as the most suitable for successful TDM application. The application of an instrument with a poor precision could only to some extent be overcome by applying a higher tracer gas release rate. A sideward misplacement of the tracer gas release point of about 250 m resulted in an emission rate comparable to those obtained using a tracer gas correctly simulating the methane emission. Conversely, an upwind misplacement of about 150 m resulted in an emission rate overestimation of almost 50%, showing the importance of proper emission source simulation when applying the TDM.

General information

State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Residual Resource Engineering, FluxSense AB
Authors: Delre, A. (Intern), Mønster, J. (Intern), Samuelsson, J. (Ekstern), Fredenslund, A. M. (Intern), Scheutz, C. (Intern)
Enantiomeric profiling of chiral illicit drugs in a pan-European study

The aim of this paper is to present the first study on spatial and temporal variation in the enantiomeric profile of chiral drugs in eight European cities. Wastewater-based epidemiology (WBE) and enantioselective analysis were combined to evaluate trends in illicit drug use in the context of their consumption vs direct disposal as well as their synthetic production routes. Spatial variations in amphetamine loads were observed with higher use in Northern European cities. Enantioselective analysis showed a general enrichment of amphetamine with the R-(-)-enantiomer in wastewater indicating its abuse. High loads of racemic methamphetamine were detected in Oslo (EF = 0.49 ± 0.02). This is in contrast to other European cities where S-(+)

methamphetamine was the predominant enantiomer. This indicates different methods of methamphetamine synthesis and/or trafficking routes in Oslo, compared with the other cities tested. An enrichment of MDMA with the R-(-)-enantiomer was observed in European wastewaters indicating MDMA consumption rather than disposal of unused drug. MDA’s chiral signature indicated its enrichment with the S-(+)-enantiomer, which confirms its origin from MDMA metabolism in humans. HMMA was also detected at quantifiable concentrations in wastewater and was found to be a suitable biomarker for MDMA consumption. Methadone was only detected in wastewater from the United Kingdom with population-normalised loads up to 47.7 mg 1000 people−1 day−1. The enrichment of methadone in the R-(+)-enantiomer in wastewater suggests stereoselective metabolism in humans, hence consumption, rather than direct disposal of the drug. The investigation of drug precursors, such as ephedrine, showed that their presence was reasonably ascribed to their medical use.

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Environmental impacts of food waste: Learnings and challenges from a case study on UK

Food waste, particularly when avoidable, incurs loss of resources and considerable environmental impacts due to the multiple processes involved in the life cycle. This study applies a bottom-up life cycle assessment method to quantify the environmental impacts of the avoidable food waste generated by four sectors of the food supply chain in United Kingdom,
namely processing, wholesale and retail, food service, and households. The impacts were quantified for ten environmental impact categories, from Global Warming to Water Depletion, including indirect land use change impacts due to demand for land. The Global Warming impact of the avoidable food waste was quantified between 2000 and 3600kg CO2-eq. t−1. The range reflected the different compositions of the waste in each sector. Prominent contributors to the impact, across all the environmental categories assessed, were land use changes and food production. Food preparation, for households and food service sectors, also provided an important contribution to the Global Warming impacts, while waste management partly mitigated the overall impacts by incurring significant savings when landfilling was replaced with anaerobic digestion and incineration. To further improve these results, it is recommended to focus future efforts on providing improved data regarding the breakdown of specific food products within the mixed waste, indirect land use change effects, and the share of food waste undergoing cooking. Learning from this and previous studies, we highlight the challenges related to modelling and methodological choices. Particularly, food production datasets should be chosen and used carefully, to avoid double counting and overestimation of the final impacts.
Environmental sustainable decision making – The need and obstacles for integration of LCA into decision analysis

Decision analysis is often used to help decision makers choose among alternatives, based on the expected utility associated to each alternative as function of its consequences and potential impacts. Environmental impacts are not always among the prioritized concerns of traditional decision making. This has fostered the development of several environmental problems and is nowadays a reason of concern. Life Cycle Assessment (LCA) can assess an extensive range of environmental impacts associated with a product or service system and support a life cycle perspective on the alternative products or service systems, revealing potential problem shifting between life cycle stages. Through the integration with traditional risk based decision analysis, LCA may thus facilitate a better informed decision process. In this study we explore how environmental impacts are taken into account in different fields of interest for decision makers to identify the need, potential and obstacles for integrating LCA into conventional approaches to decision problems. Three application areas are used as examples: transportation planning, flood management, and food production and consumption. The analysis of these cases shows that environmental impacts are considered only to a limited extent in traditional evaluation of transport and food projects. They are rarely, if at all, addressed in flood risk management. Hence, in each of the three cases studied, there is a clear need for the inclusion of a better and systematic assessment of environmental impacts. Some LCA studies have been conducted in all three research areas, mainly on infrastructures and production systems. The three cases show the potential of integrating LCA into existing decision analysis by providing the environmental profiles of the alternatives. However, due to different goals and scopes of LCA and other decision analysis approaches, there is a general lack of consistency in study system scoping in terms of considered elements and boundaries, in uncertainty treatment, and in applied metrics. In the present paper, we discuss the obstacles arising when trying to integrate LCA with conventional evaluation tools and we propose a research agenda to eventually make such integration feasible and consistent.
Equilibrium sampling reveals increasing thermodynamic potential of polycyclic aromatic hydrocarbons during sewage sludge digestion

The reuse of digested sludge from wastewater treatment plants (WWTPs) as soil fertilizer poses a risk for contamination of soil and water environments. The present study provides a new approach for investigating the exposure of hydrophobic organic chemicals in sewage sludge. The methodology of equilibrium sampling with multiple thicknesses of silicone was successfully validated and applied to complex sludge matrices. Polycyclic aromatic hydrocarbon (PAH) concentrations in
silicone (Csilicone) were determined and compared across four WWTPs. Activity ratios (ARs), defined as Csilicone at equilibrium with digested sludge (final product) over Csilicone at equilibrium with secondary sludge (intermediate product), were in the range 0.85-20 with all but one AR>1. These ARs thus revealed increased thermodynamic potential of both parent and alkylated PAHs in digested sludge compared with secondary sludge, and thereby higher exposure of PAHs in sludge after digestion than before digestion. This observation can be explained by the concept of “solvent depletion” as organic matter decreased by a factor of 1.3 during digestion, resulting in reduced sorptive capacity and increased freely dissolved concentrations (Cfree). The PAHs with logKow > 6 had ARs close to 1.3, whereas PAHs with logKow <6 showed higher ARs than the organic matter decrease factor of 1.3. Cfree in digested sludge were higher than reported in rural soil and generally consistent with levels reported for Baltic Sea sediment.

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- Scopus rating (2009): SJR 1.842 SNIP 1.572
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Estimating the Transfer Range of Plasmids Encoding Antimicrobial Resistance in a Wastewater Treatment Plant Microbial Community

Wastewater treatment plants (WWTPs) have been suggested as reservoirs and sources of antibiotic resistance genes (ARGs) in the environment. In a WWTP ecosystem, human enteric and environmental bacteria are mixed and exposed to pharmaceutical residues, potentially favoring genetic exchange and thus ARG transmission. However, the contribution of microbial communities in WWTPs to ARG dissemination remains poorly understood. Here, we examined for the first time plasmid permissiveness of an activated sludge microbial community by utilizing an established fluorescent bioreporter system. The activated sludge microbial community was challenged in standardized filter matings with one of three multidrug resistance plasmids (pKJK5, pB10, and RP4) harbored by Escherichia coli or Pseudomonas putida. Different donor–plasmid combinations had distinct transfer frequencies, ranging from 3 to 50 conjugation events per 100000 cells of the WWTP microbial community. In addition, transfer was observed to a broad phylogenetic range of 13 bacterial phyla with several taxa containing potentially pathogenic species. Preferential transfer to taxa belonging to the predicted evolutionary host range of the plasmids was not observed. Overall, the ARG dissemination potential uncovered in WWTP communities calls for a thorough risk assessment of ARG transmission across the wastewater system, before identification of possible mitigation strategies.
Evaluating catchment response to artificial rainfall from four weather generators for present and future climate

The technical lifetime of urban water infrastructure has a duration where climate change has to be considered when alterations to the system are planned. Also, models for urban water management are reaching a very high complexity level with e.g. decentralized stormwater control measures being included. These systems have to be evaluated under as close-to-real conditions as possible. Long Term Statistics (LTS) modelling with observational data is the most close-to-real solution for present climate conditions, but for future climate conditions artificial rainfall time series from weather generators (WGs) have to be used. In this study we run LTS simulations with four different WG products for both present and future conditions on two different catchments. For present conditions all WG products result in realistic catchment responses when it comes to the number of full flowing pipes and the number and volume of combined sewer overflows. For future conditions, the differences in the WGs representation of the expectations to climate change is evident. Nonetheless, all future results indicate that the catchments will have to handle more events that utilize the full capacity of the drainage systems. Generally WG products are relevant to use in planning of future changes to sewer systems.
Evaluation of direct membrane filtration and direct forward osmosis as concepts for compact and energy-positive municipal wastewater treatment

Municipal wastewater treatment commonly involves mechanical, biological and chemical treatment steps to protect humans and the environment from adverse effects. Membrane technology has gained increasing attention as an alternative to conventional wastewater treatment due to increased urbanization. Among the available membrane technologies, microfiltration (MF) and forward osmosis (FO) have been selected for this study due to their specific characteristics, such as compactness and efficient removal of particles. In this study, two treatment concepts were evaluated with regard to their specific electricity, energy and area demands. Both concepts would fulfill the Swedish discharge demands for small- and medium-sized wastewater treatment plants at full scale: (1) direct MF and (2) direct FO with seawater as the draw solution. The framework of this study is based on a combination of data obtained from bench- and pilot-scale experiments applying direct MF and FO, respectively. Additionally, available complementary data from a Swedish full-scale wastewater treatment plant and the literature were used to evaluate the concepts in depth. The results of this study indicate that both concepts are net positive with respect to electricity and energy, as more biogas can be produced compared to that using conventional wastewater treatment. Furthermore, the specific area demand is significantly reduced. This study demonstrates that municipal wastewater could be treated in a more energy- and area-efficient manner with techniques that are already commercially available and with future membrane technology.
Evaluation of microalgae production coupled with wastewater treatment

In the present study the feasibility of microalgae production coupled with wastewater treatment was assessed. Continuous cultivation of Chlorella sorokiniana with wastewater was tested in lab-scale flat panel photobioreactors. Biomass productivity was determined for four dilution rates (4.32 d⁻¹, 3.6 d⁻¹, 1.8 d⁻¹ and 0.72 d⁻¹). The productivity peak was 1.524 g l⁻¹d⁻¹ at the dilution rate of 2.41 d⁻¹. Nitrogen and phosphorus removals were found to be inversely proportional to dilution rates, while COD removal was found to be 50% at all the tested conditions. The biomass obtained at the highest dilution rate was characterized for its content of lipids, proteins and pigments. The average yields of fatty acid methyl esters (FAME), protein, lutein, chlorophylls and β-carotene was 62.4 mg, 388.2 mg, 1.03 mg, 11.82 mg and 0.44 mg per gram dry biomass, respectively. Economic analysis revealed that potentially more than 70% of revenue was from the production of pigments, i.e. chlorophyllin (59.6%), lutein (8.9%) and β-carotene (5.0%) while reduction in discharging costs of the treated wastewaters could account for 19.6% of the revenue. Due to the low yield of FAME and the low market price of biodiesel, the revenue from the above was found to be the least profitable (1.4%). Even when taking into account all these different revenues combined, this cultivation strategy was found with the current prices to be uneconomical. Power consumption for artificial light was responsible for the 94.5% of the production costs.

General information
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Web of Science (2014): Indexed yes
In this study, the performance of moving-bed biofilm sequencing batch reactor in operating the anaerobic/anoxic/oxic (A2O) process for treatment of wastewaters containing nitrogen and phosphorous was evaluated. For this purpose, a pilot system with two bench-scale sequencing batch reactors with a total volume of 30 L and functional volume of 10 L was used. The installation was elaborated using plexiglass, in which 60% of the functional volume consisted of PVC suspended carriers (Kaldnes K3) with a specific surface area of 560 m2/m3. The independent variables used in this study were hydraulic retention time (HRT) (1.5, 2, 2.5, 3, and 3.5 h) and the initial organic load (300, 500, 800, 1000 mg O2/L). The results showed impressive performance in the case of an initial organic load of 300 mg O2/L and HRT of 3 h with maximum removal of COD and TN, respectively, by 95.1 and 89.8%. In the case of an initial organic load of 1000 mg O2/L and HRT of 3.5 h, the maximum total phosphorus removal was 72.3%. Therefore, according to the analysis of data obtained by different HRTs, it was revealed that the system of A2O has greater efficiency in removing organic matter from wastewater in the shortest possible time.
Evaluation of multi-mode CryoSat-2 altimetry data over the Po River against in situ data and a hydrodynamic model

Coverage of in situ observations to monitor surface waters is insufficient on the global scale, and decreasing across the globe. Satellite altimetry has become an increasingly important monitoring technology for continental surface waters. The ESA CryoSat-2 altimetry mission, launched in 2010, has two novel features. (i) The radar altimeter instrument on board of CryoSat-2 is operated in three modes; two of them reduce the altimeter footprint by using Delay-Doppler processing. (ii) CryoSat-2 is placed on a distinct orbit with a repeat cycle of 369 days, leading to a drifting ground track pattern. The drifting ground track pattern challenges many common methods of processing satellite altimetry data over rivers. This study evaluates the observation error of CryoSat-2 water level observations over the Po River, Italy, against in situ observations. The average RMSE between CryoSat-2 and in situ observations was found to be 0.38 meters. CryoSat-2 was also shown to be useful for channel roughness calibration in a hydrodynamic model of the Po River. The small across-track distance of CryoSat-2 means that observations are distributed almost continuously along the river. This allowed resolving channel roughness with higher spatial resolution than possible with in situ or virtual station altimetry data. Despite the Po River being extensively monitored, CryoSat-2 still provides added value thanks to its unique spatio-temporal sampling pattern.
Evidence of co-metabolic bentazone transformation by methanotrophic enrichment from a groundwater-fed rapid sand filter

The herbicide bentazone is recalcitrant in aquifers and is therefore frequently detected in wells used for drinking water production. However, bentazone degradation has been observed in filter sand from a rapid sand filter at a waterworks with methane-rich groundwater. Here, the association between methane oxidation and removal of bentazone was investigated with a methanotrophic enrichment culture derived from methane-fed column reactors inoculated with that filter sand. Several independent lines of evidence obtained from microcosm experiments with the methanotrophic enrichment culture, tap water and bentazone at concentrations below 2 mg/L showed methanotrophic co-metabolic bentazone transformation: The culture removed 53% of the bentazone in 21 days in presence of 5 mg/L of methane, while only 31% was removed in absence of methane. Addition of acetylene inhibited methane oxidation and stopped bentazone removal. The presence of bentazone partly inhibited methane oxidation since the methane consumption rate was significantly lower at high (1 mg/L) than at low (1 μg/L) bentazone concentrations. The transformation yield of methane relative to bentazone normalized by their concentration ratio ranged from 58 to 158, well within the range for methanotrophic co-metabolic degradation of trace contaminants calculated from the literature, with normalized substrate preferences varying from 3 to 400. High-resolution mass spectrometry revealed formation of the transformation products (TPs) 6-OH, 8-OH, isopropyl-OH and di-OH-bentazone, with higher abundances of all TPs in the presence of methane. Overall, we found a suite of evidence all showing that bentazone was co-metabolically transformed to hydroxy-bentazone by a methanotrophic culture enriched from a rapid sand filter at a waterworks.
Explorative analysis of thirteen years of radar rainfall data

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Authors: Thomassen, E. D. (Intern), Sørup, H. J. D. (Intern), Scheibel, M. (Ekstern), Einfalt, T. (Ekstern), Arnbjerg-Nielsen, K. (Intern)
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**From wastewater to fertilizing water- pilot scale operation**

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**Genome Sequence of Enterococcus mundtii EM01, Isolated from Bombyx mori Midgut and Responsible for Flacherie Disease in Silkworms Reared on an Artificial Diet**

The whole genome sequence of Enterococcus mundtii strain EM01 is reported here. The isolate proved to be the cause of flacherie in Bombyx mori To date, the genomes of 11 other E. mundtii strains have been sequenced. EM01 is the only strain that displayed active pathological effects on its associated animal species.

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Genome sequence of Rhizobium sullae HCNT1 isolated from Hedysarum coronarium nodules and featuring peculiar denitrification phenotypes

The genome sequence of Rhizobium sullae strain HCNT1, isolated from root nodules of the legume Hedysarum coronarium growing in wild stands in Tuscany, Italy, is described here. Unlike other R. sullae strains, this isolate features a truncated denitrification pathway lacking NO/N₂O reductase activity and displaying high sensitivity to nitrite under anaerobic conditions.

Genomic analysis and immune response in a murine mastitis model of vB_EcoM-UFV13, a potential biocontrol agent for use in dairy cows

Bovine mastitis remains the main cause of economic losses for dairy farmers. Mammary pathogenic Escherichia coli (MPEC) is related to an acute mastitis and its treatment is still based on the use of antibiotics. In the era of antimicrobial resistance (AMR), bacterial viruses (bacteriophages) present as an efficient treatment or prophylactic option. However, this makes it essential that its genetic structure, stability and interaction with the host immune system be thoroughly characterized. The present study analyzed a novel, broad host-range anti-mastitis agent, the T4virus vB_EcoM-UFV13 in genomic terms, and its activity against a MPEC strain in an experimental E. coli-induced mastitis mouse model. 4,975 Single Nucleotide Polymorphisms (SNPs) were assigned between vB_EcoM-UFV13 and E. coli phage T4 genomes with high impact on coding sequences (CDS) (37.60%) for virion proteins. Phylogenetic trees and genome analysis supported
a recent infection mix between vB_EcoM-UFV13 and Shigella phage Shfl2. After a viral stability evaluation (e.g. pH and temperature), intramammary administration (MOI 10) resulted in a 10-fold reduction in bacterial load. Furthermore, pro-inflammatory cytokines, such as IL-6 and TNF-alpha, were observed after viral treatment. This work brings the whole characterization and immune response to vB_EcoM-UFV13, a biocontrol candidate for bovine mastitis.

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Geophysics Based Contaminant Mass Discharge Quantification Downgradient of a Landfill and a Former Pharmaceutical Factory

Contaminant mass discharge is a commonly applied tool to evaluate the environmental impact of contaminated sites on water resources. At large contaminated sites with heterogeneous sources, such as landfills, the number of wells available is often not sufficient, leading to a high uncertainty of mass discharge estimates. In this study, we tackle the uncertainty of the contaminant mass discharge due to low sampling densities by interpolating limited water-sample data with the support of surface Direct Current resistivity and Induced Polarization geophysical data. The method relies on finding a conceptual link between the bulk conductivity imaged from geophysics and the contaminant concentrations. We investigate the link between: 1) imaged bulk and electrical water conductivity, 2) water conductivity and conservative ionic species, 3) water conductivity and redox-sensitive species, 4) water conductivity and semi-persistent organic species, 5) water conductivity and biodegradable organic compounds. The method successfully identify similarities between the distribution of the bulk conductivity and chloride and pharmaceutical compounds in a landfill leachate plume and between the bulk conductivity data and benzene and chlorinated ethenes for a contaminant plume from a former pharmaceutical factory. Contaminant concentrations were interpolated through regression kriging, using geophysical data as the dependent variable. The
distribution of concentration determined with the novel method showed a lower mean relative estimation error than the traditional method of kriging only contaminant concentration data. At large sites, the method can improve contaminant mass discharge estimates, especially if surface geophysical measurements are integrated in the site investigation at an early stage.

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- Web of Science (2015): Indexed yes
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- ISI indexed (2013): ISI indexed yes
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- ISI indexed (2012): ISI indexed yes
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- Scopus rating (2011): SJR 1.937 SNIP 1.48 CiteScore 2.92
- ISI indexed (2011): ISI indexed yes
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- BFI (2010): BFI-level 2
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- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 2
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- Web of Science (2008): Indexed yes
- Scopus rating (2007): SJR 1.695 SNIP 1.44
- Web of Science (2007): Indexed yes
- Scopus rating (2006): SJR 1.794 SNIP 1.704
- Web of Science (2006): Indexed yes
- Scopus rating (2005): SJR 1.73 SNIP 1.402
Granular activated carbon with grafted nanoporous polymer enhances nanoscale zero-valent iron impregnation and water contaminant removal

Granular activated carbon was customized with a chemical grafting procedure of a nanoporous polymeric network for the purpose of nanoscale zero-valent iron impregnation and subsequent water contaminant remediation. Characterization of the prepared composite material revealed that not only was the polymer attachment and iron impregnation successful, but also that the polymeric shell acted as a protective barrier against the effects of oxidation from the surrounding environment, nearly 99% of total iron content was in the form of zero-valent iron. When applied towards the remediation of two common water contaminants, nitrobenzene and nitrate, the composite material exploited the qualities of both the activated carbon and the polymeric network to work together in a synergistic manner. In that the increased protection from oxidation allowed for increased reactivity of the nanoscale zero-valent iron, and that the adsorption abilities of both the carbon and the polymer achieved a higher amount of total removal of the contaminants.

General information
State: Published
Organisations: Department of Micro- and Nanotechnology, Surface Engineering, Department of Environmental Engineering, Water Technologies, Korea Advanced Institute of Science and Technology, Seoul National University
Pages: 22-31
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Chemical Engineering Journal
Volume: 339
ISSN (Print): 1369-703X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.18
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.16
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.75
Greenhouse gas emissions from wastewater treatment plants: measurements and carbon footprint assessment

The anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere are of great concern, due to their effect on climate change. To curb the increased accumulation of GHGs in the atmosphere, the United Nations Framework Convention on Climate Change promotes the reporting of national anthropogenic GHG emissions. Wastewater treatment plants (WWTPs) emit two potent GHGs, namely methane (CH4) and nitrous oxide (N2O), but also carbon dioxide (CO2), which is not accounted as a GHG, due to its biogenic origin (IPCC, 2006). Currently, CH4 and N2O emissions from WWTPs are estimated according to national and international guidelines. However, it is unknown how well these estimated emissions resemble actual plant-specific CH4 and N2O emissions; therefore, CH4 and N2O emission quantifications are needed to assure the reliable accounting of GHG emissions on the plant scale. Quantifying GHG emissions from WWTPs is a challenging undertaking, since emissions are fugitive, and are occurring across a large area consisting of several smaller sources at different emission heights and physical shapes. In the last two decades, this challenge has been addressed mainly by using on-site point measurements, namely measuring directly on individual emitting sources identified inside the facility. Usually, a single source is either completely encapsulated or partially covered, in order to measure GHG concentration in a known air volume or through a known air flow, i.e. the flux chamber techniques. Complete encapsulation of a single emitting source usually occurs when measuring leakages from biogas bearing process units, while partial coverage usually is used when measuring emissions from surfaces such as open basins surface. In the last few years, plant-integrated measurements have also been performed at WWTPs, using the mobile tracer gas dispersion method (MTDM). This method uses a ground-based remote sensing approach combining the controlled release of tracer gas from the WWTP with atmospheric plume concentration measurements. Since facilities having different plant layouts, and using different process units and technologies could require different applications of the method, further investigations are needed to identify how MTDM can be best applied at WWTPs. In addition to fugitive emissions of CH4 and N2O, WWTPs indirectly emit GHGs, mainly CO2, due to the consumption of chemicals and energy. The carbon footprint assessment allows the quantification of the overall contribution of a WWTP to climate change. The principal aim of this PhD thesis was to implement the MTDM application at WWTPs, in order to quantify plant-integrated CH4 and N2O emissions. Additionally, the influence of analytical instrument characteristics and tracer gas release on MTDM results was investigated. GHG emissions were quantified at six WWTPs, using the MTDM. At two facilities, plant-
Groundwater System of Sundarbans (Basanti), West Bengal, India

In Basanti, a rural block in the Sundarbans, West Bengal, the water availability is vital for its inhabitants. Groundwater levels are decreasing, and a proper understanding of key factors influencing the water resource is required. In the following, a social review of Basanti is given followed by a geologic and hydrostratigraphic analysis. The main hydrologic flows, a water balance, and the trend of salinity in the groundwater are presented. Finally, available long- and short-term drawdown data of South 24 Parganas and Basanti to determine groundwater level and annual recharge trends. The
assessment shows that Basanti’s groundwater resource is under stress because of increased groundwater irrigation. The critical state of groundwater reservoirs increases the danger of saltwater intrusion and raises the need for mitigation strategies.

**General information**
State: Published
Organisations: Office for Study Programmes and Student Affairs, Department of Environmental Engineering, Technical University of Munich, Københavns Universitet
Authors: Kopmann, M. (Ekstern), Binning, P. J. (Intern), Bregnhøj, H. (Forskerdatabase)
Pages: 497-520
Publication date: 2018

**Host publication information**
Title of host publication: Groundwater of South Asia
Publisher: Springer
Editor: Mukherjee, A.
ISBN (Print): 978-981-10-3888-4
ISBN (Electronic): 978-981-10-3889-1
Chapter: 30
Main Research Area: Technical/natural sciences
Earth Sciences, Hydrogeology, Hydrology/Water Resources, Water Policy/Water Governance/Water Management, Groundwater level, Hydrostratigraphy, Saltwater intrusion

**Holistic design of centralised drinking water softening**

**General information**
State: Published
Authors: Tang, C. (Intern), Rosshaug, P. S. (Ekstern), Kristensen, J. B. (Ekstern), Albrechtsen, H. (Intern)
Number of pages: 2
Publication date: 2018
Event: Abstract from Nordic drinking water conference (NORDIWA 2018), Oslo, Norway.
Main Research Area: Technical/natural sciences

**Hvordan kan 3D geologiske modeller bruges i forureningsundersøgelser?**

**General information**
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals
Authors: Møller, I. (Ekstern), Høyer, A. (Ekstern), Klint, K. E. (Ekstern), Fiandaca, G. (Ekstern), Maurya, P. K. (Ekstern), Balbarini, N. (Intern), Christiansen, A. V. (Ekstern), Møller, M. G. (Ekstern), Bjerg, P. L. (Intern)
Pages: 12-15
Publication date: 2018
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Vand & Jord
Volume: 25
Issue number: 1
ISSN (Print): 0908-7761
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Hybrid biogas upgrading in a two-stage thermophilic reactor

The aim of this study is to propose a hybrid biogas upgrading configuration composed of two-stage thermophilic reactors. Hydrogen is directly injected in the first stage reactor. The output gas from the first reactor (in-situ biogas upgrade) is subsequently transferred to a second upflow reactor (ex-situ upgrade), in which enriched hydrogenotrophic culture is responsible for the hydrogenation of carbon dioxide to methane. The overall objective of the work was to perform an initial methane enrichment in the in-situ reactor, avoiding deterioration of the process due to elevated pH levels, and subsequently, to complete the biogas upgrading process in the ex-situ chamber. The methane content in the first stage reactor reached on average 87% and the corresponding value in the second stage was 91%, with a maximum of 95%. A remarkable accumulation of volatile fatty acids was observed in the first reactor (in-situ) after 8 days of continuous hydrogen injection reaching a concentration of 5.6 g/L. Nevertheless, after an adaptation period, the system managed to recover and the volatile fatty acids decreased to 2.5 g/L. No pH drop was recorded during the period characterised by increased volatile fatty acids concentration mainly due to the consumption of the endogenous carbon dioxide by hydrogenotrophic methanogens. The effect of hydrogen injection on the microbial community in both reactors was analysed by 16S rRNA gene amplicon sequencing. The results demonstrated an increment in relative abundance of hydrogenotrophic methanogens and homoacetogens in the in-situ reactor, while the microbial community in the ex-situ chamber was simpler and dominated by hydrogenotrophic methanogens.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Politecnico di Milano
Authors: Corbellini, V. (Ekstern), Kougias, P. (Intern), Treu, L. (Intern), Bassani, I. (Intern), Malpei, F. (Ekstern), Angelidaki, I. (Intern)
Pages: 1-10
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Energy Conversion and Management
Volume: 168
ISSN (Print): 0196-8904
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 2.233 SJR 2.537 CiteScore 6.85
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 6.04 SJR 2.232 SNIP 2.109
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.023 SNIP 2.079 CiteScore 5.24
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.789 SNIP 2.791 CiteScore 5.35
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.613 SNIP 2.534 CiteScore 4.49
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.674 SNIP 2.242 CiteScore 3.72
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.24 SNIP 1.82 CiteScore 3.03
ISI indexed (2011): ISI indexed yes
Hydrogen-Fueled Microbial Pathways in Biogas Upgrading Systems Revealed by Genome-Centric Metagenomics

Biogas upgrading via carbon dioxide hydrogenation is an emerging technology for electrofuel production. The biomethanation efficiency is strongly dependent on a balanced microbial consortium, whose high-resolution characterization along with their functional potential and interactions are pivotal for process optimization. The present work is the first genome-centric metagenomic study on mesophilic and thermophilic biogas upgrading reactors aiming to define the metabolic profile of more than 200 uncultivated microbes involved in hydrogen assisted methanogenesis. The outcomes from predictive functional analyses were correlated with microbial abundance variations to clarify the effect of process parameters on the community. The operational temperature significantly influenced the microbial richness of the reactors, while the H₂ addition distinctively alternated the abundance of the taxa. Two different *Methanoculleus* species (one mesophilic and one thermophilic) were identified as the main responsible ones for methane metabolism. Finally, it was demonstrated that the addition of H₂ exerted a selective pressure on the concerted or syntrophic interactions of specific microbes functionally related to carbon fixation, propionate and butanoate metabolisms. Novel bacteria were identified as candidate syntrophic acetate oxidizers (e.g., *Tepidanaerobacter* sp. DTU063), while the addition of H₂ favored the proliferation of potential homoacetogens (e.g., *Clostridia* sp. DTU183). Population genomes encoding genes of Wood-Ljungdahl pathway were mainly thermophilic, while propionate degraders were mostly identified at mesophilic conditions. Finally, putative syntrophic interactions were identified between microbes that have either versatile metabolic abilities or are obligate/facultative syntrophs.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padova
Authors: Treu, L. (Intern), Campanaro, S. (Ekstern), Kougias, P. (Intern), Sartori, C. (Ekstern), Bassani, I. (Intern), Angelidaki, I. (Intern)
Number of pages: 16
Publication date: 2018
Main Research Area: Technical/natural sciences
Imaging the spatial distribution of geochemical heterogeneities in porous media: multidimensional flow-through experiments and inverse modeling

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Technical University of Denmark, University of Hawaii
Authors: Rolle, M. (Intern), Battistel, M. (Intern), Onses, F. (Ekstern), Lee, J. (Ekstern)
Number of pages: 2
Publication date: 2018
Event: Abstract from InterPore 10th Annual Meeting and Jubilee, New Orleans, United States
Main Research Area: Technical/natural sciences
Electronic versions:
contribution_Massimo_InterPore_2018.pdf
Source: PublicationPreSubmission
Source-ID: 2435400419
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018
Imaging the spatial distribution of geochemical heterogeneities with inverse reactive transport modeling: The example of pyrite oxidation

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, University of Hawaii
Authors: Rolle, M. (Intern), Harry Lee, J. (Ekstern)
Number of pages: 1
Publication date: 2018
Main Research Area: Technical/natural sciences
Reactive transport modeling, Geochemical heterogeneity, Model inversion, Sensor data, Flow-through experiments
Electronic versions:
CMWR2018_paper_28_Massimo.pdf
Source: PublicationPreSubmission
Source-ID: 149076550
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Impact of meteorological parameters on extracted landfill gas composition and flow
The objective of this study was to investigate the impact of four pre-selected meteorological parameters (barometric pressure, wind speed, ambient temperature and solar radiation) on recovered landfill gas (LFG) flow, methane (CH4) content of the LFG and the recovered CH4 flow by performing statistical correlation tests and a visual check on correlations in scatterplots. Meteorological parameters were recorded at an on-site weather station, while LFG data were recorded when entering the gas engine. LFG CH4 concentration, LFG flow and CH4 flow correlated highly with both barometric pressure and changes in barometric pressure, and the correlations were statistically significant. A higher correlation was observed when studying changes in barometric pressure in comparison to the absolute value of barometric pressure. LFG recovery data correlated highly and significantly with wind speed during winter, but not during summer. Ambient temperature and solar radiation were not major meteorological parameters affecting LFG recovery, as low correlation coefficients were observed between these two parameters and the LFG recovery data.

General information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Air, Land & Water Resources
Authors: Fathi Aghdam, E. (Intern), Scheutz, C. (Intern), Kjeldsen, P. (Intern)
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Waste Management
ISSN (Print): 0956-053X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.456 SNIP 2.059 CiteScore 4.94
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.407 SNIP 2.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.732 SNIP 2.263 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.763 SNIP 2.49 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.815 SNIP 2.413 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Impact of surface complexation and electrostatic interactions during pH fronts propagation in silica porous media: Experiments and model-based interpretation

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Geological Survey of Finland
Authors: Stolze, L. (Intern), Muniruzzaman, M. (Ekstern), Rolle, M. (Intern)
Number of pages: 2
Publication date: 2018
Event: Abstract from InterPore 10th Annual Meeting and Jubilee, New Orleans, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
contribution_Lucien_talk.pdf
Source: PublicationPreSubmission
Source-ID: 147148363
Publication: Research - peer-review » Conference abstract for conference – Annual report year: 2018
Incorporating diffuse radiation into a light use efficiency and evapotranspiration model: An 11-year study in a high latitude deciduous forest

The fraction of diffuse photosynthetic active radiation (PAR) reaching the land surface is one of the biophysical factors regulating carbon and water exchange between terrestrial ecosystems and the atmosphere. This is especially relevant for high latitude ecosystems, where cloudy days are prevalent. Without considering impacts of diffuse PAR, traditional 'top-down' models of ecosystem gross primary productivity (GPP) and evapotranspiration (ET), which use satellite remote sensing observations, are biased towards clear sky conditions. This study incorporated a cloudiness index (CI), an index for the fraction of diffuse PAR, into a joint 'top-down' model that uses the same set of biophysical constraints to simulate GPP and ET for a high latitude temperate deciduous forest. To quantify the diffuse PAR effects, CI along with other environmental variables derived from an eleven-year eddy covariance data set were used to statistically explore the independent and joint effects of diffuse PAR on GPP, ET, incident light use efficiency (LUE), evaporative fraction (EF) and ecosystem water use efficiency (WUE). The independent and joint effects of CI were compared from global sensitivity analysis of the 'top-down' models. Results indicate that for independent effects, CI increased GPP, LUE, ET, EF and WUE. Analysis of joint effects shows that CI mainly interacted with the radiation intercepted in the canopy (PAR, net radiation and leaf area index) to influence GPP, ET and WUE. Moreover, Ta and vapor pressure saturation deficit played a major role for the joint influence of CI on LUE and ET. In the growing season from May to October, variation in CI accounts for 11.9%, 3.0% and 7.8% of the total variation of GPP, ET and transpiration, respectively. As the influence of CI on GPP is larger than that on ET, this leads to an increase in WUE with CI. Joint GPP and ET model results showed that when including CI, the root mean square errors (RMSE) of daily GPP decreased from 1.64 to 1.45 g C m−2 d−1 (11.7% reduction) and ET from 15.79 to 14.50 W m−2 (8.2% reduction). Due to the interaction of diffuse PAR with plant canopies, the largest model improvements using CI for GPP and ET occurred during the growing season and for the transpiration component, as suggested by comparisons to sap flow measurements. Furthermore, our study suggests a potential biophysical mechanism, not considered in other studies: under high diffuse PAR conditions, due to the increased longwave emission from clouds, canopy temperature gets higher and enhances GPP and transpiration in this temperature-limited high latitude ecosystem.

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources
Authors: Wang, S. (Intern), Ibrom, A. (Intern), Bauer-Gottwein, P. (Intern), Garcia, M. (Intern)
Pages: 479-493
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Agricultural and Forest Meteorology
Volume: 248
ISSN (Print): 0168-1923
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.794 SJR 1.818 CiteScore 4.67
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.62 SJR 2.047 SNIP 1.916
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.162 SNIP 1.992 CiteScore 4.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.056 SNIP 1.906 CiteScore 4.31
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.827 SNIP 2.061 CiteScore 4.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.899 SNIP 2.065 CiteScore 3.71
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Influence of the environmental context: assessing stream water quality under conditions of multiple stress

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Urban Water Systems, Aarhus University
Authors: McKnight, U. S. (Intern), Rasmussen, J. J. (Ekstern), Vezzaro, L. (Intern), Brudler, S. (Intern), Bigi, G. (Intern), Bjerg, P. L. (Intern), Arnbjerg-Nielsen, K. (Intern)
Number of pages: 1
Publication date: 2018
Event: Abstract from Møde i ATV Jord og Grundvand (Mødenr. 25), Odense, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Influence_of_the_environmental_context_assessing_stream_water.pdf
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Informing a hydrological model of the Ogooué with multi-mission remote sensing data
Remote sensing provides a unique opportunity to inform and constrain a hydrological model and to increase its value as a decision-support tool. In this study, we applied a multi-mission approach to force, calibrate and validate a hydrological model of the ungauged Ogooué river basin in Africa with publicly available and free remote sensing observations. We used a rainfall–runoff model based on the Budyko framework coupled with a Muskingum routing approach. We parametrized the model using the Shuttle Radar Topography Mission digital elevation model (SRTM DEM) and forced it using precipitation from two satellite-based rainfall estimates, FEWS-RFE (Famine Early Warning System rainfall estimate) and the Tropical Rainfall Measuring Mission (TRMM) 3B42 v.7, and temperature from ECMWF ERA-Interim. We combined three different datasets to calibrate the model using an aggregated objective function with contributions from (1) historical in situ discharge observations from the period 1953–1984 at six locations in the basin, (2) radar altimetry measurements of river stages by Envisat and Jason-2 at 12 locations in the basin and (3) GRACE (Gravity Recovery and Climate Experiment) total water storage change (TWSC). Additionally, we extracted CryoSat-2 observations throughout the basin using a Sentinel-1 SAR (synthetic aperture radar) imagery water mask and used the observations for validation.
The use of new satellite missions, including Sentinel-1 and CryoSat-2, increased the spatial characterization of river stage. Throughout the basin, we achieved good agreement between observed and simulated discharge and the river stage, with an RMSD between simulated and observed water amplitudes at virtual stations of 0.74m for the TRMM-forced model and 0.87m for the FEWS-RFE-forced model. The hydrological model also captures overall total water storage change patterns, although the amplitude of storage change is generally underestimated. By combining hydrological modeling with multi-mission remote sensing from 10 different satellite missions, we obtain new information on an otherwise unstudied basin. The proposed model is the best current baseline characterization of hydrological conditions in the Ogooué in light of the available observations.
Integrated production of cellulosic bioethanol and succinic acid from rapeseed straw after dilute-acid pretreatment

The aim of this study was to develop an integrated biofuel (cellulosic bioethanol) and biochemical (succinic acid) production process from rapeseed straw after dilute-acid pretreatment. Rapeseed straw pretreatment at 20% (w/v) solid loading and subsequent hydrolysis with Cellic® CTec2 resulted in high glucose yield (80%) and ethanol output (122-125 kg of EtOH/Mg of rapeseed straw). Supplementation the enzymatic process with 10% dosage of endoxylanases (Cellic® HTec2) reduced the hydrolysis time required to achieve the maximum glucan conversion by 44-46% and increased the xylose yield by 10% compared to the process with Cellic® CTec2. Significantly higher amounts of succinic acid were produced after fermentation of pretreatment liquor (48 kg/Mg of rapeseed straw, succinic acid yield: 60%) compared to fermentation of xylose-rich residue after ethanol production (35-37 kg/Mg of rapeseed straw, succinic yield: 68-71%). Results obtained in this study clearly proved the biorefinery potential of rapeseed straw.
Integrating groundwater stress in life-cycle assessments – An evaluation of water abstraction

Understanding groundwater abstraction effects is vital for holistic impact assessments in areas depending on groundwater resources. The objective of our study was to modify the state-of-the-art AWaRe (available water remaining), freshwater impact assessment specifically for use in LCAs in areas dependent on groundwater resources. The new method, called “AGWaRe” (available groundwater remaining), reflects groundwater availability, based on a fraction of available groundwater remaining locally relative to a reference. Furthermore, our method increases spatial resolution beyond 1770 km² grid cells and adjusts demarcations in order to improve the representation of the heterogeneity of groundwater catchments. The applicability of AGWaRe was demonstrated on three groundwater systems producing 5 million m³ water for the city of Copenhagen, namely Advanced Treatment of Groundwater, Simple Treatment of Groundwater and Infiltration of Reclaimed water. Results were normalised to compare with other effects of supplying water to an average Danish person. The normalised impacts for drinking water for one person ranged between 0.1 and 39PE (person equivalent) for the three systems, which indicates that effects on groundwater resources differ substantially between systems. A comparative LCA of these groundwater systems shows that other impact categories range between 0 and 1 PE/person. Advanced Treatment of Groundwater generally has the lowest effect, for example <50% of the other groundwater systems in Global Warming Potential. The AGWaRe results indicate that freshwater impacts from Simple Treatment of Groundwater are up to 100 times greater than for Infiltration of Reclaimed water. Furthermore, AGWaRe exposes differences between the groundwater systems that AWaRe cannot evaluate, because one AWaRe cell covers
two of the systems in question. These improvements are crucial for groundwater managers looking to include sustainability considerations in their analysis and decision-making.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Environmental Fate & Effect of Chemicals, Department of Management Engineering, Quantitative Sustainability Assessment, Geological Survey of Denmark and Greenland, HOFOR A/S
Authors: Gejl, R. N. (Intern), Bjerg, P. L. (Intern), Henriksen, H. J. (Ekstern), Hauschild, M. Z. (Intern), Rasmussen, J. (Ekstern), Ryaard, M. (Intern)
Pages: 112-121
Publication date: 2018
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Journal of Environmental Management
Volume: 222
ISSN (Print): 0301-4797
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.161 SNIP 1.705 CiteScore 4.54
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.28 SJR 1.161 SNIP 1.809
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.189 SNIP 1.712 CiteScore 3.86
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.228 SNIP 1.913 CiteScore 3.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.203 SNIP 1.988 CiteScore 3.84
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.354 SNIP 2.51 CiteScore 4.01
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.212 SNIP 2.182 CiteScore 3.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.143 SNIP 1.741
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 0.962 SNIP 1.735
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.759 SNIP 1.344
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.899 SNIP 1.505
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.823 SNIP 1.423
Scopus rating (2005): SJR 0.677 SNIP 1.098
Scopus rating (2004): SJR 0.536 SNIP 1.056
Scopus rating (2003): SJR 0.64 SNIP 0.915
Scopus rating (2002): SJR 0.392 SNIP 0.817
Scopus rating (2001): SJR 0.473 SNIP 0.92
Scopus rating (2000): SJR 0.447 SNIP 0.956
Scopus rating (1999): SJR 0.41 SNIP 0.629
Original language: English
Groundwater footprint, Water stress, Groundwater abstraction, AWaRe, LCA
DOIs:
10.1016/j.jenvman.2018.05.058
Source: FindIt
Source-ID: 2434817897
Publication: Research - peer-review › Journal article – Annual report year: 2018

Kan vi få et bedre miljø med smartere kloakker?

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Vezzaro, L. (Intern)
Number of pages: 72
Publication date: 2018

Publication information
Media of output: Powerpoint
Original language: Danish
Place of publication: Kgs. Lyngby
Publisher: DTU Miljø, Danmarks Tekniske Universitet
Main Research Area: Technical/natural sciences
Electronic versions:
2018_04_26F_rskingsD_gnLUVE_002_.pdf
Publication: Communication › Sound/Visual production (digital) – Annual report year: 2018

Kinetic Modeling of Weak Base nAChR Ligand Selective Trapping within Intracellular Acidic Vesicles: Insights into Mechanisms Underlying Nicotine Addiction and Smoking Cessation

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, University of Chicago
Authors: Liu, Y. (Ekstern), Trapp, S. (Intern), Green, W. N. (Ekstern), Haddadian, E. J. (Ekstern)
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Scopus rating (2016): CiteScore 3.06 SJR 1.988 SNIP 1.005
Kontrollen og beskyttelsen af vores drikkevand forringeres

Folketinget har indført nye regler for kontrol af danskernes drikkevand. Reglerne forringer på flere afgørende punkter denne kvalitetskontrol. I forhold til hidtil får forbrugerne en ringere sikkerhed for, at vandet fra vandhanen rent faktisk er
rent.

General information
State: Published
Organisations: Department of Environmental Engineering, HOFOR A/S
Authors: Andersen, J. (Ekstern), Arvin, E. (Intern)
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LCA of Drinking Water Supply
Water supplies around the globe are growing complex and include more intense treatment methods than just decades ago. Now, desalination of seawater and wastewater reuse for both non-potable and potable water supply have become common practice in many places. LCA has been used to assess the potentials and reveal hotspots among the possible technologies and scenarios for water supplies of the future. LCA studies have been used to support decisions in the planning of urban water systems and some important findings include documentation of reduced environmental impact from desalination of brackish water over sea water, the significant impacts from changed drinking water quality and reduced environmental burden from wastewater reuse instead of desalination. Some of the main challenges in conducting LCAs of water supply systems are their complexity and diversity, requiring very large data collection efforts, with multiple sources of information, many of them not public and requiring cooperation. Important for product and system LCAs with substantial water use, it is emphasized that standard life cycle inventory databases do not reflect the significant variance in environmental impacts of water supply across locations and technologies.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Tel Aviv University
Authors: Godskesen, B. (Intern), Meron, N. (Ekstern), Rygaard, M. (Intern)
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LCA of Soil and Groundwater Remediation
Today, there is increasing interest in applying LCA to support decision-makers in contaminated site management. In this chapter, we introduce remediation technologies and associated environmental impacts, present an overview of literature findings on LCA applied to remediation technologies and present methodological issues to consider when conducting LCAs within the area. Within the field of contaminated site remediation, a terminology distinguishing three types of environmental impacts: primary, secondary and tertiary, is often applied. Primary impacts are the site-related impacts due to the contamination in the ground, secondary impacts are the impacts related to clean-up of the site, and tertiary impacts are the impacts associated with the future use of the site. The major methodological issues to consider when conducting
LCA are: (i) defining a functional unit that considers time frame and efficiency of remediation, which are important for assessment or primary impacts; (ii) robust assessment of primary impacts using site-specific fate and exposure models; (iii) weighting of primary and secondary (or tertiary) impacts to evaluate trade-offs between life cycle impacts from remediation and reduced pressure locally; and (iv) comparison with a no action scenario to determine whether there is a net environmental benefit from remediation. Overall, LCA is an important tool for the assessment of the secondary environmental impacts of remediation, and occasionally it has also been used to assess primary and tertiary impacts. In order to obtain robust decisions for the management of contaminated sites, the combination of LCA with other tools is necessary, including multi-criteria decision analysis tools, site-specific fate and exposure models and consideration of stakeholders’ views.

LCA of Solid Waste Management Systems

The chapter explores the application of LCA to solid waste management systems through the review of published studies on the subject. The environmental implications of choices involved in the modelling setup of waste management systems are increasingly in the spotlight, due to public health concerns and new legislation addressing the impacts from managing our waste. The application of LCA to solid waste management systems, sometimes called “waste LCA”, is distinctive in that system boundaries are rigorously defined to exclude all life cycle stages except from the end-of-life. Moreover, specific methodological challenges arise when investigating waste systems, such as the allocation of impacts and the consideration of long-term emissions. The complexity of waste LCAs is mainly derived from the variability of the object under study (waste) which is made of different materials that may require different treatments. This chapter attempts to address these challenges by identifying common misconceptions and by providing methodological guidance for alleviating the associated uncertainty. Readers are also provided with the list of studies reviewed and key sources for reference to implement LCA on solid waste systems.
Life cycle assessment comparing the treatment of surplus activated sludge in a sludge treatment reed bed system with mechanical treatment on centrifuge

In Denmark, the conventional method for treating sewage sludge is mechanical dewatering and subsequent storage. However, sludge treatment reed bed systems, which are holistic sludge treatment facilities combining the dewatering, mineralisation and storage of sludge, have been more common during the last three decades. Treatment of sludge in a sludge treatment reed bed system can be combined with post-treatment (further dewatering and mineralisation) on a stockpile area. This study aimed to compare the environmental performances of a mechanical sludge treatment method with the sludge treatment reed bed system strategy, using the life cycle assessment approach and a life cycle inventory based on newly generated data obtained from Danish reference facilities. The scenarios based on the different treatment methods were initiated by sludge entering the sludge treatment reed bed system or the centrifuge and terminated by land application of the final sludge product. The environmental impacts caused by the sludge treatment reed bed system strategy were comparable to or lower than those caused by the mechanical sludge treatment method. The impacts on climate change were the same for all the treatment scenarios; however, the conversion of organic carbon and nitrogen into gas species was more efficient in the sludge treatment reed bed system compared to mechanical treatment. Thus, mechanically treated sludge contained more nitrogen, causing higher nitrogen emissions (nitrous oxide, nitrate and ammonia) when applied on land. Furthermore, the impact of resource depletion was higher for mechanical dewatering due to a larger fossil fuel demand related to daily operation and longer transportation distances in this scenario. According to the results of the life cycle assessment, there were no considerable environmental gains made by combining the treatment of sludge in a sludge treatment reed bed system with post-treatment on a stockpile area. However, some practical aspects, which are not expressed in a life cycle assessment, should also be taken into consideration when evaluating the performances of sludge treatment scenarios.

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Residual Resource Engineering, Technical University of Denmark, Orbicon
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Scopus rating (2014): SJR 1.665 SNIP 2.481 CiteScore 4.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.618 SNIP 2.527 CiteScore 4.47
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.672 SNIP 2.296 CiteScore 4.07
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
This study attempted to apply life cycle assessment (LCA) methodology to compare distinctive management strategies when biologically treating source-sorted organic household waste (SSOHW). The management strategies included different pretreatment methods of SSOHW prior to anaerobic digestion and different biogas applications. Biopulp technology, screw press, and disc screen were chosen as three available pretreatment methods and electricity production, combined heat and power (CHP) production, as well as biogas upgrading were selected as three downstream management strategies. In all scenarios, the produced digestate was assumed for nutrient recovery and reject fractions from pretreatment step were considered to be incinerated. A consequential LCA was employed and long term marginal data was adapted to credit the amount of recovered energy and nutrient. The composition of SSOHW collected in Denmark was used to investigate the impact of created scenarios on several damage categories, i.e., Global warming potential, Human health, Ecosystem quality, and Resources. Moreover, the scenarios were also compared in terms of energy ratio to find the strategy resulting in the highest energy payback. The results showed that scenarios developed under the biopulp technology outperformed their counterparts in which other pretreatment methods were used. This was mostly due to the higher energy and nutrient recovery caused by correct sorting of SSOHW into reject and substrate fractions. Moreover, based on the results obtained, it can be concluded that CHP production would be the best downstream management option while the results were so sensitive to the source of substituted energy.
Life cycle assessment of sewage sludge management options including long-term impacts after land application

A life cycle assessment (LCA) was performed on five commonly applied sewage sludge treatment practices: dewatering of mixed sludge (DMS), lime stabilisation of dewatered sludge (LIMS), anaerobic digestion of mixed sludge (ADS), dewatering of anaerobically-digested sludge (DADS) and incineration of dewatered anaerobically-digested sludge (INC). In the first four scenarios, the sludge residues were applied on agricultural land, while in the fifth scenario ash from sludge incineration was landfilled. It was found that the sludge treatment technology influenced in which processes C and N emissions happened. In general, the INC scenario performed better than or comparably to the scenarios with land application of the sludge. Human toxicity (non-carcinogenic) and eco-toxicity showed the highest normalised impact potentials for all the scenarios with land application. In both categories, impacts were dominated by the application of zinc and copper to agricultural soil. For the eutrophication potentials, different scenarios appeared beneficial depending on the receiving compartment in focus. The fate of P dominated freshwater eutrophication, while the fate of N had a profound effect on all non-toxic impact categories other than freshwater eutrophication. The sensitivity analysis showed that the results were sensitive to soil and precipitation conditions. The ranking of scenarios was affected by local conditions for marine eutrophication. Overall, the present study highlighted the importance of including all sludge treatment stages and conducting a detailed N flow analysis, since the emission of reactive N into the environment is the major driver for almost all non-toxic impact categories.
Linking algal growth inhibition to chemical activity: Excess toxicity below 0.1% of saturation

Chemical activity quantifies the energetic level of an organic compound relative to its pure liquid [0–1], and several studies have reported that baseline toxicity generally requires chemical activities of 0.01–0.1. The first aim was to challenge this chemical activity range for baseline toxicity. Algal growth inhibition data (median effective concentrations, EC50) were compiled from two recent studies and included 108 compounds categorised as non-polar (mode of action, MOA1) and polar (MOA2) narcotics. These data were linked to chemical activity by (1) plotting them relative to a regression for (subcooled) liquid solubility (SL), which served as visual reference for chemical activity of unity and (2) determining EC50/SL ratios that essentially equal median effective chemical activity (Ea50). Growth inhibition required chemical activity >0.01 for MOA1 and >0.001 for MOA2 compounds. The second aim was to identify compounds exerting excess toxicity, i.e., when growth inhibition occurred at chemical activity <0.001. From a recent review with 2323 data entries, 315 EC50 values passed our selection criteria. 280 of these EC50 values were within or near the baseline toxicity range (Ea50 >0.001), and 25 compounds were found to exert excess toxicity (Ea50<0.001). Of these compounds, 16 are pesticides or precursors. Methodologically, this study includes two methods for translating EC50 values into the chemical activity framework, each having advantages and limitations. Scientifically, this study confirms that baseline toxicity generally requires chemical activities of 0.01–0.1 and extends the application of the chemical activity approach beyond baseline toxicity, by demonstrating its utility to identify compounds that exert excess toxicity.

General Information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, ARC Arnot Research & Consulting Inc., Trent University
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Publication date: 2018
Main Research Area: Technical/natural sciences
Freshwaters are among the most endangered ecosystems worldwide, due predominantly to excessive anthropogenic practices compromising the future provisioning of ecosystem services. Despite increased awareness of the role of multiple stressors in accounting for ecological degradation in mixed land-use stream systems, risk assessment approaches applicable in field settings are still required. This study provides a first indication for ecological consequences of the interaction of organic and inorganic chemical stressors, not typically evaluated together, which may provide a missing link enabling the reconnection of chemical and ecological findings. Specifically, impaired ecological conditions – represented by lower abundance of meiobenthic individuals – were observed in the hyporheic zone where a contaminant groundwater plume discharged to the stream. These zones were characterized by high xenobiotic organic concentrations, and strongly reduced groundwater (e.g. elevated dissolved iron and arsenic) linked to the dissolution of iron oxides caused by the degradation of organic compounds in the plume. Further research is still needed to separate whether impact is driven by a combined effect of organic and inorganic stressors impacting the ecological communities, or whether the conditions – when present simultaneously – are responsible for enabling a specific chemical stressor's availability (e.g. trace metals), and thus toxicity, along the study stream. Regardless, these findings suggest that benthic invertebrates are promising indicators for supporting biological assessments of stream systems to sufficiently represent impacts resulting from the co-occurrence of stressors in different stream compartments. Importantly, identification of the governing circumstances is crucial for revealing key patterns and impact drivers that may be needed in correctly prioritizing stressor impacts in these systems. This study further highlights the importance of stream-aquifer interfaces for investigating chemical stressor effects in multiple stressor systems. This will require holistic approaches for linking contaminant hydrogeology and eco(toxico)logy in order to positively influence the sustainable management of water resources globally.
Longitudinal dispersion coefficients for numerical modeling of groundwater solute transport in heterogeneous formations

Most recent research on hydrodynamic dispersion in porous media has focused on whole-domain dispersion while other research is largely on laboratory-scale dispersion. This work focuses on the contribution of a single block in a numerical model to dispersion. Variability of fluid velocity and concentration within a block is not resolved and the combined spreading effect is approximated using resolved quantities and macroscopic parameters. This applies whether the formation is modeled as homogeneous or discretized into homogeneous blocks but the emphasis here being on the latter. The process of dispersion is typically described through the Fickian model, i.e., the dispersive flux is proportional to the gradient of the resolved concentration, commonly with the Scheidegger parameterization, which is a particular way to compute the dispersion coefficients utilizing dispersivity coefficients. Although such parameterization is by far the most commonly used in solute transport applications, its validity has been questioned. Here, our goal is to investigate the effects of heterogeneity and mass transfer limitations on block-scale longitudinal dispersion and to evaluate under which conditions the Scheidegger parameterization is valid. We compute the relaxation time or memory of the system; changes
in time with periods larger than the relaxation time are gradually leading to a condition of local equilibrium under which dispersion is Fickian. The method we use requires the solution of a steady-state advection-dispersion equation, and thus is computationally efficient, and applicable to any heterogeneous hydraulic conductivity $K$ field without requiring statistical or structural assumptions. The method was validated by comparing with other approaches such as the moment analysis and the first-order perturbation method. We investigate the impact of heterogeneity, both in degree and structure, on the longitudinal dispersion coefficient and then discuss the role of local dispersion and mass transfer limitations, i.e., the exchange of mass between the permeable matrix and the low permeability inclusions. We illustrate the physical meaning of the method and we show how the block longitudinal dispersivity approaches, under certain conditions, the Scheidegger limit at large Péclet numbers. Lastly, we discuss the potential and limitations of the method to accurately describe dispersion in solute transport applications in heterogeneous aquifers.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Stanford University
Authors: Lee, J. (Ekstern), Rolle, M. (Intern), Kitanidis, P. K. (Ekstern)
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Scopus rating (2016): CiteScore 2.26 SJR 1.037 SNIP 1.077
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.941 SNIP 1.073 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.293 SNIP 1.516 CiteScore 2.4
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.51 SNIP 1.457 CiteScore 3.04
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.582 SNIP 1.663 CiteScore 2.97
ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.401 SNIP 1.566 CiteScore 2.49
ISI indexed (2011): ISI indexed yes
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BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.363 SNIP 1.194
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.335 SNIP 1.4
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.442 SNIP 1.525
Web of Science (2008): Indexed yes
Long-term leaching of nutrients and contaminants from wood combustion ashes

With increasing amounts of woody biomass being combusted for energy purposes worldwide, more wood ash is being generated and needs management. As an alternative to landfilling, residues may be utilised for liming and fertilising purposes on forest soils. Comprehensive evaluations of long-term leaching from these residues are needed in order to assess potential environmental impacts associated with their utilisation. Two Danish wood ash samples, one fly ash and one mixed ash (a combination of fly ash and bottom ash), were evaluated in long-term percolation column tests (up to L/S $\sim$2000 L/kg), in order to quantify the release of major, minor and trace metalloid(s). While columns of three different lengths were used, the leaching of individual elements could be described as a function of the L/S ratio – irrespective of the column length. At L/S 1000 L/kg, the cumulative releases of K, S, Na, Ca and Rb were at 40–100% of their respective solid contents, followed by Ba, Cr, Sb, Sr and V at 15–40% and Al, Mg, Zn, Cd, Co, Fe, Pb, Ti, Mn and P at <5%.

Speciation calculations indicated that (i) the observed concentrations of Ca, Mg, Al, Ba, Si and sulphate from both ash types could be described through the dissolution/precipitation of a limited set of minerals and that (ii) leaching of silicates should be included in long-term assessment of alkalinity release from wood ashes. Non-equilibrium conditions were indicated by flow interruptions. However, the presence of non-equilibrium did not have significant effect on the calculated cumulative releases at high L/S ratios. Based on the assessment of cumulative releases at L/S 10 L/kg and L/S 1000 L/kg it is concluded that low L/S-based data may not provide sufficient background for prediction of long-term release from wood ash, in particular for Ba, Cr, Sb and V, and less critically also for As, Cd, Cu, Mo and Ni.
Målinger på overløb – hvor svært kan det være?

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Authors: Vezzaro, L. (Intern)
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Målinger på overløb – hvor svært kan det være?

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Measuring methane emissions from a UK landfill using the tracer dispersion method and the influence of operational and environmental factors

The methane emissions from a landfill in south-east, UK were successfully quantified during a six-day measurement campaign using the tracer dispersion method. The fair weather conditions made it necessary to perform measurements in the late afternoon and in the evening when the lower solar flux resulted in a more stable troposphere with a lower inversion layer. This caused a slower mixing of the gasses, but allowed plume measurements up to 6700m downwind from the landfill. The average methane emission varied between 217±14 and 410±18kg-h⁻¹ within the individual measurement days, but the measured emission rates were higher on the first three days (333±27, 371±42 and 410±18kg-h⁻¹) compared to the last three days (217±14, 249±20 and 263±22kg-h⁻¹). It was not possible to completely isolate the extent to which these variations were a consequence of measuring artefacts, such as wind/measurement direction and measurement distance, or from an actual change in the fugitive emission. Such emission change is known to occur with changes in the atmospheric pressure. The higher emissions measured during the first three days of the campaign were measured during a period with an overall decrease in atmospheric pressure (from approximately 1014mbar on day 1 to 987mbar on day 6). The lower emissions measured during the last three days of the campaign were carried out during a period with an initial pressure increase followed by a period of slowly reducing pressure. The average daily methane recovery flow varied between 633 and 679kg-h⁻¹ at STP (1 atm, 0°C). The methane emitted to the atmosphere accounted for approximately 31% of the total methane generated, assuming that the methane generated is the sum of the methane recovered and the methane emitted to the atmosphere, thus not including a potential methane oxidation in the landfill cover soil.

General information
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Organisations: Department of Environmental Engineering, Air, Land & Water Resources, University of Southampton
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.407 SNIP 2.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.732 SNIP 2.263 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.763 SNIP 2.49 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.815 SNIP 2.413 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.59 SNIP 2.18 CiteScore 2.91
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.694 SNIP 2.071 CiteScore 2.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.553 SNIP 1.821
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.519 SNIP 1.919
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.375 SNIP 2.145
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.998 SNIP 1.785
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.021 SNIP 1.819
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.065 SNIP 1.653
Scopus rating (2004): SJR 1.271 SNIP 1.911
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.853 SNIP 1.234
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.498 SNIP 0.903
Scopus rating (2001): SJR 0.45 SNIP 0.731
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.328 SNIP 0.444
Scopus rating (1999): SJR 0.26 SNIP 0.541

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Measuring the effects of central softening of drinking water in households and industries in Brøndby

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Organisations: Department of Environmental Engineering, Urban Water Systems, HOFOR A/S
Authors: Godskesen, B. (Intern), von Bülow, D. (Ekstern), Rygaard, M. (Intern)
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Meta-Analysis of Fish Early Life Stage Tests - Association of Toxic Ratios and Acute-To-Chronic Ratios with Modes of Action

Fish early life stage (FELS) tests (OECD test guideline 210) are widely conducted to estimate chronic fish toxicity. In these tests, fish are exposed from the embryonic to the juvenile life stage. In order to analyse whether certain modes of action are related to high toxic ratios (TR, i.e., ratios between experimental effect and baseline toxicity) and/or acute-to-chronic ratios (ACR) in the FELS test effect concentrations for 183 compounds were extracted from the US EPA ecotoxicity database. Analysis of effect concentration of narcotic compounds indicated that baseline toxicity could be observed in the FELS test at similar concentrations as in acute fish toxicity test. All non-narcotic modes of action were associated with higher TRs with median values ranging from 4 to 9.3*10^4 (uncoupling < reactivity < neuromuscular toxicity < methemoglobin formation < endocrine disruption < extracellular matrix formation inhibition). Four modes of action were also found to be associated with high ACRs: (1) lysyl oxidase inhibition leading to notochord distortion, (2) putative methemoglobin formation or haemolytic anemia, (3) endocrine disruption, and (4) compounds with neuromuscular toxicity. It was discussed that for the prediction of effect concentrations in the FELS test with alternative test systems, endpoints targeted to the modes of action of compounds with enhanced TR or ACR could be used to trigger FELS tests or even replace these tests.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Helmholtz Center for Environmental Research (UFZ), University of Toronto, L'Oreal
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Main Research Area: Technical/natural sciences
Metagenomic analysis to elucidate the metabolic potential of microbial communities in Danish waterworks

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Fowler, J. (Intern), Palomo, A. (Intern), Gülay, A. (Intern), Smets, B. F. (Intern)
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Abstract book

Metagenomic binning reveals the functional roles of core abundant microorganisms in twelve full-scale biogas plants
The aim of this work was to elucidate the microbial ecology in twelve mesophilic and thermophilic full-scale biogas plants using a genome-centric metagenomic approach. In this study both biogas plants treating manure and those treating sludge from waste water treatment plants were considered. The identification of 132 Metagenome-Assembled Genomes (MAGs) and analysis of their abundance profile in different samples allowed the identification of the most abundant core members of the anaerobic digestion microbiome. Canonical correspondence analysis was used to determine the influence of biotic and environmental factors on MAGs abundance and to investigate the methanogenic performance of the biogas plants. Prediction of the functional properties of MAGs was obtained analyzing their KEGG pathways and their carbohydrate active domains. Network analysis allowed investigation of species-species associations and shed light on syntrophic interactions between members belonging to the anaerobic digestion dark matter (phylum Fermentibacteria). By stratifying and comparing different levels of information, it was predicted that some MAGs have a crucial role in the manure-supplemented thermophilic biogas plants and it was highlighted the importance of the glycine cleavage system in complementing the "truncated" Wood-Ljungdahl pathway.

General information
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Methane oxidation and the degradation potential of the herbicide bentazone at Danish waterworks

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Methane production, recovery and emission from two Danish landfills
Landfill gas (LFG), mainly consisting of methane (CH4) and carbon dioxide (CO2), is produced by the anaerobic digestion of biodegradable waste deposited in landfills. CH4 is a greenhouse gas with global warming potential 28 times that of CO2 over a period of 100 years. The produced CH4 in landfills can be recovered and utilized for the production of electricity and/or heat. Higher recovery of CH4 could result in lower CH4 emissions into the atmosphere, and thus lower the contribution of landfills to climate change. Moreover, higher CH4 recovery can result in higher production of heat and electricity, leading to higher revenue for landfill owners. Therefore, it is important to understand the factors that can affect CH4 recovery from landfills. The amount of CH4 recovered from a landfill is indeed a function of the amount of CH4 produced in a landfill. The amount of produced CH4 in a landfill is governed by the waste composition and can be affected by many factors, including temperature, moisture, and chemical or microbial reactions, which occur simultaneously inside a landfill, such as corrosion. Moreover, the amount of CH4 recovered from a landfill depends on the efficiency of the gas recovery system, which is affected by its design and management, as well as the presence and type of top cover at the landfill. Furthermore, CH4 recovery from a landfill can be affected by changes in meteorological parameters. For instance, changes in barometric pressure affect the pressure gradient, which is the driving force for advective gas transport, between inside the landfill and the atmosphere, and thus potentially can impact CH4 recovery. The overall goal of this PhD project was to address specific challenges regarding CH4 production and recovery at landfills. The PhD project focused on three topics: 1) an in-depth investigation of CH4 production from shredder waste (SW) at landfills, 2) the determination of gas recovery efficiency at two adjacent Danish landfills by field measurement, and 3) the influence of meteorological parameters on gas recovery from landfills. This PhD project focused on two adjacent Danish landfills, Stige Ø and Odense Nord, which are connected to the same gas recovery system. In order to assess the CH4 production from SW at landfills, SW was sampled from the Odense Nord landfill, size-reduced and characterized in terms of total solids (TS), volatile solids (VS), total carbon (TC), total organic carbon (TOC) and biogenic carbon (BioC). SW samples were incubated to measure their first-order decay kinetic constant (k-value), under different operating conditions (temperature and moisture), and their biochemical methane potential (BMP). In addition, four main metals present in SW (Fe, Al, Zn and Cu) were examined for their ability to produce available H2 for methanogens. The characterization results showed that a high fraction of the organic carbon (47-61%) in SW is fossil carbon. Moreover, high TS content (82-91%) in the waste samples showed that the samples were fairly dry. The measured BMPs were 1.5-6.2 kg CH4/ton waste, while the measured k-values were 0.033-0.075/yr at room temperature, 0.220-0.429/yr at 37 ºC and 0.235-0.488/yr at 55 ºC. The fine fraction of SW obtained after sieving showed a lower BMP and k-value in comparison to the unsieved SW, meaning that landfilling of the fine fraction of SW could result in lower CH4 production in comparison to unsieved SW. Carrying out the incubation experiments under different operating conditions indicated the high dependency of the CH4 production rate on temperature and moisture. H2 was produced by biocorrosion of Fe, Al and Zn and utilized by methanogens to convert CO2 into CH4. The addition of Al and Zn to the incubated SW resulted in higher CH4 production. Relatively high CH4 production from SW at landfills and the unusual gas composition (high CH4 and low CO2 content) are most likely due to methanogens converting the existing CO2 in the produced LFG into CH4, using the H2 produced by biocorrosion of Al and Zn. In order to determine the gas recovery efficiency at the landfills, a set of field activities was performed: whole-site CH4 emissions were measured by the tracer gas dispersion method (six measurement campaigns), while CH4 oxidation in the top layer of the landfills was measured by stable carbon isotopic analysis (two measurement campaigns). The CH4 recovery rate, which was provided by landfill operators, was the sum of the CH4 recovered from both landfills. In addition, the total CH4 production rate was estimated using the Afvalzorg model and compared with the results of field measurements. Total CH4 emissions from the two landfills combined were 29-50 kg/h, while the measured CH4 oxidation efficiency was 6-37%. The CH4 recovery rate from both landfills combined was 85-115 kg/h. The calculated gas recovery efficiency was 59-76%, which indicated a high potential for improvement in the gas recovery system at landfills. The
average total CH4 production rate determined by field measurements (sum of methane recovered, emitted and oxidized) was 147 kg/h, which was close to the estimated total CH4 production rate of 154 kg/h by the Afvalzorg model. The calculated gas recovery efficiency, along with the observed major CH4 emission areas during the surface screenings, can be used for developing a plan for improvement of the gas recovery system. In order to investigate the influence of meteorological parameters on LFG recovery, correlation coefficients and p-values were calculated between the gas recovery data and meteorological parameters. Barometric pressure, wind speed, ambient temperature and solar radiation were the chosen meteorological parameters. Four periods (from a few days to approximately one month) in 2015 and 2016 were studied. These four periods were chosen because the gas recovery system was not manually adjusted in these periods by the landfill operators. Relatively high correlation coefficients were observed between LFG data (LFG CH4 concentration, LFG flow and CH4 flow) and barometric pressure (\(| r | = 0.37-0.73\)), while higher correlation coefficients were observed between LFG data and changes in barometric pressure (\(| r | = 0.80-0.93\)). Moreover, a strong correlation was observed between wind speed and LFG data in winter (\(| r | = 0.75-0.77\)), but not in summer (\(| r | = 0.05-0.30\)). The correlations of LFG data with barometric pressure, changes in barometric pressure and wind speed were statistically significant (p < 0.01) and observed visually in scatterplots. The slope of the linear regression between changes in barometric pressure and LFG data can be used to predict changes in recovered LFG as a function of changes in pressure. As LFG recovery data only correlated weakly with ambient temperature (\(| r | = 0.12-0.49\)) and solar radiation (\(| r | = 0.03-0.21\)), these two parameters were not found to affect LFG recovery.

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Microalgae modeling in water resource recovery facilities - Toward a consensus
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Microalgal process-monitoring based on high-selectivity spectroscopy tools: status and future perspectives
Microalgae are well known for their ability to accumulate lipids intracellularly, which can be used for biofuels and mitigate CO2 emissions. However, due to economic challenges, microalgal bioprocesses have maneuvered towards the simultaneous production of food, feed, fuel, and various high-value chemicals in a biorefinery concept. On-line and in-line monitoring of macromolecules such as lipids, proteins, carbohydrates, and high-value pigments will be more critical to maintain product quality and consistency for downstream processing in a biorefinery to maintain and valorize these
Markets. The main contribution of this review is to present current and prospective advances of on-line and in-line process analytical technology (PAT), with high-selectivity – the capability of monitoring several analytes simultaneously – in the interest of improving product quality, productivity, and process automation of a microalgal biorefinery. The high-selectivity PAT under consideration are mid-infrared (MIR), near-infrared (NIR), and Raman vibrational spectroscopies. The current review contains a critical assessment of these technologies in the context of recent advances in software and hardware in order to move microalgae production towards process automation through multivariate process control (MVPC) and software sensors trained on "big data". The paper will also include a comprehensive overview of off-line implementations of vibrational spectroscopy in microalgal research as it pertains to spectral interpretation and process automation to aid and motivate development.

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Microbial degradation of pesticides in rapid sand filters used for drinking water treatment

Groundwater is used as drinking water source all over the world. However, large parts are contaminated by pesticides at low concentrations (sub µg/L), due to anthropogenic activities. These pesticides can adversely impact human health, and have legal implications. Thus, it is important to identify sustainable methods to remove pesticides from polluted water sources. Aeration of anaerobic groundwater, followed by biological rapid sand filtration is a widespread technology in drinking water treatment. Even though these systems are not designed for removal of trace contaminants, they have shown potential for microbial degradation of pesticides and their degradation products. If pesticides can be removed in rapid sand filters, it is of large commercial interest due to the importance in maintaining a simple, sustainable water treatment. To take advantage of the microbial pesticide degradation and identify associated risks, it is necessary to understand the extent of pesticide degradation and the governing microbial processes in the water treatment.

The objective of this PhD thesis was to investigate the potential for microbial pesticide degradation at waterworks treating groundwater and to investigate, which microbial processes govern the degradation, in order to suggest how pesticide degradation can be stimulated in water treatment systems.

In a full-scale waterworks the rapid sand filters removed a phenoxy acid (herbicide) contamination from drinking water and investigations showed a potential for removing several pesticides in filter sand from different waterworks. The largest biological pesticide removal was observed in filter sand from a waterworks characterised by methane-rich groundwater. Thus, it was investigated for a connection between pesticide degradation and methane oxidation.

In an enrichment culture, methanotrophs contributed to the degradation of phenoxy acids. However, a phenoxy acid was degraded in filter sand from 10 different waterworks receiving groundwater with varying concentrations and absence of methane. The omnipresent phenoxy acid degradation demonstrated that degradation in rapid sand filters was not associated with methane oxidation. Based on the present investigations and literature, it was suggested that phenoxy acid degradation in rapid sand filters is due to primary metabolism, and that degradation might be stimulated by enriching naturally occurring specific degraders in the sand filters upon exposure to phenoxy acid contaminated groundwater.

A suite of evidence showed that the herbicide bentazone was co-metabolically transformed to hydroxy-bentazone by the methanotrophic enrichment culture. Subsequently, it was investigated whether bentazone degradation was also connected with methane oxidation in drinking water treatment systems.

In waterworks wells in Denmark, bentazone was detected significantly less frequently in wells with methane than in wells without methane. Similarly, the biological bentazone removal in filter sand from 14 waterworks correlated significantly with the maximum methane concentration in the raw water and did not correlate with other water quality parameters, such as the ammonium concentration. Furthermore, the connection between bentazone degradation and methane oxidation in filter sand was demonstrated by inhibition experiments, in which acetylene inhibited both the methane oxidation and the bentazone removal. The main biotransformation pathways clearly showed the importance of initial hydroxylation reactions during bentazone degradation in filter sand. However, bentazone was further degraded in filter sand and showed that not only methanotrophs, but also other heterotrophs contributed to the degradation. Methanotrophic biomass from the aeration tanks clearly demonstrated a bentazone degradation, which depended on the presence of methane.

Transformation yields describing the bentazone removal versus the methane oxidation were in same order of magnitude for all investigated media: methanotrophic enrichment cultures, filter sand and biomass from aeration tanks, which strongly indicated that the same degradation process governed bentazone removal in the different media. It was suggested that full-scale waterworks operates like a sequential reactor system, where methanotrophs are grown in the aeration tanks and transported to the rapid sand filters where they can perform co-metabolic pesticide biodegradation. It was suggested that bentazone removal can be stimulated at waterworks, by stimulating growth of methanotrophs.

Overall, this PhD demonstrated a substantial potential for biological pesticide degradation in drinking water treatment systems. While the omnipresent phenoxy acid degradation potential was probably due to specific degraders, bentazone degradation was connected with the methane oxidation. Based on the present investigations and literature, it was suggested that phenoxy acid degradation can be stimulated by enrichment of naturally occurring degraders in filter sand, and that bentazone degradation can be stimulated by stimulating growth of methanotrophs in the water treatment.
Microbial electrochemical separation of CO₂ for biogas upgrading

Biogas upgrading to natural gas quality has been under focus the recent years for increasing the utilization potential of biogas. Conventional methods for CO₂ removal are expensive and have environmental challenges, such as increased emissions of methane in the atmosphere with serious greenhouse impact. In this study, an innovative microbial electrochemical separation cell (MESC) was developed to in-situ separate and regenerate CO₂ via alkali and acid regeneration. The MESC was tested under different applied voltages, inlet biogas rates and electrolyte concentrations. Pure biomethane was obtained at 1.2 V, inlet biogas rate of 0.088 mL/h/mL reactor and NaCl concentration of 100 mM at a 5-day operation. Meanwhile, the organic matter of the domestic wastewater in the anode was almost completely removed at the end. The study demonstrated a new sustainable way to simultaneously upgrade biogas and treat wastewater which can be used as proof of concept for further investigation.
Microbial fuel cell-based biosensor for toxic carbon monoxide monitoring

This study presents an innovative microbial fuel cell-based biosensor for carbon monoxide (CO) monitoring. The hypothesis for the function of the biosensor is that CO inhibits bacterial activity in the anode and thereby reduces electricity production. A mature electrochemically active biofilm on the anode was exposed to CO gas at varied concentrations. A proportional linear relationship (R² = 0.987) between CO concentration and voltage drop (0.8 to 24 mV) in the range of 10% and 70% of CO concentration was observed. Notably, no further decrease of voltage output was observed by with further increasing CO concentration over 70%. Besides, the response time of the biosensor was 1 h. The compact design and simple operation of the biosensor makes it easy to be integrated in existing CO-based industrial facilities either as a forewarning sensor for CO toxicity or even as an individual on-line monitoring device.

General information
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Pages: 368-371
Microbial resource management for the mitigation of nitrous oxide emissions from the Partial Nitritation-Anammox process

Urban wastewater treatment plants are designed to remove pathogens and pollutants from wastewater in order to provide sanitation and to protect receiving water bodies from eutrophication. Reactive nitrogen, mainly in the form of ammonium, is one of the components in wastewater that is converted to dinitrogen gas during treatment. The Partial Nitritation-Anammox process (PNA) uses the capacity of autotrophic aerobic and anaerobic ammonia oxidizing bacteria (AOB and AnAOB) to perform this task. The process is mainly applied to treat ammonium-rich wastewater streams with low concentrations of organic carbon. Its advantages over conventional nitrogen removal technology include lower energy needs for aeration, no addition of organic carbon and reduced sludge production. However, emissions of the greenhouse gas nitrous oxide (N2O), that are commonly measured during process operation, have the potential to determine the CO2 footprint of PNA, thus off-setting its environmental benefits. Consequently, strategies to mitigate N2O emissions from PNA are needed. In the presented Ph.D. study a laboratory scale PNA model system was investigated to infer beneficial modes of process operation for high rate PNA with simultaneously low N2O emissions. Dynamics of N2O emission, production and consumption reactions were quantified to identify correlations between N2O and process parameters, a method to engineer the microbial community by aeration patterns was tested and a N2O mitigation strategy based on pH set-points was evaluated. The concept of Microbial Resource Management (MRM) was adopted to steer the fraction of AOB and AnAOB in bio-granules and to manipulate the activity of enzymes relevant for N2O metabolism. Both, microorganisms and enzymes were considered as microbial resources. The characterization of the system revealed that net N2O production in aerated phases primarily contributed to overall N2O emissions (80-100%). The remaining N2O was produced during non-aerated phases, leading to distinct N2O emission peaks at the onset of aerated phases. Net N2O production rates in aerated phases were positively related with the specific ammonia removal rate, while during non-aerated phases net N2O production rates were positively correlated with the nitrite concentration (NO2-). Operation of PNA at reduced specific ammonia removal rates is, therefore, a feasible strategy to mitigate N2O emissions. However, when high ammonium removal rates shall be maintained, an increased NO2- sink capacity by a relatively larger fraction of AnAOB has the potential to reduce N2O production. Changes of the intermittent aeration regime were applied to engineer the microbial community. Indeed, longer aerated phases were feasible to increase the size of bio-granules by approx. two-fold, which resulted in an increase of the AnAOB/AOB ratio from 0.4 up to 1.4. However, an effect of median granule size and granule size distribution on process performance was not detectable, since periodic non-aerated phases in intermittently aerated PNA had stronger regulating effects on NO2- accumulation, than the granule size distribution had. Consequently, the granule size distribution was less relevant for stable process performance in intermittently aerated systems, than for continuously aerated systems. Net N2O production is the difference between N2O production and consumption. Therefore, increased N2O consumption rates reduce net N2O production, also when production is not altered. A comprehensive review, synthesizing current knowledge on the effect of pH on enzymes involved in nitrogen conversions, suggested a N2O mitigation strategy based on pH set-points. Indeed, pH exerted a strong effect on N2O emissions, when emission factors (% N2O-Nproduced/NH4+-Nremoved) increased with pH from 2.5% at pH 6.5 to 3.3% at pH 7.0 and 7.5, before substantially decreasing to 1.6% at pH 8.0. The cause for low net N2O production rates at alkaline pH was assigned to high N2O reduction rates by the enzyme nitrous oxide reductase, which became relevant at pH > 7.5. Based on the results obtained in the Ph.D. study, operation of Partial Nitritation-Anammox at relatively long aerated phases, low specific ammonia removal rates and pH 8.0 is suggested to reduce N2O emissions from the process.
Microplastics in food and beverages - a distorted perspective on risk

General information
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Model-based interpretation of tracer tests in fractured limestone and clayey till

General information
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Model-based optimization biofilm based systems performing autotrophic nitrogen removal using the comprehensive NDHA model

Completely autotrophic nitrogen removal (CANR) can be obtained in single stage biofilm-based bioreactors. However, their environmental footprint is compromised due to elevated N2O emissions. We developed novel spatially explicit biochemical process model of biofilm based CANR systems that predicts N2O dynamics and stripping, using the biological NDHA model coupled with a simple and roubust pH calculator. In this work we present two case studies: i) membrane aerated biofilm reactor (MABR) with focus on model calibration; and ii) granular system with focus on process optimization.

General information
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Model identification for hindered-compression settling velocity

Two of the key questions regarding secondary settling are (a) Does a process model exist for which all hindered and compression settling velocity parameters can be estimated using experimental data?; (b) What is the minimum data that
need be inferred, from a settling sensor setup to identify process models?" This international research effort aimed to address these questions by carrying out a comprehensive practical identifiability assessment of constitutive functions for hindered and compression settling velocity using laboratory-scale measurements and one-dimensional (1-D) simulation models. For model validation, the triangulation technique was used, including independent laboratory- and full-scale measurements as well as 1-D and computational fluid dynamics (CFD) simulation models.

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**Modelling approach and benchmark experiments for Nernst-Plack-based transport, Coulombic interactions and geochemical reactions in saturated porous media**

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**Model predictive control of urban drainage systems: A review and perspective towards smart real-time water management**
Model predictive control (MPC) can be used to manage combined urban drainage systems more efficiently for protection of human health and the environment, but examples of operational implementations are rare. This paper reviews more than 30 years of partly heterogeneous research on the topic. We propose a terminology for MPC of urban drainage systems and a hierarchical categorization where we emphasize four overall components: the "receding horizon principle", the "optimization model", the "optimization solver", and the "internal MPC model". Most of the reported optimization models share the trait of a multiobjective optimization based on a conceptual internal MPC model. However, there is a large variety of both convex and non-linear optimization models and optimization solvers as well as constructions of the internal MPC model. Furthermore, literature disagrees about the optimal length of the components in the receding horizon principle. The large number of MPC formulations and evaluation approaches makes it problematic to compare different MPC methods. This review highlights methods, challenges, and research gaps in order to make MPC of urban drainage systems accessible for researchers and practitioners from different disciplines. This will pave the way for shared understanding and further development within the field, and eventually lead to more operational implementations.

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Monitoring and modeling of nitrogen conversions in membrane-aerated biofilm reactors: Effects of intermittent aeration

Nitrogen can be removed from sewage by a variety of physicochemical and biological processes. Due to the high removal efficiency and relatively low costs, biological processes have been widely adopted for treating nitrogen-rich wastewaters. Among the biological technologies, biofilm processes show great advantages as compared to suspended growth processes, allowing for biomass accumulation and retention without the need of external solid separation devices. The decoupling of solids retention from hydraulic retention is especially useful for slow-growing microorganisms, such as nitrifying bacteria, e.g., ammonium-oxidizing bacteria (AOB) and nitrite-oxidizing bacteria (NOB), and anaerobic ammonium-oxidizing bacteria (AnAOB), which are involved in ammonium (NH4+) removal process.

Stability of engineered biological processes requires an appropriate balance between activities of the main microbial groups involved in the system. How-ever, finding proper operational conditions is especially challenging in biofilms. On the one hand, the existence of strong spatial chemical gradients within biofilms increases the difficulty to prescribe environmental conditions that favor any desired biological process. On the other hand, the presence of multiple simultaneous chemical gradients complicates the performance optimization. Mathematical modeling offers a way to describe and analyze multiple processes that occur simultaneously in time and space in biofilm systems.

This PhD project investigated NH4+ removal process in membrane-aerated biofilm reactors (MABRs), focusing on aeration control, especially the application of intermittent aeration. Compared to conventional biofilms which are characterized by co-diffusion, MABRs display counter-diffusion fluxes of substrates: oxygen is supplied through the membrane, whilst NH4+ is provided from the bulk liquid phase. The counter substrate supply not only offers flexible aeration control, but also supports the development of a unique microbial community and spatial structure inside the biofilm. In this study, lab-scale MABRs were operated under two types of aeration control: continuous versus intermittent aeration. Long-term reactor performance was monitored. Based on bulk measurements of NH4+, nitrite (NO2-) and nitrate (NO3-), microbial activities of individual functional guilds were evaluated. I found that NOB suppression occurred under intermittent aeration, but not under continuous aeration. Relative aeration duration and aeration intermittency were two effective operational factors in regulating MABR performance under intermittent aeration. Besides daily bulk monitoring, in situ microprofiles of dissolved oxygen (DO), pH and nitrous oxide (N2O) were performed. The significant temporal fluctuations in local biofilm pH (not DO) during aeration control suggested that pH-related effects drive the changing microbial activities under intermittent aeration, as compared to continuous aeration. Total N2O emissions were dramatically reduced at the onset of intermittent aeration, due to the development of an anoxic N2O reduction zone by heterotrophic bacteria (HB).

To further investigate the mechanisms of N2O mitigation under aeration control, the 1-D biofilm model was extended to a partial nitritation-anammox (PNA) biofilm model, including description of all relevant biological N2O production pathways. Sensitive kinetic parameters were estimated with long-term bulk performance data. With the calibrated model, roles of HB and AnAOB were discussed and evaluated in mitigating N2O emissions in auto-trophic nitrogen removal MABRs. Moreover, I developed a 1-D biofilm model in Matlab software describing the counter-diffusion PNA process, aiming at an improved model calibration/evaluation for the highly variable N2O emissions.

Overall, a combination of experimental and modeling efforts were implemented to study nitrogen conversions in MABRs. The results showed that intermittent aeration was an efficient strategy to regulate microbial activities in counter-diffusion biofilms, achieving an energy-efficient NH4+ removal process with low N2O emissions.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Ma, Y. (Intern), Smets, B. F. (Intern)
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Original language: English
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Projects:

Monitoring and modeling of nitrogen conversions in membrane-aerated biofilm reactors: Effects of intermittent aeration

Publication: Research › Ph.D. thesis – Annual report year: 2018
Monitoring of surface water resources in East Africa using CryoSat-2 radar altimetry and Sentinel-1 SAR imagery

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, National Space Institute, Geodesy, DHI GRAS
Authors: Kittel, C. M. M. (Intern), Jiang, L. (Intern), Tøttrup, C. (Ekstern), Nielsen, K. (Intern), Bauer-Gottwein, P. (Intern)
Number of pages: 1
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ISI indexed (2011): ISI indexed no
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Publication: Research - peer-review › Conference abstract in journal – Annual report year: 2018

Monitoring Riverscapes with Unmanned Airborne Vehicles

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Environmental Fate & Effect of Chemicals, National Space Institute, Geodesy, Astrophysics and Atmospheric Physics, Orbicon, Drone Systems ApS, DHI, Region Hovedstaden, Region Syddanmark, Vejle County, Technical University of Denmark, Photrack AG
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Main Research Area: Technical/natural sciences
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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2018

Moving from adequate to optimal drinking water quality. A reassessment of mineral composition

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Nernst-Planck Based Description of Transport, Coulombic Interactions and Geochemical Reactions in Porous Media: Modeling Approach and Benchmark Experiments

Transport of multicomponent electrolyte solutions in saturated porous media is affected by the electrostatic interactions between charged species. Such Coulombic interactions couple the displacement of the different ions in the pore water and remarkably impact mass transfer not only under diffusion- but also under advection-dominated flow regimes. To accurately describe charge effects in flow-through systems, we propose a multidimensional modeling approach based on the Nernst-Planck formulation of diffusive/dispersive fluxes. The approach is implemented with a COMSOL-PhreeqcRM coupling allowing us to solve multicomponent ionic conservative and reactive transport problems, in domains with different dimensionality (1-D, 2-D and 3-D), and in homogeneous and heterogeneous media. The Nernst-Planck based coupling has been benchmarked with analytical solutions, numerical simulations with another code, and high-resolution experimental datasets. The latter include flow-through experiments that have been carried out in this study to explore the effects of electrostatic interactions in fully three-dimensional setups. The results of the simulations show excellent agreement for all the benchmarks problems, which were selected to illustrate the capabilities and the distinct features of the Nernst-Planck based reactive transport code. The outcomes of this study illustrate the importance of Coulombic interactions during conservative and reactive transport of charged species in porous media and allow the quantification and visualization of the specific contributions to the diffusive/dispersive Nernst-Planck fluxes, including the Fickian component, the term arising from the activity coefficient gradients, and the contribution due to electromigration.
New innovative Moving Bed Biofilm Reactor (MBBR) concept removes pharmaceutical from municipal wastewater using only biological polishing

**General information**

State: Published

Organisations: Department of Environmental Engineering, Water Technologies, Aarhus Water, Aarhus University Hospital, Herning Vand, Danish Technological Institute, Krüger A/S, AnoxKaldnes AB, Aarhus University


Pages: 22-22

Publication date: 2018

**Host publication information**

Title of host publication: Danish Water Forum Annual Water Conference 2018 - abstract book
Nitrous oxide production in intermittently aerated Partial Nitritation-Anammox reactor: oxic N₂O production dominates and relates with ammonia removal rate

Emissions of the greenhouse gas nitrous oxide from the Partial Nitritation-Anammox process are of concern and can determine the carbon footprint of the process. In order to reduce nitrous oxide emissions intermittent aeration regimes have been shown to be a promising mode of operation, possibly due to an effective control of accumulation of nitrogen intermediates. However, due to frequent changes of redox conditions under intermittent aeration regimes, nitrous oxide production and emissions are dynamic. In this study the production and emission dynamics of nitrous oxide in an intermittently aerated sequencing batch reactor were monitored in high temporal resolution, the contribution of different redox conditions to overall nitrous oxide production was quantified and the most relevant factors for nitrous oxide production were identified. The average fraction of nitrous oxide produced (per unit ammonium removed) was 1.1 ± 0.5%. Cycle-averaged approx. 80% of nitrous oxide was produced during aerated phases, the remaining 20% were produced during non-aerated phases. Yet, the intra-cycle dynamics of nitrous oxide were substantial. The net-production rate of nitrous oxide during aerated phases correlated with the ammonia removal rate, whereas the concentration of nitrite determined the production during non-aerated phases. While aerated phases contributed predominantly at the beginning of reactor cycles, non-aerated phases became the dominant source of nitrous oxide at the end. Particularly low net-production rates were observed at ammonia removal rates below 5 mg NH₃-N*gVSS−1*L−1, when the fraction of nitrous oxide produced was 0.011 ± 0.004% (per ammonia removed). Based on the nitrous oxide dynamics and correlations, reactor operation at relatively low nitrogen loadings (below 100 mg NH₄+-N*L−1), ammonia removal rates of approx. 5 mg NH₃-N*gVSS−1*L−1 and nitrite concentrations below 1 mg NO₂−1-N*L−1 appears as beneficial for low emission of nitrous oxide.
Novel insights linking ecological health to biogeochemical hotspots in mixed land use stream systems

Increasing modifications in land use and water management have resulted in multiple stressors impacting freshwater ecosystems globally. Chemicals with the potential to impact aquatic habitats are still often evaluated individually for their adverse effects on ecosystem health. This may lead to critical underestimations of the combined impact caused by interactions occurring between stressors not typically evaluated together, e.g., xenobiotic groundwater pollutants and trace metals. Although water managers need a set of measures for determining water body status, approaches capable of clarifying the many existing discrepancies between chemical and ecological status are still urgently needed.

To address this issue, we identified sources and levels of chemical stressors along a 16-km groundwater-fed stream corridor (Grindsted, Denmark), representative for a mixed land use stream system. Potential pollution sources included two contaminated sites (factory, landfill), aquaculture, wastewater/industrial discharges, and diffuse sources from agriculture and urban areas (Sonne et al., 2017). Ecological status was determined by monitoring meiobenthic and macrobenthic invertebrate communities.

The stream was substantially impaired by both geogenic and anthropogenic sources of metals throughout the investigated corridor, with concentrations close to or above threshold values for copper, nickel and zinc in the stream water, hyporheic zone and streambed sediment. The groundwater plume from the factory site caused elevated concentrations of chlorinated ethenes, benzene and pharmaceuticals in both the hyporheic zone and stream, persisting for several km downstream.

Impaired ecological conditions, represented by a lower abundance of meiobenthic individuals, were found in zones where the groundwater plume discharges to the stream. The effect was only pronounced in areas characterized by high xenobiotic organic concentrations and elevated dissolved iron and arsenic levels – linked to the dissolution of iron hydroxides caused by the degradation of xenobiotic compounds in the plume. The results thus provide ecological evidence for the interaction of organic and inorganic chemical stressors, which may provide a missing link enabling the reconnection of chemical and ecological findings. This study highlights the importance of stream-aquifer interfaces for ecosystem functioning in terms of biological habitat, and that multiple stressor systems need to be tackled from a holistic perspective.

General information

State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Aarhus University, Bielefeld University
Novel method reveals a narrow phylogenetic distribution of bacterial dispersers in environmental communities exposed to low hydration conditions

In this study, we developed a method that provides community-level surface dispersal profiles under controlled hydration conditions from environmental samples and enables us to isolate and uncover the diversity of the fastest bacterial dispersers. The method expands on the Porous Surface Model (PSM), previously used to monitor dispersal of individual bacterial strains in liquid films at the surface of a porous ceramic disc. The novel procedure targets complex communities and captures the dispersed bacteria on a solid medium for growth and detection. The method was first validated by distinguishing motile Pseudomonas putida and Flavobacterium johnsoniae strains from their non-motile mutants. Applying the method to soil and lake water bacterial communities showed that community-scale dispersal declined as conditions became drier. However, for both communities, dispersal was detected even under low hydration conditions (matric potential: -3.1 kPa), previously proven too dry for P. putida KT2440 motility. We were then able to specifically recover and characterize the fastest dispersers from the inoculated communities. For both soil and lake samples, 16S rRNA gene amplicon sequencing revealed that the fastest dispersers were substantially less diverse than the total communities. The dispersing fraction of the soil microbial community was dominated by Pseudomonas which increased in abundance at low hydration conditions, while the dispersing fraction of the lake community was dominated by Aeromonas and, under wet conditions (-0.5 kPa), also by Exiguobacterium. The results gained in this study bring us a step closer to assessing the dispersal ability within complex communities under environmentally relevant conditions. IMPORTANCE Dispersal is a key process of bacterial community assembly. Yet, very few attempts have been made at assessing bacterial dispersal at the community level as focus has previously been on pure culture studies. A crucial factor for dispersal in habitats where hydration conditions vary, such as soils, is the thickness of the liquid films surrounding solid surfaces, but little is known on how the ability to disperse in such films varies within bacterial communities. Therefore, we developed a method to profile community dispersal and identify fast dispersers on a rough surface resembling soil surfaces. Our results suggest that within the motile fraction of a bacterial community only a minority of the bacterial types are able to disperse in the thinnest liquid films. During dry periods, these efficient dispersers can gain a significant fitness advantage through their ability to colonize new habitats ahead of the rest of the community.
Nutrient recovery from industrial wastewater as single cell protein by a co-culture of green microalgae and methanotrophs

Conventional water treatment technologies remove nutrients via resource intensive processes. However, new approaches for nutrient recycling are needed to provide food to the increasing population. This work explores the use of microbial biomass as a means to recover nutrients from industrial wastewater and upcycle them to feed grade single cell protein. Results demonstrated that both algae and bacteria could remove or assimilate most of the organic carbon present in the wastewater (~95% removal for monocultures and 91% for the algal-bacterial consortium). However, their growth stopped before nutrients and substrates in the gas phase (i.e., methane and oxygen for methanotrophs and carbon dioxide for algae) were depleted. Likely, algal growth was light limited and stopped after organic carbon was consumed. Methanotrophs growth could be limited by trace elements (e.g., copper). Nevertheless, for all cultures the protein content (45% of dry weight, DW, for methanotrophs; 52.5% of DW for algae; and 27.6% of DW for consortium) and amino acid profile was suitable for substitution of conventional protein sources. Further research should focus on increasing productivity of biomass grown on wastewater resources.

General information

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Water Technologies, Technical University of Denmark
Authors: Rasouli, Z. (Ekstern), Valverde Pérez, B. (Intern), D’Este, M. (Intern), De Francisci, D. (Intern), Angelidaki, I. (Intern)
Pages: 129-135
Publication date: 2018
Main Research Area: Technical/natural sciences

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Volume: 134
ISSN (Print): 1369-703X
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.18
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.16
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.75
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.72
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.03
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.95
Due to their widespread application in consumer products, elemental titanium (e.g., titanium dioxide, TiO2) and silver (Ag), also in nanoparticulate form, are increasingly released from households and industrial facilities to urban wastewater treatment plants (WWTPs). A seven-day sampling campaign was conducted in two full-scale WWTPs in Trondheim (Norway) employing only primary treatment. We assessed the occurrence and elimination of Ti and Ag, and conducted size-based fractionation using sequential filtration of influent samples to separate particulate, colloidal and dissolved fractions. Eight-hour composite influent samples were collected to assess diurnal variations in total Ti and Ag influx. Measured influent Ti concentrations (up to 290μgL−1) were significantly higher than Ag (<0.15–2.1μgL−1), being mostly associated with suspended solids (>0.7μm). Removal efficiencies ≥70% were observed for both elements, requiring for one WWTP to account for the high Ti content (∼2gL−1) in the flocculant. Nano- and micron-sized Ti particles were observed with scanning transmission electron microscopy (STEM) in influent, effluent and biosolids, while Ag nanoparticles were detected in biosolids only. Diurnal profiles of influent Ti were correlated to flow and pollutant concentration patterns (especially total suspended solids), with peaks during the morning and/or evening and minima at night, indicating household discharges as predominant source. Irregular profiles were exhibited by influent Ag, with periodic concentration spikes suggesting short-term discharges from one or few point sources (e.g., industry). Influent Ti and Ag dynamics were reproduced using a disturbance scenario generator model, and we estimated per capita loads of Ti (42–45mg cap−1 d−1) and Ag (0.11mg cap−1 d−1) from households as well as additional Ag load (14–22gd−1) from point discharge. This is the first study to experimentally and mathematically describe short-term release dynamics and dry-weather sources of emissions of Ti and Ag in municipal WWTPs and receiving environments.
On the contribution of reclaimed wastewater irrigation to the potential exposure of humans to antibiotics, antibiotic resistant bacteria and antibiotic resistance genes - NEREUS COST Action ES1403 position paper

Antibiotic resistance (AR) is becoming a worldwide threat due to the increasing occurrence of antibiotic-resistant pathogenic bacterial strains. There is a general consensus about the potential implications of the use of antibiotics in livestock on the onset of antibiotic resistant bacteria (ARB), mainly through meat consumption. However, the ever-increasing use of reclaimed wastewater (RWW) in agriculture may also contribute significantly to the non-accounted exposure to antibiotics, ARB, and antibiotic resistance genes (ARGs). This position paper aims at evaluating the current knowledge concerning the occurrence of antibiotics, ARBs, and ARGs in edible parts of different common crops irrigated with RWW. We will discuss which regulations on the use of RWW may contribute to the minimization of the prevalence of these contaminants in crops, and provide recommendations on how to minimize the impact of these practices.

General information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, CSIC, Ministry of Agriculture and Natural Resources Cyprus, University of Cyprus, Universite de Reims Champagne-Ardenne, Aristotle University of Thessaloniki
Authors: Piña, B. (Ekstern), Bayona, J. M. (Ekstern), Christou, A. (Ekstern), Fatta-Kassinos, D. (Ekstern), Guillon, E. (Ekstern), Lambropoulou, D. (Ekstern), Michael, C. (Ekstern), Polesel, F. (Intern), Sayen, S. (Ekstern)
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Environmental Chemical Engineering
ISSN (Print): 2213-3437
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SJR 0.924 SNIP 1.385 CiteScore 4.01
Scopus rating (2016): CiteScore 3.83 SJR 0.859 SNIP 1.378
Web of Science (2016): Indexed yes
Scopus rating (2015): SJR 0.797 SNIP 1.489 CiteScore 3.21
Scopus rating (2014): SJR 0.589 SNIP 1.062 CiteScore 2.21
Original language: English
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DOIs:
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Publication: Research - peer-review › Journal article – Annual report year: 2018

General information
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Optical technologies applied alongside on-site and remote approaches for climate gas emission quantification at a wastewater treatment plant

Plant-integrated and on-site gas emissions were quantified from a Swedish wastewater treatment plant by applying several optical analytical techniques and measurement methods. Plant-integrated CH₄ emission rates, measured using mobile ground-based remote sensing methods, varied between 28.5 and 33.5 kg CH₄ h⁻¹, corresponding to an average emission factor of 5.9% as kg CH₄ (kg CH₄-production)⁻¹, whereas N₂O emissions varied between 4.0 and 6.4 kg h⁻¹, corresponding to an average emission factor of 1.5% as kg N₂O-N (kg TN influent)⁻¹. Plant-integrated NH₃ emissions were around 0.4 kg h⁻¹, corresponding to an average emission factor of 0.11% as kg NH₃-N (kg TN removed)⁻¹. On-site emission measurements showed that the largest proportions of CH₄ (70%) and NH₃ (66%) were emitted from the sludge treatment line (mainly biosolid stockpiles and the thickening and dewatering units), while most of the N₂O (82%) was emitted from nitrifying trickling filters. In addition to being the most important CH₄ source, stockpiles of biosolids exhibited different emissions when the sludge digesters were operated in series compared to in parallel, thus slightly increasing substrate retention time in the digesters. Lower CH₄ emissions and generally higher N₂O and NH₃ emissions were observed when the digesters were operated in series. Loading biosolids onto trucks for off-site treatment generally resulted in higher CH₄, N₂O, and NH₃ emissions from the biosolid stockpiles. On-site CH₄ and N₂O emission quantifications were approximately two-thirds of the plant-integrated emission quantifications, which may be explained by the different timeframes of the approaches and that not all emission sources were identified during on-site investigation. Off-site gas emission quantifications, using ground-based remote sensing methods, thus seem to provide more comprehensive total plant emissions rates, whereas on-site measurements provide insights into emissions from individual sources.
Methane, Nitrous oxide, Biosolid stockpiles, Sewage sludge, Emission factors

Optimization of regional water - power systems under cooling constraints and climate change
Thermo-electric generation represents 70% of Europe's electricity production and 43% of water withdrawals, and is therefore a key element of the water-energy nexus. In 2003, 2006 and 2009, several thermal power plants had to be switched off in Europe because of heat waves, showing the need to assess the impact of climate change on cooling constraints of thermal power plants. An integrated water-power model of the Iberian Peninsula was developed in this
study. It includes a physical hydrologic representation, spatially and temporally resolved water demands, management of water infrastructure and a simple power system model. The system was evaluated under present and future climatic conditions using different climate change scenarios. The cost of cooling constraints is found to increase by 220–640 million €/year, for the period 2046–2065 depending on the climate change scenario. Average available capacity of freshwater-cooled thermal power plants is reduced by 16–30% while production is reduced by 5–12% in summer. The power production is shifted from plants equipped with once-through cooling systems (−5 to −14%) towards plants using closed-circuit cooling systems (+41 to +95%).

**General information**

State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Politecnico di Milano
Authors: Payet-burin, R. (Intern), Bertoni, F. (Ekstern), Davidsen, C. (Intern), Bauer-Gottwein, P. (Intern)
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BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.99 SNIP 1.923 CiteScore 5.6
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.17 SJR 1.974 SNIP 1.823
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.22 SNIP 2.037 CiteScore 5.03
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.575 SNIP 2.602 CiteScore 5.7
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.458 SNIP 2.556 CiteScore 5.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.935 SNIP 2.214 CiteScore 4.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.566 SNIP 2.01 CiteScore 4
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.712 SNIP 2.46
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.663 SNIP 2.357
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.103 SNIP 1.438
Scopus rating (2007): SJR 0.902 SNIP 1.434
Web of Science (2007): Indexed yes
Optimizing the benefits from drinking water softening by better calculating the calcium carbonate precipitation potential - CCPP

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, HOFOR A/S
Authors: Tang, C. (Intern), Lopato, L. (Ekstern), Merks, C. (Ekstern), Albrechtsen, H. (Intern)
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Optimizing water resources allocation in the Haihe River basin under groundwater sustainability constraints

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Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Chinese Academy of Sciences, Chinese Academy of Sciences
Authors: Martinsen, G. (Intern), Liu, S. (Ekstern), Mo, X. (Ekstern), Bauer-Gottwein, P. (Intern)
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Web of Science (2013): Indexed yes
Ozonation control and effects of ozone on water quality in recirculating aquaculture systems

To address the undesired effect of chemotherapeutants in aquaculture, ozone has been suggested as an alternative to improve water quality. To ensure safe and robust treatment, it is vital to define the ozone demand and ozone kinetics of the specific water matrix to avoid ozone overdose. Different ozone dosages were applied to water in freshwater recirculating aquaculture systems (RAS). Experiments were performed to investigate ozone kinetics and demand, and to evaluate the effects on the water quality, particularly in relation to fluorescent organic matter. This study aimed at predicting a suitable ozone dosage for water treatment based on daily ozone demand via laboratory studies. These ozone dosages will be eventually applied and maintained at these levels in pilot-scale RAS to verify predictions. Selected water quality parameters were measured, including natural fluorescence and organic compound concentration changes during ozonation. Ozone reactions were described by first order kinetics. Organic matter, assessed as chemical oxygen demand and fluorescence, decreased by 25% (low O3), 30% (middle O3) and 53% (high O3), while water transmittance improved by 15% over an 8-day period. No fish mortality was observed. Overall, this study confirms that ozone can improve RAS water quality, provides a better understanding of the ozone decay mechanisms that can be used to define further safe ozone treatment margins, and that fluorescence could be used as a monitoring tool to control ozone. This study might be used as a tool to design ozone systems for full-scale RAS by analysing water sample from the specific RAS in the laboratory.
Partitioning of ecosystem respiration in a beech forest

Terrestrial ecosystem respiration (Reco) represents a major component of the global carbon cycle. It consists of many sub-components, such as aboveground plant respiration and belowground root and microbial respiration, each of which may respond differently to abiotic factors, and thus to global climate change. To correctly predict future carbon cycles in forest ecosystems, Reco must therefore be partitioned and understood for each of its various components. In this study we used the eddy covariance technique together with manual and automated closed-chambers to quantify the individual components of Reco in a temperate beech forest at diel, seasonal and annual time scales. Reco was measured by eddy covariance while respiration rates from soil, tree stems and isolated coarse tree roots were measured bi-hourly by an automated closed-chamber system. Soil respiration (Rsoil) was measured in intact plots, and heterotrophic Rsoil was measured in trenched plots. Tree stem (Rstem) and coarse root (Rroot) respiration were measured by custom made closed-chambers. We found that the contribution of Rstem to total Reco varied across the year, by only accounting for 6% of Reco during winter and 16% during the summer growing season. In contrast Rsoil was approximately half of Reco during winter (52%), spring (45%) and summer (49%), while the contribution increased to 79% during autumn. Based on observed fluxes in the trenched and intact soil plots, we found that autotrophic Rsoil accounted for 34% of Rsoil during summer, i.e. a relatively low fractional estimate compared to findings from other studies. It is likely that dead roots were still decomposing in the trenched soil plots thus causing overestimation of heterotrophic Rsoil. Diel Rstem and Rroot
measurements showed a distinct pattern during summer with the highest respiration rates around 13:00-15:00 CET for $R_{\text{stem}}$, and the highest respiration seen from 9:00â€“15:00 for $R_{\text{root}}$. In contrast, $R_{\text{soil}}$ showed the lowest respiration during daytime with no clear difference in the diel pattern between the intact and trenched soil plots. Finally, we calculated annual $R_{\text{soil}}$ for different transects, and found that annual $R_{\text{soil}}$ estimated from the previously used transect at the site was underestimated due to $R_{\text{soil}}$ of the transect not being representative for the spatial heterogeneity of $R_{\text{soil}}$ at the site. This highlights the importance of performing a sufficient number of chamber measurements at a site to adequately capture the spatial variation and estimate $R_{\text{soil}}$ correctly.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources
Authors: Brændholt, A. (Intern), Ibrom, A. (Intern), Larsen, K. S. (Intern), Pilegaard, K. (Intern)
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.794 SJR 1.818 CiteScore 4.67
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.62 SJR 2.047 SNIP 1.916
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.162 SNIP 1.992 CiteScore 4.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.056 SNIP 1.906 CiteScore 4.31
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.827 SNIP 2.061 CiteScore 4.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.899 SNIP 2.065 CiteScore 3.71
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.783 SNIP 1.69 CiteScore 3.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.922 SNIP 1.684
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.036 SNIP 1.849
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.269 SNIP 2.054
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.796 SNIP 1.631
Web of Science (2007): Indexed yes
Performance and genome-centric metagenomics of thermophilic single and two-stage anaerobic digesters treating cheese wastes

The present research is the first comprehensive study regarding the thermophilic anaerobic degradation of cheese wastewater, which combines the evaluation of different reactor configurations (i.e. single and two-stage continuous stirred tank reactors) on the process efficiency and the in-depth characterization of the microbial community structure using genome-centric metagenomics. Both reactor configurations showed acidification problems under the tested organic loading rates (OLRs) of 3.6 and 2.4 g COD/L-reactor day and the hydraulic retention time (HRT) of 15 days. However, the two-stage design reached a methane yield equal to 95% of the theoretical value, in contrast with the single stage configuration, which reached a maximum of 33% of the theoretical methane yield. The metagenomic analysis identified 22 new population genomes and revealed that the microbial compositions between the two configurations were remarkably different, demonstrating a higher methanogenic biodiversity in the two-stage configuration. In fact, the acidogenic reactor of the serial configuration was almost solely composed by the lactose degrader Bifidobacterium crudilactis UC0001. The predictive functional analyses of the main population genomes highlighted specific metabolic pathways responsible for the AD process and the mechanisms of main intermediates production. Particularly, the acetate accumulation experienced by the single stage configuration was mainly correlated to the low abundant syntrophic acetate oxidizer Tepidanaerobacter acetatoxydans UC0018 and to the absence of aceticlastic methanogens.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padua, Catholic University of Piacenza, Technical University of Denmark
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Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.601 SNIP 2.358 CiteScore 7.55
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.663 SNIP 2.563
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.592 SNIP 2.192
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.319 SNIP 2.224
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.073 SNIP 2.178
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.94 SNIP 2.184
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.902 SNIP 2.233
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.113 SNIP 2.334
Web of Science (2005): Indexed yes
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Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.702 SNIP 1.908
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.568 SNIP 1.757
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.319 SNIP 1.69
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.399 SNIP 1.662
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.432 SNIP 1.55
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Publication: Research - peer-review › Journal article – Annual report year: 2018
Permeability Estimation Directly From Logging-While-Drilling Induced Polarization Data

In this study we present the prediction of permeability from time-domain spectral induced polarization (IP) data, measured in boreholes on undisturbed formations using the El-log logging-while-drilling technique. We collected El-log data and hydraulic properties on unconsolidated Quaternary and Miocene deposits in boreholes at three locations at a field site in Denmark, characterized by different electrical water conductivity and chemistry. The high vertical resolution of the El-log technique matches the lithological variability at the site, minimizing ambiguity in the interpretation originating from resolution issues. The permeability values were computed from IP data using a laboratory-derived empirical relationship presented in a recent study for saturated unconsolidated sediments, without any further calibration. A very good correlation, within one order of magnitude, was found between the IP-derived permeability estimates and those derived using grain size analyses and slug-tests, with similar depth-trends and permeability contrasts. Furthermore, the effect of water conductivity on the IP-derived permeability estimations was found negligible in comparison to the permeability uncertainties estimated from the inversion and the laboratory-derived empirical relationship.

General information
State: Published
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.296 SNIP 1.555 CiteScore 4.39
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.1 SJR 2.615 SNIP 1.633
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.525 SNIP 1.593 CiteScore 4.06
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.442 SNIP 1.668 CiteScore 3.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.204 SNIP 1.751 CiteScore 3.65
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.127 SNIP 1.586 CiteScore 3.12
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.937 SNIP 1.48 CiteScore 2.92
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.053 SNIP 1.431
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Pesticide use in the wheat-maize double cropping systems of the North China Plain: Assessment, field study, and implications

In the North China Plain (NCP), rising inputs of pesticides have intensified the environmental impact of farming activities in recent decades by contributing to surface water and groundwater contamination. In response to this, the Chinese government imposed stricter regulations on pesticide approval and application, and better monitoring strategies are being developed. However, sufficient and well-directed research on the accumulation and impact of different pesticides is needed for informed decision-making. In this study, current pesticide use, and recent and current research on water contamination by pesticides in the NCP are reviewed and assessed. Additionally, a small-scale field study was performed to determine if residuals from currently-used pesticides in the NCP can be detected in surface water, and in connected shallow groundwater. The contaminants of interest were commonly used pesticides on winter wheat-summer maize fields (the dominant cropping system in the NCP), such as 2,4-D and atrazine. Sampling took place in May, July, and October 2013; and March 2014. Results from our literature research showed that sampling is biased towards surface water monitoring. Furthermore, most studies focus on organic chlorinated pesticides (OCPs) like the isomers of dichlorodiphenyltrichloroethane (DDT) and hexachlorocyclohexane (HCH), which were banned in China in 1983. However, currently-used herbicides like 2,4-D and atrazine were detected in river water and groundwater in all samplings of our field study. The highest concentrations of 2,4-D and atrazine were found in the river water, ranging up to 3.00 and 0.96μg/L, respectively. The monitoring of banned compounds was found to be important because several studies indicate that they are still accumulating in the environment and/or are still illegally in use. However, supported by our own data, we find that the monitoring in groundwater and surface water of currently permitted pesticides in China needs equal attention, and should therefore be increased.
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.546 SNIP 1.65 CiteScore 4.98
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.09 SJR 1.652 SNIP 1.856
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.653 SNIP 1.648 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.635 SNIP 1.843 CiteScore 4.2
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.527 SNIP 1.745 CiteScore 3.73
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.749 SNIP 1.82 CiteScore 3.7
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.802 SNIP 1.676 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.651 SNIP 1.506
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.576 SNIP 1.6
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.461 SNIP 1.489
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.393 SNIP 1.473
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.512 SNIP 1.586
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.439 SNIP 1.509
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.126 SNIP 1.299
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.156 SNIP 1.35
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.175 SNIP 1.359
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.054 SNIP 1.076
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.916 SNIP 1.051
Web of Science (2000): Indexed yes
Phytoscreening for vinyl chloride in groundwater discharging to a stream

This study applies an optimized phytoscreening method to locate a chlorinated ethene plume discharging into a stream. To evaluate the conditions most suitable for successful phytoscreening, trees along the stream bank were monitored through different seasons with different environmental conditions and hence different uptake/loss scenarios. Vinyl chloride (VC) as well as cis-dichloroethylene (cis-DCE), trichloroethylene (TCE), and tetrachloroethylene (PCE) were detected in the trees, documenting that phytoscreening is a viable method to locate chlorinated ethene plumes, including VC, discharging to streams. The results reveal, that phytoscreening for VC is more sensitive to environmental conditions affecting transpiration than for the other chlorinated ethenes detected. Conditions leading to higher groundwater uptake by transpiration than contaminant loss by diffusion from the tree trunks are optimal (e.g., low relative humidity, plentiful hours of sunshine and an intermediate air temperature). Additionally, low precipitation prior to the sampling event is beneficial, as uptake of infiltrating precipitation dilutes the concentration in the trees. All chlorinated ethenes were sensitive to dilution by clean precipitation and in some months, this resulted in no detection of contaminants in the trees at all. Under optimal environmental conditions the tree cores allowed detection of chlorinated solvents and their metabolites in the underlying groundwater. Whereas, for less ideal conditions there was a risk of no detection of the more volatile VC. This study is promising for the future applicability of phytoscreening to locate shallow groundwater contamination with the degradation products of chlorinated solvents.

General information

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Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals
Authors: Ottosen, C. B. (Intern), Rønde, V. K. (Intern), Trapp, S. (Intern), Bjerg, P. L. (Intern), Broholm, M. M. (Intern)
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  - Web of Science (2018): Indexed yes
  - BFI (2017): BFI-level 1
  - Scopus rating (2017): SNIP 0.992 SJR 0.73 CiteScore 1.14
  - Web of Science (2017): Indexed Yes
  - BFI (2016): BFI-level 1
  - Scopus rating (2016): CiteScore 1.35 SJR 0.91 SNIP 1.096
  - BFI (2015): BFI-level 1
  - Scopus rating (2015): SJR 0.39 SNIP 0.487 CiteScore 0.68
  - Web of Science (2015): Indexed yes
  - BFI (2014): BFI-level 1
  - Scopus rating (2014): SJR 0.663 SNIP 0.808 CiteScore 1.03
  - BFI (2013): BFI-level 1
  - Scopus rating (2013): SJR 0.79 SNIP 0.786 CiteScore 1.11
  - ISI indexed (2013): ISI indexed yes
  - Web of Science (2013): Indexed yes
  - BFI (2012): BFI-level 1
  - Scopus rating (2012): SJR 0.882 SNIP 1.183 CiteScore 1.24
  - ISI indexed (2012): ISI indexed yes
  - BFI (2011): BFI-level 1
The textile industry produces large volumes of wastewater that requires appropriate treatment before being released into the environment. Research globally has focused on advanced desalination technologies to augment the limited freshwater resources. Forward osmosis (FO) technology has gained substantial interest as a possible lower-energy desalination technology. However, challenges such as the availability of effective draw solutions (DS) have limited its implementation. This study evaluated alternative feed water resources and assessed the potential of dye solutions as DS. The aim is to dilute a concentrated dye DS to a target concentration for direct dye-batch use, thereby reclaiming water resources. The measured osmotic pressure (OP) of the alternative feed solutions (synthetic brackish water; syntethic seawater; seawater from the Atlantic and Indian Oceans; and wastewater from two textile factories) were 414, 2 761, 2 580, 2 614; 1 716 and 7 822 kPa, respectively. Three basic dyes (Maxilon Turquoise, Red and Blue) and three reactive dyes (Carmine, Olive Green and Black) were selected based on common use in the South African textile industry. The dye samples were prepared without and with salt at different concentrations and different dye-to-salt mass ratios ranging from 1:10 to 1:60. The OP trends for the basic dyes followed Blue >> Red > Turquoise and for the reactive dyes Black >> Olive > Carmine. The overall OP trend was Black > Olive > Carmine > Blue > Red > Turquoise. The OP at different dye concentrations and different dye-to-salt ratios was mostly influenced by the dye chemistry and molecular weight (Mw) rather than the type of
dye, i.e., reactive vs basic. The OP trend for the dye-to-salt ratios was 1:60 > 1:50 > 1:40 > 1:30 > 1:20 > 1:10. For both the basic and reactive dyes a linear relationship exists between OP and dye concentration; as well as between OP and Mw. The dye DS exhibited larger OP compared to that of the FS evaluated, thus rendering them suitable DS.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Cape Peninsula University of Technology, University of Maribor
Authors: Sheldon, M. (Ekstern), Jingxi, E. Z. (Ekstern), De Jager, D. (Ekstern), Augustine, R. (Ekstern), Korenak, J. (Ekstern), Helix-Nielsen, C. (Intern), Petrinic, I. (Ekstern)
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.624 SJR 0.361 CiteScore 1.06
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.09 SJR 0.372 SNIP 0.859
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.38 SNIP 0.781 CiteScore 0.93
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.352 SNIP 0.685 CiteScore 0.78
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.403 SNIP 0.805 CiteScore 0.93
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.417 SNIP 0.798 CiteScore 0.98
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.371 SNIP 0.676 CiteScore 0.95
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.37 SNIP 0.551
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.518 SNIP 0.902
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.429 SNIP 0.748
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.578 SNIP 1.011
Scopus rating (2006): SJR 0.45 SNIP 0.821
Scopus rating (2005): SJR 0.374 SNIP 0.529
Scopus rating (2004): SJR 0.489 SNIP 0.993
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.527 SNIP 0.92
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.476 SNIP 0.983
Predicting the fate of pharmaceuticals during wastewater treatment and crop irrigation with reclaimed wastewater

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Catholic University of Murcia (UCAM)
Authors: González-García, M. (Ekstern), Fernández-López, C. (Ekstern), Polesel, F. (Intern), Trapp, S. (Intern)
Number of pages: 2
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Main Research Area: Technical/natural sciences
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Prediction of the formation of biogenic non-extractable residues during degradation of environmental chemicals from biomass yields

Degradation tests with radio or stable isotope labeled compounds enable the detection of the formation of non-extractable residues (NER). In PBT and vPvB assessment, remobilisable NER are considered as a potential risk while biogenic NER from incorporation of labeled carbon into microbial biomass are treated as degradation products. Relationships between yield, released CO2 (as indicator of microbial activity and mineralization) and microbial growth can be used to estimate the formation of biogenic NER. We provide a new approach for calculation of potential substrate transformation to microbial biomass (theoretical yield) based on Gibbs free energy and microbially available electrons. We compare estimated theoretical yields of biotechnological substrates and of chemicals of environmental concern with experimentally determined yields for validation of the presented approach. A five-compartment dynamic model is applied to simulate experiments of 13C-labeled 2,4-D and ibuprofen turnover. The results show that bioNER increase with time, and that most bioNER originate from microbial proteins. Simulations with pre-calculated input data demonstrate that pre-calculation of yields reduces the number of fit parameters considerably, increases confidence in fitted kinetic data and reduces the uncertainty of the simulation results.

General information
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Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Helmholtz Centre for Environmental Research
Authors: Trapp, S. (Intern), Brock, A. L. (Intern), Nowak, K. M. (Ekstern), Kästner, M. (Ekstern)
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Three distinctive start-up strategies of biogas reactors fed with source-sorted organic fraction of municipal solid waste were investigated to reveal the most reliable procedure for rapid process stabilization. Moreover, the experimental results were compared with mathematical modeling outputs. The initial inoculations to start-up the reactors were 10, 50 and 100% of the final working volume. While a constant feeding rate of 7.8gVS/d was considered for the control reactor, the organic loading rate for fed-batch reactors with 10 and 50% inoculation was progressively increased during a period of 60 and 13 days, respectively. The results clearly demonstrated that an exponentially feeding strategy, considering 50% inoculation relative to final volume, can significantly decrease the alternatively prolonged period to reach steady conditions, as observed by high biogas and methane production rates. The combination of both experimental and modelling/simulation succeeded in optimizing the start-up process for anaerobic digestion of biopulp under mesophilic conditions.
Quantitative characterization of TiO\textsubscript{2} nanoparticle release from textiles by conventional and single particle ICP-MS

TiO\textsubscript{2} is ubiquitously present in a wide range of everyday items, both as an intentionally incorporated additive and naturally occurring constituent. It can be found in a wide range of consumer products, including personal care products, food contact materials, and textiles. Normal use of these products may lead to consumer and/or environmental exposure to TiO\textsubscript{2}, possibly in form of nanoparticles. The aim of this study is to perform a leaching test and apply state-of-the-art methods to investigate nano-TiO\textsubscript{2} and total Ti release from five types of commercially available conventional textiles: table placemats, wet wipes, microfiber cloths, and two types of baby bodysuits, with Ti contents ranging from 2.63 to 1448 \textmu g/g. Released particle analysis was performed using conventional and single particle inductively coupled plasma mass spectrometry (ICP-MS and spICP-MS), in conjunction with transmission electron microscopy (TEM), to measure total and particulate TiO\textsubscript{2} release by mass and particle number, as well as size distribution. Less than 1% of the initial Ti content was released over 24 h of leaching, with the highest releases reaching 3.13 \textmu g/g. The fraction of nano-TiO\textsubscript{2} released varied among fabric types and represented 0–80% of total TiO\textsubscript{2} release. Particle mode sizes were 50–75 nm, and TEM imaging revealed particles in sizes of 80–200 nm. This study highlights the importance of using a multi-method approach to obtain quantitative release data that is able to provide an indication regarding particle number, size distribution, and mass concentration, all of which can help in understanding the fate and exposure of nanoparticles.

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Publication: Research - peer-review › Journal article – Annual report year: 2018
Quantitative human health risk assessment along the lifecycle of nano-scale copper-based wood preservatives
The use of nano-scale copper oxide (CuO) and basic copper carbonate (Cu$_2$(OH)$_2$CO$_3$) in both ionic and micronized wood preservatives has raised concerns about the potential of these substances to cause adverse human health effects. To address these concerns, we performed quantitative (probabilistic) human health risk assessment (HHRA) along the lifecycles of these formulations used in antibacterial and antifungal wood coatings and impregnations by means of the EU FP7 SUN project’s Decision Support System (SUNDS, www.sunds.gd). The results from the risk analysis revealed inhalation risks from CuO in exposure scenarios involving workers handling dry powders and performing sanding operations as well as potential ingestion risks for children exposed to nano Cu$_2$(OH)$_2$CO$_3$ in a scenario involving hand-to-mouth transfer of the substance released from impregnated wood. There are, however, substantial uncertainties in these results, so some of the identified risks may stem from the safety margin of extrapolation to fill data gaps and might be resolved by additional testing. Our stochastic approach successfully communicated the contribution of different sources of uncertainty in the risk assessment. The main source of uncertainty was the extrapolation from short to long-term exposure, which was necessary due to the lack of (sub)chronic in vivo studies with CuO and Cu$_2$(OH)$_2$CO$_3$. Considerable uncertainties also stemmed from the use of default inter- and intra-species extrapolation factors.

General information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Ca’ Foscari University of Venice, National Research Centre for the Working Environment, BASF, TNO-Research, Heriot-Watt University, National Institute for Public Health and the Environment
Number of pages: 20
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Nanotoxicology
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Scopus rating (2017): CiteScore 5.99
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.8
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 7.14
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 5.92
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 6.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 6.49
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 4.77
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Reactor staging influences microbial community composition and diversity of denitrifying MBBRs- Implications on pharmaceutical removal

The subdivision of biofilm reactor in two or more stages (i.e., reactor staging) represents an option for process optimisation of biological treatment. In our previous work, we showed that the gradient of influent organic substrate availability (induced by the staging) can influence the microbial activity (i.e., denitrification and pharmaceutical biotransformation kinetics) of a denitrifying three-stage Moving Bed Biofilm Reactor (MBBR) system. However, it is unclear whether staging and thus the long-term exposure to varying organic carbon type and loading influences the microbial community structure and diversity. In this study, we investigated biofilm structure and diversity in the three-stage MBBR system (S) compared to a single-stage configuration (U) and their relationship with microbial functions. Results from 16S rRNA amplicon libraries revealed a significantly higher microbial richness in the staged MBBR (at 99% sequence similarity) compared to single-stage MBBR. A more even and diverse microbial community was selected in the last stage of S (S3), likely due to exposure to carbon limitation during continuous-flow operation. A core of OTUs was shared in both systems, consisting of Burkholderiales, Xanthomonadales, Flavobacteriales and Sphingobacteriales, while MBBR staging selected for specific taxa (i.e., Candidate division WS6 and Deinococcales). Results from quantitative PCR (qPCR) showed that S3 exhibited the lowest abundance of 16S rRNA but the highest abundance of atypical nosZ, suggesting a selection of microbes with more diverse N-metabolism (i.e., not-complete denitrifiers) in the stage exposed to the lowest carbon availability. A positive correlation (p<0.05) between removal rate constants of several pharmaceuticals with abundance of relevant denitrifying genes was observed, but not with biodiversity. Despite the previously suggested positive relationship between microbial diversity and functionality in macrobial and microbial ecosystems, this was not observed in the current study, suggesting a need to further investigate structure-function relationships for denitrifying systems.
Registration, Evaluation, Authorisation, Categorisation and Tools to Evaluate Nanomaterials – Opportunities and Weaknesses (REACT NOW)

Nanotechnology and nanomaterials (NMs) have become an integrated part of our lives in the past decade, whether we realise it or not, and we have entered a phase where the early hype about the benefits of this mind-blowing technology is over.

Concerns have been raised throughout this period about the adverse impacts of NMs, and although these have previously been very loud, they are now slowly quieting down. This is not because we have resolved the challenges related to assessing and managing the risks of NMs but rather because we seem to have caught a sense of “nanorisk-immunity” where we gradually have become more and more indifferent to hearing about the potential risks of NMs.

Instead of implementing a regulatory framework tailored to NMs, the European Commission has initiated multiple reviews of state-of-the-scientific literature in regard to environmental, health and safety, and seems to be discussing the same risk assessment and regulatory challenges over and over. If history in regard to emerging risks and hazards can be used as a guide, we can now expect 15-20 years of univocal environmental, health and safety research that will not provide definitive
answers but only dropwise glimpse into the true nature of the risks of NMs. This thesis summarises the state of research and regulatory affairs within the field of nanomaterial regulation and risk assessment. Specifically, the focus is on areas of research with which I have been involved since 2009 in regard to: 1) mapping current uses of NMs in Europe, 2) understanding the limitations of existing legislation and, finally, 3) addressing the restraints of risk assessment and alternatives to risk assessment when it comes to NMs.

In order to obtain an overview of consumer products in Europe that are claimed to contain NMs or are claimed to be based on nanotechnology, we established an online inventory, The Nanodatabase (www.nanodb.dk), back in 2012 and started systematically to collect information about the proclaimed nanoproducts name, producers “nanoclaim”, country of origin, used NMs, location of the NM in the product, most likely exposure route among other. The Nanodatabase originally contained a little more than 1,200 products and now has information about more than 3,000 products. Through our research, we found that most of the products fall into the category of “Health and Fitness” and “Home and Garden”. The most used NMs are silver and titanium dioxide, but it is not possible to identify the NMs used for almost 60% of the products in the database.

The safety evaluation tool, NanoRiskCat, was developed and integrated into The Nanodatabase with the purpose of communicating what is known about the hazard and exposure potential of consumer products containing NMs. In its simplest form, the final NanoRiskCat evaluation of a specific nanomaterial in a given application can be communicated in the form of a short title describing the use of the NM and a colour code whereby the first three coloured bullets (***** refer to the potential exposure of professional end-users, consumers and the environment – in that sequence – and the last two coloured bullets refer to the hazard potential for humans and the environment. The colours assigned to the exposure and hazard potential are green (+), yellow (+), red (+) and grey (+), corresponding to high, medium, low and unknown, respectively. A data analysis of the products in The Nanodatabase shows that for most product categories, the dominant route of exposure is dermal, and that the NanoRiskCat exposure potential as well as human and environmental hazard potential of most products is either “high (+) or “unknown (+).”

In order to address the potential risks of NMs and take the unique properties of NMs into account, a number of EU regulations and directives have been amended in recent years such as, for instance, the biocidal product regulation. However, the research presented in this thesis identifies three major weaknesses to the current regulation, namely how to define “nanomaterials”, threshold values and information requirements not tailored to the nanoscale and how to overcome the obstacles of chemical risk assessment applied to NMs.

The outcome of this research has led me to conclude that the fact that NMs are covered by the scope of existing legislation is not enough to ensure the protection of human health and the environment. We therefore need a new regulatory framework tailored for NMs and their applications. A proposal of such a framework termed “Registration, Evaluation, Authorisation, Categorisation and Tools to Evaluate Nanomaterials – Opportunities and Weaknesses (REACT NOW)” is proposed and presented herein.

The thesis consists of nine chapters. An introduction is provided in chapter 1. In chapter 2, what is known about the current uses of NMs is presented in detail, and it is established that there is a general lack of data and access to data on, for example, production volumes and uses of NMs which hampers qualitative and quantitative occupational, consumer and environmental exposure assessment of NMs – and this in turn impedes the completion of any kind of risk assessment. The latter has repetitively led to questions being raised by politicians, NGOs, academics and members of the public about whether current regulatory frameworks are up to the job, as many of them rely heavily on, for instance, the completion of meaningful risk assessments.

Chapter 3 is devoted to an analysis of the revisions that have been made to existing regulatory frameworks, such as REACH, BPR and food legislation, whereas Chapter 4 is allocated to an evaluation of proposed revisions made by a number of EU member states and REACH competent authorities such as German UBA, BfR and BAuA and the Swedish KEMI, as well as the NGOs CIEL, ClientEarth and BUND. It is concluded that the revisions that have been implemented for existing EU legislation and the proposed revisions by UBA, BfR and BAuA, KEMI and CIEL, ClientEarth and BUND collectively provide a lot of opportunities. However, a number of weaknesses have also been identified and these are elaborated on and discussed in Chapter 5, as they continue to dog the effective regulation of NMs and still need to be addressed.

In recognition of the challenges that traditional chemical risk assessments entail, and outstanding scientific research questions that still need to be resolved, no less than 50 alternative decision-support tools, or supplements to traditional risk assessments, have been explored and proposed in recent years. These are analysed in Chapter 6, in order to identify tools that could potentially be used to support a new regulatory framework tailored specifically for NMs and their applications throughout the life cycle. This evaluation is based on a series of recent scientific publications which provide substantial reviews of these alternative tools applied in regard to risk governance, worker protection, consumer exposure, environmental assessment, waste, etc. This led to the realisation that we need a tool that is both regulatory-relevant and can be applied despite the lack of data and lack of access to information.

Safety evaluation plays a key role in REACT NOW and the safety evaluation tool NanoRiskCat developed by Hansen et al. (2014, 2017c) is presented in detail in chapter 7. A strength of NanoRiskCat is that it has been applied to more than 2,000 products claimed to include NMs or to be based on nanotechnology. The outcome of this is presented in this thesis. Finally, in Chapter 8, REACT NOW is introduced and key components of the framework are outlined.

As part of REACT NOW, I recommend that manufacturers and importers of NMs should be required to register their NM(s) prior to commercialisation and independent of production and import volumes. For NM(s) already being sold, manufacturers and importers should be required to register and fulfill the REACT NOW requirements within a certain time period e.g. six months of the adoption of the framework. NMs are defined according to SCENIHR’s definition and not the one recommended by the EC. Primary particle size distribution, shape (including aspect ratio), specific surface area and surface treatment are considered “identifiers” and not the “characterisers” as suggested by UBA, BfR and BAuA (2013). In practice, this means that any variation in size, shape, surface area and surface-treated
NM that is commercialised in the EU has to be identified, named, registered and safety-evaluated separately, before it is placed into a separate registration dossier.

The European Chemicals Agency is identified as the European authority that should be responsible for the management and carrying out the technical and administrative aspects of REACT NOW, however the burden of proof of safety should be placed on industry to ensure that data are generated in good time. In order to ensure the protection of health and the environment, I recommend that the registrant should be required to explain a relevant product’s functional use, provide justification for its use and carry out an effectiveness evaluation prior to the commercialisation of any nanomaterial.

Following the requirements of REACT NOW, all uses of NMs have to be evaluated according to NanoRiskCat. The health and environmental hazard information required as part of the information requirements focuses on enabling the application of NanoRiskCat. In regard to human health it includes High Aspect Ratio Nanoparticles (HARN), bulk CLP classification, acutely toxicity, genotoxicity and mutagenicity, carcinogenicity and respiratory toxicity. For the environment, it includes bulk CLP classification, aquatic toxicity, freshwater tests for degradation, bioaccumulation and a scientific review in regard to dispersive or long-range transport, ecosystem effects and novelty. It is important to note that NanoRiskCat uses a tiered approach and that the registrant only has to submit enough information to enable the categorisation of the health and environmental hazard potential of the specific NM into high (+), medium (•), low (+) or unknown (•).

Depending on the outcome of the NanoRiskCat evaluation, manufacturers and importers of NMs and producers of NM products might have to seek authorisation, which can only be given for specific uses of NMs and nanoproducts that are deemed necessary, efficient and have a functional use.

For NMs that have undergone a NanoRiskCat evaluation and have 1) a red professional end-user and/or a consumer exposure profile combined with a red human health hazard profile and/or 2) a red environmental exposure profile combined with a red environmental hazard profile, the registrant is required to complete an “Alternatives Assessment” and the agency responsible for REACT NOW is required to seek opinion on safe use from the European scientific committee of relevance. In such cases, authorisation should be granted, but only if the specific use under consideration is deemed safe and necessary.

Uses of NMs deemed not to be safe by the scientific committees e.g. dispersive uses of HARN, indoor consumer uses of spray products with NMs associated with respiratory toxicity, should not be granted authorisation and should not be given permission to be marketed in Europe. For all other combinations of exposure and hazard profiles, i.e. NanoRiskCat categories 2-4, the agency responsible for REACT NOW can ask for an opinion from the scientific committees of relevance on a case-by-case basis.

As a general rule, authorisation should only be given for specific professional end-user and consumer applications of NMs and nanoproducts, if they have a green human health hazard profile combined with a green professional end-user exposure profile and a consumer exposure profile, respectively. The same goes for uses that are expected to lead to environmental exposure that should only be granted authorisation if the NM in question has a green environmental hazard profile.

Should the agency or the scientific committees have questions about the safety of a given NM and its specific use, the agency can make a request for additional information, to be generated within 3 years, within which time conditional authorisation can be granted.

For combinations of yellow exposure and hazard profiles, conditional authorisation is possible for a time-limited period during which time the agency should request the generation of additional information by the registrant. In order to assist industry and especially Small and Medium-sized Enterprises in the process of implementing REACT NOW, technical and non-technical assistance is needed and should be provided by the European Commission Joint Research Centre and the European Chemicals Agency.

REACT NOW is the first attempt to present a comprehensive and transparent decision-making framework tailored to regulate the use of NMs, but as no framework is without either potential or limitations, the opportunities and weaknesses related to the implementation of REACT NOW are pinpointed. Strengths include that NanoRiskCat can be used despite lack of data and information, whereas the lack of clear-cut definitions of “necessity” and “effectiveness” could be considered a weakness along with the arguably crude exposure assessment in NanoRiskCat.

In the appendix, the 28 peer reviewed journal papers on which this thesis is based are detailed in the journal papers and that this thesis is written to present REACT NOW and to give the reader an overview of the original achievements of the work.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals
Authors: Hansen, S. F. (Intern)
Number of pages: 146
Publication date: 2018

Publication information
Place of publication: Kgs. Lyngby, Denmark
Publisher: Technical University of Denmark (DTU)
ISBN (Print): 978-87-93478-83-1
ISBN (Electronic): 978-87-93478-84-8
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
Regulating combined sewage discharges to support EU Water Framework Directive ambitions in natural water bodies

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Environmental Fate & Effect of Chemicals, Aarhus University
Authors: Vezzaro, L. (Intern), Brudler, S. (Intern), McKnight, U. S. (Intern), Rasmussen, J. J. (Ekstern), Ambjerg-Nielsen, K. (Intern)
Number of pages: 86
Publication date: 2018

Publication information
Place of publication: Kgs. Lyngby
Publisher: Department of Environmental Engineering, Technical University of Denmark (DTU)
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Source-ID: 142937642
Publication: Commissioned › Report – Annual report year: 2018

Remediation of incomplete nitrification and capacity increase of biofilters at different drinking water treatment plants through copper dosing

Drinking water treatment plants based on groundwater may suffer from incomplete ammonium removal, which deteriorates drinking water quality and constrains water utilities in the operation of their plants. Ammonium is normally removed through nitrification in biological granular media filters, and recent studies have demonstrated that dosing of copper can stimulate the removal of ammonium. Here, we investigated if copper dosing could generically improve ammonium removal of biofilters, at treatment plants with different characteristics. Copper was dosed at ≤1.5μg Cu/L to biofilters at 10 groundwater treatment plants, all of which had displayed several years of incomplete nitrification. Plants exceeded the Danish national water quality standard of 0.05mg NH4+/L by a factor of 2–12. Within only 2-3 weeks of dosing, ammonium removal rates increased significantly (up to 150%). Nitrification was fully established, with ammonium effluent concentrations of <0.01mg NH4+-N/L at most plants, regardless of the differences in raw water chemistry, ammonium loading rates, filter design and operation, or treatment plant configuration. However, for filters without primary filtration, it took longer time to reach complete ammonium removal than for filters receiving prefiltered water, likely due to sorption of copper to iron oxides, at plants without prefiltration. With complete ammonium removal, we subjected two plants to short-term loading rate upshifts, to examine the filters’ ability to cope with loading rate variations. After 2 months of dosing and an average loading rate of 1.0g NH4+-N/m3 filter material/h, the loading rate was upshifted by 50%. Yet, a filter managed to completely remove all the influent ammonium, showing that with copper dosing the filter had extra capacity to remove ammonium even beyond its normal loading rates. Depth sampling revealed that the ammonium removal rate of the filter's upper 10cm increased more than 7-fold from 0.67 to 4.90g NH4+-N/m3/h, and that nitrite produced from increased ammonium oxidation was completely oxidized further to nitrate. Hence, no problems with nitrite accumulation or breakthrough occurred. Overall, copper dosing generically enhanced nitrification efficiency and allowed a range of quite different plants to meet water quality standards, even at increased loading rates. The capacity increase is highly relevant in practice, as it makes filters more robust towards sudden ammonium loading rate variations.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Krüger A/S
Authors: Wagner, F. B. (Intern), Borch Nielsen, P. (Ekstern), Boe-Hansen, R. (Ekstern), Albrechtsen, H. (Intern)
Pages: 42-51
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Water Research
Volume: 132
ISSN (Print): 0043-1354
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Research in organic waste as resources: How to implement circular bio-economy in the urban context?

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Water Technologies
Authors: Valverde Pérez, B. (Intern), Boldrin, A. (Intern), Smets, B. F. (Intern), Astrup, T. F. (Intern), Angelidaki, I. (Intern)
Number of pages: 37
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Original language: English
Place of publication: Kgs. Lyngby, Denmark
Publisher: Technical University of Denmark (DTU)
Main Research Area: Technical/natural sciences
Electronic versions: Natur_Miljo.pdf
Source: PublicationPreSubmission
Source-ID: 149423814
Publication: Research › Sound/Visual production (digital) – Annual report year: 2018

Salinity-gradient energy driven microbial electrosynthesis of value-added chemicals from CO₂ reduction
Biological conversion of CO₂ to value-added chemicals and biofuels has emerged as an attractive strategy to address the energy and environmental concerns caused by the over-reliance on fossil fuels. In this study, an innovative microbial reverse-electrodialysis electrolysis cell (MREC), which combines the strengths of reverse electrodialysis (RED) and microbial electrosynthesis technology platforms, was developed to achieve efficient CO₂-to-value chemicals bioconversion by using the salinity gradient energy as driven energy sources. In the MREC, maximum acetate and ethanol concentrations of 477.5±33.2 and 46.2±8.2mgL⁻¹ were obtained at the cathode, catalyzed by Sporomusa ovata with production rates of 165.79±11.52 and 25.11±4.46mmolm⁻² d⁻¹, respectively. Electron balance analysis indicates that 94.4±3.9% of the electrons derived from wastewater and salinity gradient were recovered in acetate and ethanol. This work for the first time proved the potential of innovative MREC configuration has the potential as an efficient technology platform for simultaneous CO₂ capture and electrosynthesis of valuable chemicals.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Li, X. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
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Publication date: 2018
Main Research Area: Technical/natural sciences

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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.663 SNIP 2.563
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
Satellite altimetry-derived water level for calibration of river morphological parameters in hydrodynamic models

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, DHI Denmark
Authors: Jiang, L. (Intern), Madsen, H. (Ekstern), Bauer-Gottwein, P. (Intern)
Number of pages: 1
Publication date: 2018
Conference: EGU General Assembly: 2018, Vienna, Austria, 08/04/2018 - 08/04/2018

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Source-ID: 2435391425
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Microbial electrosynthesis, CO2 reduction, Microbial reverse-electrodialysis electrolysis cell (MREC), Salinity gradient, Wastewater, Acetate
Simulating flood risk under non-stationary climate and urban development conditions - Experimental setup for multiple hazards and a variety of scenarios

A framework for assessing economic flood damage for a large number of climate and urban development scenarios with limited computational effort is presented. Response surfaces are applied to characterize flood damage based on physical variables describing climate-driven hazards and changing vulnerability resulting from urban growth. The framework is embedded in an experimental setup where flood damage obtained from combined hydraulic-urban development simulations is approximated using kriging-metamodels. Space-filling, sequential and stratified sequential sampling strategies are tested. Reliable approximations of economic damage are obtained in a theoretical case study involving pluvial and coastal hazards, and the stratified sequential sampling strategy is most robust to irregular surface shapes. The setup is currently limited to considering only planned urban development patterns and flood adaptation options implemented over short time horizons. However, the number of simulations is reduced by up to one order of magnitude compared to scenario-based methods, highlighting the potential of the approach.
Simulating surface interactions of the carbon cycle and its impact on atmospheric CO2 concentrations with a high spatiotemporal resolution model framework

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, University of Edinburgh, Aarhus University
Authors: Lansø, A. S. (Forskerdatabase), Smallman, T. L. (Ekstern), Heile Chrsitensen, J. (Ekstern), Williams, M. (Ekstern), Pilegaard, K. (Intern), Sørensen, L. L. (Forskerdatabase), Geels, C. (Forskerdatabase)
Number of pages: 1
Publication date: 2018
Conference: EGU General Assembly: 2018, Vienna, Austria, 08/04/2018 - 08/04/2018
Main Research Area: Technical/natural sciences

Publication information
Simulation of dual carbon–bromine stable isotope fractionation during 1,2-dibromoethane degradation

We performed a model-based investigation to simultaneously predict the evolution of concentration, as well as stable carbon and bromine isotope fractionation during 1,2-dibromoethane (EDB, ethylene dibromide) transformation in a closed system. The modelling approach considers bond-cleavage mechanisms during different reactions and allows evaluating dual carbon–bromine isotopic signals for chemical and biotic reactions, including aerobic and anaerobic biological transformation, dibromoelimination by Zn(0) and alkaline hydrolysis. The proposed model allowed us to accurately simulate the evolution of concentrations and isotope data observed in a previous laboratory study and to successfully identify different reaction pathways. Furthermore, we illustrated the model capabilities in degradation scenarios involving complex reaction systems. Specifically, we examined (i) the case of sequential multistep transformation of EDB and the isotopic evolution of the parent compound, the intermediate and the reaction product and (ii) the case of parallel competing abiotic pathways of EDB transformation in alkaline solution.
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ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.397 SNIP 0.569 CiteScore 0.85
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.434 SNIP 0.553
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.427 SNIP 0.68
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.439 SNIP 0.695
Scopus rating (2007): SJR 0.307 SNIP 0.47
Scopus rating (2006): SJR 0.377 SNIP 0.767
Scopus rating (2005): SJR 0.222 SNIP 0.607
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.335 SNIP 0.547
Scopus rating (2003): SJR 0.183 SNIP 0.308
Scopus rating (2002): SJR 0.198 SNIP 0.479
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.204 SNIP 0.294
Scopus rating (2000): SJR 0.654 SNIP 0.26
Scopus rating (1999): SJR 0.534 SNIP 0.448
Original language: English
DOIs:
10.1080/10256016.2018.1468759
Publication: Research - peer-review › Journal article – Annual report year: 2018

Simulation of the fate of co-labeled $^{13}$C$_3$-$^{15}$N-glyphosate in a water-sediment system and formation of biogenic non-extractable residues

General information
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Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Technical University of Munich, RWTH Aachen University, Helmholtz Centre for Environmental Research
Authors: Brock, A. L. (Intern), Rein, A. (Ekstern), Polesel, F. (Intern), Nowak, K. M. (Ekstern), Kästner, M. (Ekstern), Trapp, S. (Intern)
Number of pages: 1
Publication date: 2018
Event: Abstract from SETAC Europe 28th Annual Meeting, Rome, Italy.
Main Research Area: Technical/natural sciences
Electronic versions:
SETAC_2018_5.pdf
Source: PublicationPreSubmission
Source-ID: 148017773
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Simultaneous biogas upgrading and biochemicals production using anaerobic bacterial mixed cultures

A novel biological process to upgrade biogas was developed and optimised during the current study. In this process, CO2 in the biogas and externally provided H2 were fermented under mesophilic conditions to volatile fatty acids (VFAs), which are building blocks of higher-value biofuels. Meanwhile, the biogas was upgraded to biomethane (CH4 >95%), which can be used as a vehicle fuel or injected into the natural gas grid. To establish an efficient fermentative microbial platform, a thermal (at two different temperatures of 70°C and 90°C) and a chemical pretreatment method using 2-bromoethanesulfonate were investigated initially to inhibit methanogenesis and enrich the acetogenic bacterial inoculum. Subsequently, the effect of different H2:CO2 ratios on the efficiency of biogas upgrading and production of VFAs were further explored. The composition of the microbial community under different treatment methods and gas ratios has also been unravelled using 16S rRNA analysis. The chemical treatment of the inoculum had successfully blocked the activity of methanogens and enhanced the VFAs production, especially acetate. The chemical treatment led to a significantly better acetate production (291mg HAc/L) compared to the thermal treatment. Based upon 16S rRNA gene sequencing, it was
found that H2-utilizing methanogens were the dominant species in the thermally treated inoculum, while a significantly lower abundance of methanogens was observed in the chemically treated inoculum. The highest biogas content (96% (v/v)) and acetate production were achieved for 2H2:1CO2 ratio (v/v), with Acetoanaerobium noterae, as the dominant homoacetogenic hydrogen scavenger. Results from the present study can pave the way towards more development with respect to microorganisms and conditions for high efficient VFAs production and biogas upgrading.

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BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.663 SNIP 2.563
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.592 SNIP 2.192
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.319 SNIP 2.224
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.073 SNIP 2.178
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.94 SNIP 2.184
Sorption of fluorescent polystyrene microplastic particles to edible seaweed Fucus vesiculosus

Increased global demands for food have raised interest for seaweed as a healthy and sustainable food source. At the same time, the large amounts of microplastic in the oceans have raised concern in relation to pollution of seafood including sea vegetables. The aim of this study was to examine sorption of fluorescent polystyrene (PS) microplastic particles to edible macroalga (seaweed) Fucus vesiculosus, and to investigate to what extent adsorbed PS particles could be washed off, using an industrial relevant method. PS microplastic particles (diameter of 20 μm) were used in a concentration of 2.65 mg L⁻¹ (corresponding to 597 particles per mL) in filtrated seawater (50 mL) to treat F. vesiculosus distal tips in blue cap flasks (100 mL) placed in a rotary box for 2 h. Results showed sorption of PS microplastic particles to F. vesiculosus analysed by microscopy and a significant reduction of 94.5% by washing. These results were based on high microplastic concentrations, not comparable to natural conditions/concentrations. Nonetheless, this study provides methodological and mechanistic insights into procedures for investigating the sorption of microplastics to seaweed, for which there is currently no established standardised method.
Subsurface imaging of water electrical conductivity, hydraulic permeability and lithology at contaminated sites by induced polarization

At contaminated sites, knowledge about geology and hydraulic properties of the subsurface and extent of the contamination is needed for assessing the risk and for designing potential site remediation. In this study, we have developed a new approach for characterizing contaminated sites through time-domain spectral induced polarization. The new approach is based on: (1) spectral inversion of the induced polarization data through a reparametrization of the Cole–Cole model, which disentangles the electrolytic bulk conductivity from the surface conductivity for delineating the contamination plume; (2) estimation of hydraulic permeability directly from the inverted parameters using a laboratory-derived empirical equation without any calibration; (3) the use of the geophysical imaging results for supporting the geological modelling and planning of drilling campaigns. The new approach was tested on a data set from the Grindsted stream (Denmark), where contaminated groundwater from a factory site discharges to the stream. Two overlapping areas were covered with seven parallel 2-D profiles each, one large area of 410 m × 90 m (5 m electrode spacing) and one detailed area of 126 m × 42 m (2 m electrode spacing). The geophysical results were complemented and validated by an extensive set of hydrologic and geologic information, including 94 estimates of hydraulic permeability obtained from slug tests and grain size analyses, 89 measurements of water electrical conductivity in groundwater, and four geological logs. On average the IP-derived and measured permeability values agreed within one order of magnitude, except for those close to boundaries between lithological layers (e.g. between sand and clay), where mismatches occurred due to the lack of vertical resolution in the geophysical imaging. An average formation factor was estimated from the correlation between the imaged bulk conductivity values and the water conductivity values measured in groundwater, in order to convert the imaging results from bulk conductivity to water conductivity. The geophysical models were actively used for supporting the geological modelling and the imaging of hydraulic permeability and water conductivity allowed for a better discrimination of the clay/lignite lithology from the pore water conductivity. Furthermore, high water electrical conductivity values were found in a deep confined aquifer, which is separated by a low-permeability clay layer from a shallow aquifer. No contamination was expected in this part of the confined aquifer, and confirmation wells were drilled in the zone of increased water electrical conductivity derived from the geophysical results. Water samples from the new wells showed elevated concentrations of inorganic compounds responsible for the increased water electrical conductivity in the confined aquifer and high concentrations of xenobiotic organic contaminants such as chlorinated ethenes, sulfonamides and barbiturates.
Surface complexation modeling of arsenic mobilization from goethite: Interpretation of in-situ experiments in a sedimentary basin of Inner Mongolia, China

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, China University of Geosciences, Beijing
Authors: Stolze, L. (Intern), Zhang, D. (Ekstern), Guo, H. (Ekstern), Rolle, M. (Intern)
Number of pages: 2
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Event: Abstract from InterPore 10th Annual Meeting and Jubilee, New Orleans, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
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Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Sustainable bioenergy and biofuels innovation challenge

General information
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Organisations: Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering, PILOT PLANT, CHEC Research Centre, The Hempel Foundation Coatings Science and Technology Centre (CoaST), Department of Environmental Engineering, Residual Resource Engineering
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Chapter: 8
Main Research Area: Technical/natural sciences
Electronic versions:
Publication: Research - peer-review › Report chapter – Annual report year: 2018
Taxonomy of anaerobic digestion microbiome reveals biases associated with the applied high throughput sequencing strategies

In the past few years, many studies investigated the anaerobic digestion microbiome by means of 16S rRNA amplicon sequencing. Results obtained from these studies were compared to each other without taking into consideration the followed procedure for amplicons preparation and data analysis. This negligence was mainly due to the lack of knowledge regarding the biases influencing specific steps of the microbiome investigation process. In the present study, the main technical aspects of the 16S rRNA analysis were checked giving special attention to the approach used for high throughput sequencing. More specifically, the microbial compositions of three laboratory scale biogas reactors were analyzed before and after addition of sodium oleate by sequencing the microbiome with three different approaches: 16S rRNA amplicon sequencing, shotgun DNA and shotgun RNA. This comparative analysis revealed that, in amplicon sequencing, abundance of some taxa (Euryarchaeota and Spirochaetes) was biased by the inefficiency of universal primers to hybridize all the templates. Reliability of the results obtained was also influenced by the number of hypervariable regions under investigation. Finally, amplicon sequencing and shotgun DNA underestimated the Methanoculleus genus, probably due to the low 16S rRNA gene copy number encoded in this taxon.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padova
Authors: Campanaro, S. (Ekstern), Treu, L. (Intern), Kougias, P. (Intern), Zhu, X. (Intern), Angelidaki, I. (Intern)
Number of pages: 12
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Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SJR 1.533 SNIP 1.245 CiteScore 4.36
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.692 SNIP 1.354
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.034 SNIP 1.597 CiteScore 5.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.163 SNIP 1.554 CiteScore 4.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.998 SNIP 1.57 CiteScore 4.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.531 SNIP 0.962 CiteScore 2.44
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
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DOIs:
10.1038/s41598-018-20414-0
Source: FindIt
Source-ID: 2395840493
Publication: Research - peer-review › Journal article – Annual report year: 2018
Testing lagoonal sediments with early life stages of the copepod Acartia tonsa (Dana): An approach to assess sediment toxicity in the Venice Lagoon

The early-life stages of development of the calanoid copepod Acartia tonsa from egg to copepodite I is proposed as an endpoint for assessing sediment toxicity by exposing newly released eggs directly onto the sediment-water interface. A preliminary study of 5 sediment samples collected in the lagoon of Venice highlighted that the larval development rate (LDR) and the early-life stages (ELS) mortality endpoints with A. tonsa are more sensitive than the standard amphipod mortality test; moreover LDR resulted in a more reliable endpoint than ELS mortality, due to the interference of the sediment with the recovery of unhatched eggs and dead larvae. The LDR data collected in a definitive study of 48 sediment samples from the Venice Lagoon has been analysed together with the preliminary data to evaluate the statistical performances of the bioassay (among replicate variance and minimum significant difference between samples and control) and to investigate the possible correlation with sediment chemistry and physical properties. The results showed that statistical performances of the LDR test with A. tonsa correspond with the outcomes of other tests applied to the sediment-water interface (Strongylocentrotus purpuratus embryotoxicity test), sediments (Neanthes arenaceodentata survival and growth test) and porewater (S. purpuratus); the LDR endpoint did, however, show a slightly higher variance as compared with other tests used in the Lagoon of Venice, such as 10-d amphipod lethality test and larval development with sea urchin and bivalves embryos. Sediment toxicity data highlighted the high sensitivity and the clear ability of the larval development to discriminate among sediments characterized by different levels of contamination. The data of the definitive study evidenced that inhibition of the larval development was not affected by grain-size and the organic carbon content of the sediment; in contrast, a strong correlation between inhibition of the larval development and the sediment concentrations of some metals (Cu, Hg, Pb, Zn), acid-volatile sulphides (AVS), polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs) was found. No correlation was found with DDTs, hexachlorobenzene and organotin compounds.

General information
State: Published
Organisations: Department of Environmental Engineering, Ca' Foscari University of Venice
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Number of pages: 11
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.449 SJR 1.201 CiteScore 4.24
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.99 SJR 1.225 SNIP 1.486
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.197 SNIP 1.402 CiteScore 3.46
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.11 SNIP 1.404 CiteScore 2.96
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.13 SNIP 1.316 CiteScore 2.8
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.044 SNIP 1.373 CiteScore 2.6
ISI indexed (2012): ISI indexed yes
The difficulties in establishing an occupational exposure limit for carbon nanotubes

Concern over the health effects from the inhalation of carbon nanotubes (CNTs) has been building for some time, and adverse health effects found in animal studies include acute and chronic respiratory damage, cardiac inflammation, and cancer including mesothelioma, heretofore only associated with asbestos exposure. The strong animal evidence of toxicity requires that the occupational hygiene community develops strategies for reducing or eliminating worker exposures to CNTs; part of this strategy involves the setting of occupational exposure limits (OELs) for CNTs. A number of government agencies and private entities have established OELs for CNTs; some are mass-based, while others rely on number concentration. We review these various proposed standards and discuss the pros and cons of each approach. We recommend that specific action be taken, including intensified outreach to employers and employees concerning the potential adverse health effects from CNT inhalation, the development of more nuanced OELs that reflect the complex nature of CNT exposure, a broader discussion of these issues among all interested parties, and further research into important unanswered questions including optimum methods to evaluate CNT exposures. We conclude that current animal toxicity evidence suggests that strong action needs to be taken to minimize exposures to CNTs, and that any CNT OEL should be consistent with the need to minimize exposures.

General information

State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, University of Massachusetts, Colorado State University, Institute for Work and Health, Iowa State University, National Institute of Environmental Health Sciences, Universidad de Los Andes Colombia
Authors: Ellenbecker, M. (Ekstern), Tsai, .. (Ekstern), Jacobs, M. (Ekstern), Riediker, M. (Ekstern), Peters, T. (Ekstern), Liou, S. (Ekstern), Avila, A. (Ekstern), Foss Hansen, S. (Intern)
Number of pages: 12
Publication date: 2018
Main Research Area: Technical/natural sciences
The pH dependency of N-converting enzymatic processes, pathways and microbes: effect on net N\(\text{2O}\) production

Nitrous oxide (N\(\text{2O}\)) is emitted during microbiological nitrogen (N) conversion processes, when N\(\text{2O}\) production exceeds N\(\text{2O}\) consumption. The magnitude of N\(\text{2O}\) production vs. consumption varies with pH and controlling net N\(\text{2O}\) production might be feasible by choice of system pH. This article reviews how pH affects enzymes, pathways and microorganisms that are involved in N-conversions in water engineering applications. At a molecular level, pH affects activity of cofactors and structural elements of relevant enzymes by protonation or deprotonation of amino acid residues or solvent ligands, thus causing steric changes in catalytic sites or proton/electron transfer routes that alter the enzymes’ overall activity. Augmenting molecular information with, e.g., nitritation or denitrification rates yields explanations of changes in net N\(\text{2O}\) production with pH. Ammonia oxidizing bacteria are of highest relevance for N\(\text{2O}\) production, while heterotrophic denitrifiers are relevant for N\(\text{2O}\) consumption at pH > 7.5. Net N\(\text{2O}\) production in N-cycling water engineering systems is predicted to display a ‘bell-shaped’ curve in the range of pH 6.0-9.0 with a maximum at pH 7.0-7.5. Net N\(\text{2O}\) production at acidic pH is dominated by N\(\text{2O}\) production, whereas N\(\text{2O}\) consumption can outweigh production at alkaline pH. Thus, pH 8.0 may be a favourable pH set-point for water treatment applications regarding net N\(\text{2O}\) production.
The response of fluorescent organic matter to ozone treatment in pilot freshwater RAS

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, National Institute of Aquatic Resources, Section for Aquaculture, Section for Oceans and Arctic
Authors: Spiliotopoulou, A. (Intern), Andersen, H. R. (Intern), Pedersen, L. (Intern), Stedmon, C. (Intern), Hambly, A. (Intern)
Number of pages: 1
Publication date: 2018
Main Research Area: Technical/natural sciences
Electronic versions: THE_RESPONSE_OF_FLUORESCENT_ORGANIC_MATTER_TO_OZONE_TREATMENT_IN_FRESHWATER_PILOT_R
ECIRCULATING_AQYUACULTURE_SYSTEMS.pdf
Source: PublicationPreSubmission
Source-ID: 2396058288
Publication: Research - peer-review › Review – Annual report year: 2018

TiO2–AgCl Based Nanoparticles for Photocatalytic Production of Phenolic Compounds from Lignocellulosic Residues

Lignocellulosic biomass residues can be used as an interesting resource for the production of biochemicals or sustainable fuels. In this optic, lignin represents an interesting raw material for the production of chemicals, such as aromatic compounds, or fuels. This can contribute in moving away from petroleum-based industries to bio-based industries. The aim of this study was to investigate the application of a photocatalytic process using a commercial solution composed by TiO2 doped with AgCl for wheat straw valorization. The study investigated the effect of pH and catalyst concentrations for optimal phenolic compounds production. It was found that the photocatalytic treatment boosted the phenolic production from wheat straw. The efficiency of the process depended on the initial pH and catalyst concentration. Process optimization towards increased phenolic compounds production was performed. Catalyst concentration of 1 g/L and a
treatment time of 1.56 hours in alkaline conditions resulted in the highest phenolics production. Use of the photocatalytic treated wheat straw for anaerobic digestion (AD) was also evaluated. Results showed that the AD microbiome is strongly inhibited by the presence of toxic compounds presented in the catalyst-straw solution and specifically, HNO3 was toxic to methanogenic communities. Hence, to succeed in an efficient biorefinery framework where total phenols and biogas production are combined, the usage of HNO3 for catalyst synthesis should be avoided.

**General information**
State: Accepted/In press
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padua, University of Tehran
Authors: Tsapekos, P. (Intern), Alvarado-Morales, M. (Intern), Boscaro, D. (Ekstern), Mazarji, M. (Ekstern), Sartori, L. (Ekstern), Angelidakis, I. (Intern)
Number of pages: 10
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.55
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.49
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.34
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 3.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 3.52
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 3.05
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Web of Science (2006): Indexed yes
Web of Science (2005): Indexed yes
Web of Science (2004): Indexed yes
Web of Science (2003): Indexed yes
Tissue Translocation of Polystyrene Micro- and Nanoparticles in Daphnia magna?

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Goethe University Frankfurt, Norwegian University of Science and Technology
Authors: Schuer, C. (Ekstern), Rist, S. (Intern), Hartmann, N. B. (Intern), Wagner, M. (Ekstern)
Number of pages: 1
Publication date: 2018
Event: Abstract from SETAC Europe 28th Annual Meeting, Rome, Italy.
Main Research Area: Technical/natural sciences
Electronic versions:
SETAC_2018_Schuer.pdf

Towards Biomimetic Phosphate Recovery: Molecular Dynamics Simulations of Phosphate Binding Proteins

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, University of Copenhagen
Authors: Truelsen, S. F. (Intern), Wang, Y. (Ekstern), Lindorff-Larsen, K. (Ekstern), Hélix-Nielsen, C. (Intern)
Pages: 57a
Publication date: 2018
Main Research Area: Technical/natural sciences

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Journal: Biophysical Journal
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ISSN (Print): 0006-3495
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.979 SJR 1.949 CiteScore 3.15
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.06 SJR 1.988 SNIP 1.005
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.13 SNIP 1.134 CiteScore 3.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.21 SNIP 1.15 CiteScore 3.33
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.245 SNIP 1.156 CiteScore 3.64
ISI indexed (2013): ISI indexed yes
Toxicity of 2,3,5,6-tetrachlorophenol to willow trees (Salix viminalis)
Chlorinated phenols have been intensively investigated from an eco-toxicological point of view, however almost nothing is known about toxicity of tetrachlorophenol (TeCP) to higher terrestrial plants. This paper applied the willow tree acute toxicity test to study the toxicity of 2,3,5,6-TeCP to willows Salix viminalis (S. viminalis) at neutral and acidic conditions (roughly pH 7 and 4) with inhibition of transpiration as toxic endpoint. At neutral pH the EC50 was >10Â mg Lâ”¹ while the EC50 at acidic conditions was 0.32 Â± 0.17Â mg Lâ”¹, clearly indicating that toxicity is exerted by the non-ionic chemical fraction. Standard tests running at neutral pH are therefore not capturing the full toxicity of weak acids and bases.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals
Authors: Clausen, L. P. W. (Intern), Jensen, C. K. (Intern), Trapp, S. (Intern)
Pages: 941-948
Publication date: 2018
Main Research Area: Technical/natural sciences
Trends in LST over the peninsular Spain as derived from the AVHRR imagery data

This study analyzes the spatio-temporal variability and trends of land surface temperature (LST) over peninsular Spain, considering all the available historical satellite imagery data from the NOAA-AVHRR product from July 1981 to June 2015 and explores whether changes in LST are related to the observed changes in air temperature, solar radiation and land cover. We found that LST showed a significant increase between 1982 and 2014, with an average increase on the order of
0.71 °C decade−1, being stronger during summertime (1.53 °C decade−1). The results also indicate a strong spatial coherence between LST and NDVI changes. The areas that experienced an increase in the LST were spatially consistent with those areas with no changes or even a dominant decrease in vegetation coverage. In addition, the strong increase of LST is coherent with observations of the recent radiative forcing affecting Spain, particularly during summertime. The confidence of the obtained LST trends during summer is also reinforced by the spatial differences recorded in trends, in addition to the differences found between land cover types. Specifically, the magnitude of this increase was much higher in the dryland non-permanent agricultural areas, which are usually harvested during summer, when soil is dominantly nude. In contrast, in well-developed forests, the magnitude of LST was much lower. Our results on the observed LST trends and their spatial patterns can contribute to better understanding of the recent eco-hydrological processes in peninsular Spain.
Two-year microbial adaptation during hydrogen-mediated biogas upgrading process in a serial reactor configuration

Microbial dynamics in an upgrading biogas reactor system undergoing a more than two years-period at stable operating conditions were explored. The carbon dioxide generated during biomass degradation in the first reactor of the system was converted to methane into the secondary reactor by addition of external hydrogen. Considering the overall efficiency, the long-term operation period resulted in an improved biogas upgrading performance (99% methane content). However, a remarkable accumulation of acetate was revealed, indicating the enhancement of homoacetogenic activity. For this reason, a shift in the anaerobic digestion microbiome was expected and evaluated by 16S rRNA amplicon analysis. Results demonstrated that the most abundant archaeal species identified in the first time point, Candidatus Methanoculleus thermohydrogenotrophicum, was replaced by Methanothermobacter thermautotrophicus, becoming dominant after the community adaptation. The most interesting taxonomic units were clustered by relative abundance and six main long-term adaptation trends were found, characterizing functionally related microbes (e.g. homoacetogens).

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Navarra, Technical University of Denmark
Authors: Treu, L. (Intern), Kougias, P. (Intern), de Diego-Díaz, B. (Ekstern), Campanaro, S. (Ekstern), Bassani, I. (Intern), Fernández-Rodríguez, J. (Ekstern), Angelidaki, I. (Intern)
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Main Research Area: Technical/natural sciences

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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.029 SNIP 1.799 CiteScore 6.28
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.308 SNIP 2.507 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Ultrafine particles in inhabited areas in the Arctic - From very low to high concentrations

The Arctic is considered a pristine environment, where pollution mainly originates from global sources. The present study examines particle number concentrations (PNCs) and the main sources of airborne ultrafine particles (UFPs, d < 100 nm) in the town Sisimiut and two nearby settlements, Sarfannguit and Itilleq, in West Greenland. Measurements were carried out during three weeks in April and May 2016. Air temperatures during the measurements ranged from −4.4 to +8.7 °C. A portable condensation particle counter (P-Trak) was used for the measurements. Results showed that the lowest concentrations were found during days with high wind speeds, with the lowest PNC average of 72 ± 11 cm⁻³ (n = 9) (12 m/s). Background concentrations were usually low compared to more densely populated countries, with a couple of exceptions, where there was no clear cause for elevated PNCs in a background area East of Sisimiut. Measured PNCs in the flue gas in the waste incineration plant in Sisimiut showed up to 334,976 cm⁻³ and are expected to be higher in the gas after it is released through the chimney. Average PNCs up to 77,009 ± 43,880 cm⁻³ (n = 26) were measured by a road located by the harbor in Sisimiut, while subsequent measurements at the same location showed much lower PNCs. The presence of heavy machinery elevated PNCs highly during two measurement events, giving PNCs up to 270,993 cm⁻³ but dropping to 1180 cm⁻³ 10 min later, after the vehicle had passed by. A measurement event in Sisimiut Airport while an aircraft landed and departed showed an average PNC of 44,741 ± 85,094 cm⁻³ (n = 21). Two 24-h measurements resulted in average PNCs of 2960 ± 5704 cm⁻³ and 3935 ± 10,016 cm⁻³ respectively.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Atmospheric Environment, Technical University of Denmark, The Danish Ecological Council
Authors: Pétursdóttir, U. (Ekstern), Kirkelund, G. M. (Intern), Press-Kristensen, K. (Ekstern), Hertel, O. (Ekstern), Mikkelsen, T. N. (Intern)
Publication date: 2018
Main Research Area: Technical/natural sciences
Unmanned aerial vehicle observations of water surface elevation and bathymetry in the cenotes and lagoons of the Yucatan Peninsula, Mexico

Observations of water surface elevation (WSE) and bathymetry of the lagoons and cenotes of the Yucatán Peninsula (YP) in southeast Mexico are of hydrogeological interest. Observations of WSE (orthometric water height above mean sea level, amsl) are required to inform hydrological models, to estimate hydraulic gradients and groundwater flow directions. Measurements of bathymetry and water depth (elevation of the water surface above the bed of the water body) improve current knowledge on how lagoons and cenotes connect through the complicated submerged cave systems and the diffuse flow in the rock matrix. A novel approach is described that uses unmanned aerial vehicles (UAVs) to monitor WSE and bathymetry of the inland water bodies on the YP. UAV-borne WSE observations were retrieved using a radar and a global navigation satellite system on-board a multi-copter platform. Water depth was measured using a tethered floating sonar controlled by the UAV. This sonar provides depth measurements also in deep and turbid water. Bathymetry (wet-bed elevation amsl) can be computed by subtracting water depth from WSE. Accuracy of the WSE measurements is better than 5–7 cm and accuracy of the water depth measurements is estimated to be ~3.8% of the actual water depth. The technology provided accurate measurements of WSE and bathymetry in both wetlands (lagoons) and cenotes. UAV-borne technology is shown to be a more flexible and lower cost alternative to manned aircrafts. UAVs allow monitoring of remote areas located in the jungle of the YP, which are difficult to access by human operators.

General information
State: Accepted/In press
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, National Space Institute, Geodesy, Amigos de Sian Ka’an
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Hydrogeology Journal
ISSN (Print): 1431-2174
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SJR 0.886 SNIP 1.153 CiteScore 2.03
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.13 SJR 1.134 SNIP 1.144
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.977 SNIP 1.281 CiteScore 1.96
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.167 SNIP 1.601 CiteScore 2.07
BFI (2013): BFI-level 1
Untangling the biodegradation of hydrophobic chemicals in OECD and novel tests using a unified modelling approach

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, RWTH Aachen University, Helmholtz Centre for Environmental Research
Authors: Polesel, F. (Intern), Brock, A. L. (Intern), Stibany, F. (Ekstern), Smith, K. (Ekstern), Schäffer, A. (Ekstern), Kästner, M. (Ekstern), Trapp, S. (Intern)
Number of pages: 2
Publication date: 2018
Event: Abstract from SETAC Europe 28th Annual Meeting, Rome, Italy.
Main Research Area: Technical/natural sciences
Electronic versions:
1. Unified_model_for_OECD_test_prediction_FINAL.pdf
Source: PublicationPreSubmission
Source-ID: 148017517
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Use of Forward Osmosis to Harvest Methane Oxidizing Bacteria Producing Single Cell Protein

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Water Technologies, Technical University of Denmark
Validation of landfill methane measurements from an unmanned aerial system: Project SC 160006

Landfill gas is made up of roughly equal amounts of methane and carbon dioxide. Modern UK landfills capture and use much of the methane gas as a fuel. But some methane escapes and is emitted to the atmosphere. Methane is an important greenhouse gas and controls on methane emissions are a part of international and national strategies to limit climate change. Better estimates of methane emissions from landfills and other similar sources would allow the UK to improve the quantification and control of greenhouse gas emissions.

This project tested the accuracy of methane measurement using an unmanned aerial system (UAS). We released known amounts of methane and measured these emissions using an UAS. The UAS experiments successfully measured the methane releases. The measured methane emission, taking into account the uncertainty in the measurements, always overlapped with the controlled methane emission release.

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, University of Manchester, National Physical Laboratory, University of Southampton
Number of pages: 80
Publication date: 2018

Publication information
Publisher: Environment Agency
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:

Source: PublicationPreSubmission
Source-ID: 146713871
Publication: Research - peer-review › Report – Annual report year: 2018

Valorisation of Effluents from Anaerobic Digestion as Single Cell Protein – Focus on Safe Gas Supply

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Water Technologies, Technical University of Denmark
Number of pages: 2
Publication date: 2018
Event: Abstract from 6th International Conference on Sustainable Solid Waste Management (NAXOS 2018), Naxos Island, Greece.
Waste management in the Irkutsk region, Siberia, Russia: An environmental assessment of alternative development scenarios

The current waste management system, handling around 500,000 t of household, commercial, and institutional waste annually in the Irkutsk region, Siberia, is based on landfilling in an old landfill with no controls of leachate and gas. Life-cycle assessment modelling of the current system shows that it is a major load on the environment, while the simulation of seven alternative systems results in large savings in many impact categories. With respect to climate change, it is estimated that a saving of about 1200 kg CO2 equivalents is possible per year, per inhabitant, which is a significant reduction in greenhouse gas emissions. The best alternatives involve efficient energy recovery from waste and recycling by source separation for commercial and institutional waste, the major waste type in the Irkutsk region. Recycling of household waste seems less attractive, and it is therefore recommended only to consider this option after experience has been gained with the commercial and institutional waste. Sensitivity analysis shows that recovery of energy - in particular electricity, heat, and steam - from waste is crucial to the environmental performance of the waste management system. This relates to the efficiencies of energy recovery as well as what the recovered energy substitutes, that is, the ‘dirtier’ the off-set energy, the higher the environmental savings for the waste management system. Since recovered energy may be utilised by only a few energy grids or industrial users, it is recommended to perform additional local assessments of the integration of the waste energy into existing systems and facilities.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Water Technologies, Irkutsk National Research Technical University
Authors: Starostina, V. (Ekstern), Damgaard, A. (Intern), Eriksen, M. K. (Intern), Christensen, T. H. (Intern)
Pages: 373-385
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Waste Management and Research
Volume: 36
Issue number: 4
ISSN (Print): 0734-242X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.92 SJR 0.519 CiteScore 1.78
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.76 SJR 0.673 SNIP 1.091
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.623 SNIP 0.893 CiteScore 1.53
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.733 SNIP 1.097 CiteScore 1.28
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.58 SNIP 0.925 CiteScore 1.17
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.874 SNIP 1.053 CiteScore 1.4
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Wastewater Treatment Using Staged Moving Bed Biofilm Reactor (MBBR) - Biological Transformation Products and Toxicity

The detection of pharmaceuticals and personal care products (PPCPs) in wastewater has caught the awareness of many societies, due to their impacts on the environment. The presence of these compounds in wastewater ranging from nanograms per liter to milligrams per liter is described as micropollutants. Since micropollutants are only removed partially by conventional wastewater treatment plants (WWTPs) as these treatment systems are not designed to remove pharmaceuticals, they can be detected in receiving water. These micropollutants, even at a very low concentration, were reported to pose acute and/or chronic toxic effects on aquatic organisms. Therefore, removal of these compounds is crucial in shaping a sustainable environment.

Biofilm-based processes, such as Moving Bed Biofilm Reactor (MBBR), have shown to be effective in removing a number of micropollutants, despite its relatively small footprint. MBBR consists of biofilm grown on plastic carriers, which are suspended in a reactor via mechanical mixing or aeration. This offers a compact and resilient technology to treat wastewater. Hence, technical and operational enhancements to boost micropollutant removal in this treatment are extremely attractive. Other than micropollutant removal, investigations on their fate and associated toxicity are also of importance.

In previous studies, the highest degradation rate constant (k) for the removal of 22 pharmaceuticals from diverse categories, was primarily attributed to the first reactor in a staged MBBR. However, when these degradation rate constants (k) were normalized with the respective biofilm in each reactor (kbio), the last reactor in a staged MBBR presented the most competent biofilm. In other words, biofilm in the last reactor exhibited the potential to degrade persistent pharmaceuticals, i.e. diclofenac, and a higher ratio of this biomass was involved in the degradation.

Despite the fact that the last reactor presented the most competent biofilm, biomass abundance in this reactor was too low
to perform sufficient pharmaceutical removal. Therefore, intermittent feeding was designed to boost the biomass abundance while retaining the competency. This novel concept was implemented to a laboratory-scale MBBR operated on effluent wastewater intermittently fed with settled raw wastewater. Results showed a relatively higher kbio, especially for diclofenac, atenolol and metoprolol, when comparing with other studies on activated sludge and suspended biofilm. In fact, diclofenac was removed completely in the batch experiment with half-life of 2.1 hours.

Hospital wastewater is one of the main sources where high concentrations of pharmaceuticals are presence. Hence, an on-site treatment of hospital wastewater has been considered, in order to decrease pharmaceutical input into municipal wastewater treatment plants (WWTPs). A pilot-scale MBBR consisting of six reactors in series was built with integration of intermittent feeding of the latter reactors aimed for a more efficient micropollutant removal. Based on the results, the nitrifying MBBR achieved higher removal compared with denitrifying MBBRs, except for azithromycin, clarithromycin, diatrizoic acid, propranolol and trimethoprim. In the batch experiment, nitrifying MBBRs have the ability to remove most of the analyzed pharmaceuticals except for carbamazepine, diclofenac and iopamidol, with degradation rate constants ranging from $5.0 \times 10^{-3} \text{ h}^{-1}$ to 2.6 h$^{-1}$. In general, the highest degradation rate constants (k) are from the nitrifying MBBRs. However, when the degradation rate constants were normalised to the respective biomass (kbio), the intermittently fed reactors presented the highest specific activity. Out of the 22 compounds studied, 17 compounds were removed with more than 20% through this pilot plant. Moreover, based on a model of the MBBR system, 8 of these compounds were estimated to be almost completely removed after MBBR treatment. This includes 3 of the 4 iodinated X-ray contrast media, which are used extensively in hospitals.

During biological removal of pharmaceuticals, total mineralization into carbon dioxide and water, is not often achieved. In many circumstances, formation of transformation products that are possibly persistent can occur. In this research study, the antibiotics, clindamycin and fusidic acid, were tested to investigate the pathways following MBBR treatment. Clindamycin was removed via biological treatment, forming transformation products, clindamycin sulfoxide and N-desmethyl clindamycin as well as 3 other mono-oxygenated products. Fusidic acid, on the other hand, formed transformation products that were removed over time, achieving no visible chromatographic peak after 72.5 hours of treatment. Furthermore, bioassay showed no significant antibacterial activities after fusidic acid has been degraded. A reduced Microtox® inhibition was also observed following fusidic acid biodegradation. In contrast, results showed that freshwater crustacean, Daphnia magna, is not affected by fusidic acid, even at concentrations as high as 250 mg L$^{-1}$.

In conclusion, MBBR could apply as a substitute for conventional activated sludge (CAS) to treat hospital/municipal wastewater, and as a polishing step after WWTP to lower pharmaceutical concentrations before discharge. The application to treat industrial wastewater was also proved feasible.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Ooi, G. T. H. (Intern)
Number of pages: 67
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Place of publication: Kgs. Lyngby, Denmark
Publisher: Technical University of Denmark (DTU)
Original language: English
Main Research Area: Technical/natural sciences

Relations
Projects:
Wastewater Treatment Using Staged Moving Bed Biofilm Reactor (MBBR) - Biological Transformation Products and Toxicity
Publication: Research › Ph.D. thesis – Annual report year: 2018

Water & Sanitation: An Essential Battlefront in the War on Antimicrobial Resistance
Water and sanitation represents a key battlefront in combating the spread of antimicrobial resistance (AMR). Basic water sanitation infrastructure is an essential first step to protecting public health, thereby limiting the spread of pathogens and the need for antibiotics. AMR presents unique human health risks, meriting new risk assessment frameworks specifically adapted to water and sanitation-borne AMR. There are numerous exposure routes to AMR originating from human waste, each of which must be quantified for its relative risk to human health. Wastewater treatment plants (WWTPs) play a vital role in centralized collection and treatment of human sewage, but there are numerous unresolved questions in terms of the microbial ecological processes occurring within and the extent to which they attenuate or amplify AMR. Research is needed to advance understanding of the fate of resistant bacteria and antibiotic resistance genes (ARGs) in various waste management systems, depending on the local constraints and intended re-use applications. WHO and national AMR action plans would benefit from a more holistic ‘One Water’ understanding. Here we provide a framework for research, policy, practice, and public engagement aimed at limiting the spread of AMR from water and sanitation in both low-, medium- and high-income countries, alike.

General information
Where does N\textsubscript{2}O from Partial Nitritation-Anammox processes come from? – A high temporal resolution study of a lab-scale system gives answers

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Blum, J. (Intern), Jensen, M. M. (Intern), Smets, B. F. (Intern)
Pages: 27-27
Publication date: 2018

Host publication information
Title of host publication: Danish Water Forum Annual Water Conference 2018 - abstract book
Place of publication: Lyngby, Denmark
Publisher: Danish Water Forum
Main Research Area: Technical/natural sciences
Conference: 12th Annual Water Research Meeting of Danish Water Forum, Lyngby, Denmark, 30/01/2018 - 30/01/2018
Electronic versions:
Abstract book
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2018

Estimation of caffeine intake from analysis of caffeine metabolites in wastewater
Caffeine metabolites in wastewater were investigated as potential biomarkers for assessing caffeine intake in a population. The main human urinary metabolites of caffeine were measured in the urban wastewater of ten European cities and the metabolic profiles in wastewater were compared with the human urinary excretion profile. A good match was found for 1,7-dimethyluric acid, an exclusive caffeine metabolite, suggesting that might be a suitable biomarker in wastewater for assessing population-level caffeine consumption. A correction factor was developed considering the percentage of excretion of this metabolite in humans, according to published pharmacokinetic studies. Daily caffeine intake estimated from wastewater analysis was compared with the average daily intake calculated from the average amount of coffee consumed by country per capita. Good agreement was found in some cities but further information is needed to standardize this approach. Wastewater analysis proved useful to providing additional local information on caffeine use.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, University of South Australia, University of Oslo, University of Antwerp, Swiss Federal Institute of Aquatic Science and Technology (Eawag), University of Porto, University of Queensland, University of Amsterdam, Universitat Jaume I, Istituto di Ricerche Farmacologiche Mario Negri, University of Bath, Chemical Water Quality and Health, Norwegian Institute for Water Research
Authors: Gracia-Lor, E. (Ekstern), Rousis, N. I. (Ekstern), Zuccato, E. (Ekstern), Bade, R. (Ekstern), Baz-Lomba, J. A. (Ekstern), Castrignanò, E. (Ekstern), Causanilles Llanes, A. (Ekstern), Hernández, F. (Ekstern), Kasprzyk-Hordern, B. (Ekstern), Kinyua, J. (Ekstern), McCail, A. (Ekstern), van Nuijs, A. L. N. (Ekstern), Plósz, B. G. (Ekstern), Ramin, P. (Ekstern), Ryu, Y. (Ekstern), Santos, M. M. (Ekstern), Thomas, K. V. (Ekstern), de Voogt, P. (Ekstern), Yang, Z. (Ekstern), Castiglioni, S. (Ekstern)
Number of pages: 7
Pages: 1582-1588
Publication date: 31 Dec 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Science of the Total Environment
Volume: 609
ISSN (Print): 0048-9697
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.546 SNIP 1.65 CiteScore 4.98
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.09 SJR 1.652 SNIP 1.856
Web of Science (2016): Indexed yes
Multi-criteria assessment tool for sustainability appraisal of remediation alternatives for a contaminated site

Purpose: In order to improve and support decision-making for the selection of remedial techniques for contaminated sites, a multi-criteria assessment (MCA) method has been developed. The MCA framework is structured in a decision process actively involving stakeholders, and compares the sustainability of remediation alternatives by integrating environmental, societal, and economic criteria in the assessment. Materials and methods: The MCA includes five main decision criteria:
remedial effect, remediation cost, remediation time, environmental impacts, and societal impacts. The main criteria are divided into a number of sub-criteria. The environmental impacts consider secondary impacts to the environment caused by remedial activities and are assessed by life-cycle assessment (LCA). The societal impacts mainly consider local impacts and are assessed in a more qualitative manner on a scale from 1 to 5. The performance on each main criterion is normalized to a score between 0 and 1, with 1 being the worst score. An overall score is obtained by calculating a weighted sum with criteria weights determined by stakeholders. The MCA method was applied to assess remediation alternatives for the Groyne 42 site, one of the largest contaminated sites in Denmark. Results and discussion: The compared remediation alternatives for the site were: (1) excavation of the site followed by soil treatment; (2) in situ alkaline hydrolysis; (3) in situ thermal remediation; and (4) continued encapsulation of the site by sheet piling. Criteria weights were derived by a stakeholder panel. The stakeholders gave the highest weighting to the remedial effect of the methods and to the societal impacts. For the Groyne 42 case study, the excavation option obtained the lowest overall score in the MCA, and was therefore found to be the most sustainable option. This was especially due to the fact that this option obtained a high score in the main categories Effect and Social impacts, which were weighted highest by the stakeholders. Conclusions: The developed MCA method is structured with five main criteria. Effect and time are included in addition to the three pillars of sustainability (environment, society, and economy). The remedial effect of remediation is therefore assessed and weighted separately from the main criteria environment. This structure makes interpretation of criteria scores more transparent and emphasizes the importance of effect and time as decision parameters. This also facilitated an easier weighting procedure for the stakeholders in the case study, who expressed a wish to weigh the remedial effect independently from the secondary environmental impacts.

**General information**

State: Accepted/In press  
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Central Denmark Region  
Authors: Søndergaard, G. L. (Intern), Binning, P. J. (Intern), Bondgård, M. (Ekstern), Bjerg, P. L. (Intern)  
Number of pages: 15  
Publication date: 12 Aug 2017  
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Journal of Soils and Sediments  
ISSN (Print): 1439-0108  
Ratings:  
BFI (2018): BFI-level 1  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 1  
Scopus rating (2017): SNIP 1.05 SJR 0.919 CiteScore 2.6  
Web of Science (2017): Indexed Yes  
BFI (2016): BFI-level 1  
Scopus rating (2016): CiteScore 2.44 SJR 0.866 SNIP 1.019  
BFI (2015): BFI-level 1  
Scopus rating (2015): SJR 0.877 SNIP 0.89 CiteScore 1.98  
BFI (2014): BFI-level 1  
Scopus rating (2014): SJR 1.003 SNIP 1.299 CiteScore 2.49  
BFI (2013): BFI-level 1  
Scopus rating (2013): SJR 0.972 SNIP 1.187 CiteScore 2.22  
ISI indexed (2013): ISI indexed yes  
BFI (2012): BFI-level 1  
Scopus rating (2012): SJR 1.018 SNIP 0.993 CiteScore 2.01  
ISI indexed (2012): ISI indexed yes  
BFI (2011): BFI-level 1  
Scopus rating (2011): SJR 0.939 SNIP 0.875 CiteScore 2.02  
ISI indexed (2011): ISI indexed yes  
BFI (2010): BFI-level 1  
Scopus rating (2010): SJR 0.779 SNIP 1.069  
BFI (2009): BFI-level 1  
Scopus rating (2009): SJR 0.923 SNIP 1.028  
Web of Science (2009): Indexed yes  
BFI (2008): BFI-level 1  
Scopus rating (2008): SJR 0.891 SNIP 0.997
A 3-D numerical model of the influence of meanders on groundwater discharge to a gaining stream in an unconfined sandy aquifer

Groundwater discharge to streams depends on stream morphology and groundwater flow direction, but are not always well understood. Here a 3-D groundwater flow model is employed to investigate the impact of meandering stream geometries on groundwater discharge to streams in an unconfined and homogenous sandy aquifer at the reach scale (10–200 m). The effect of meander geometry was examined by considering three scenarios with varying stream sinuosity. The interaction with regional groundwater flow was examined for each scenario by considering three groundwater flow directions. The sensitivity of stream morphology and flow direction to other parameters was quantified by varying the stream width, the meander amplitude, the magnitude of the hydraulic gradient, the hydraulic conductivity, and the aquifer thickness. Implications for a real stream were then investigated by simulating groundwater flow to a stream at a field site located in Grindsted, Denmark. The simulation of multiple scenarios was made possible by the employment of a computationally efficient coordinate transform numerical method. Comparison of the scenarios showed that the geometry of meanders greatly affect the spatial distribution of groundwater flow to streams. The shallow part of the aquifer discharges to the outward pointing meanders, while deeper groundwater flows beneath the stream and enters from the opposite side. The balance between these two types of flow depends on the aquifer thickness and meander geometry. Regional groundwater flow can combine with the effect of stream meanders and can either enhance or smooth the effect of a meander bend, depending on the regional flow direction. Results from the Grindsted site model showed that real meander geometries had similar effects to those observed for the simpler sinuous streams, and showed that despite large temporal variations in stream discharge, the spatial pattern of flow is almost constant in time for a gaining stream.

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Source-ID: 2372181933
Publication: Research - peer-review › Journal article – Annual report year: 2017
Accelerated anaerobic hydrolysis rates under a combination of intermittent aeration and anaerobic conditions

Anaerobic hydrolysis in activated return sludge was investigated in laboratory scale experiments to find if intermittent aeration would accelerate anaerobic hydrolysis rates compared to anaerobic hydrolysis rates under strict anaerobic conditions. The intermittent reactors were set up in a 240 h experiment with intermittent aeration (3h:3h) in a period of 24 h followed by a subsequent anaerobic period of 24 h in a cycle of 48 hours which was repeated 5 times during the experiment. The anaerobic reactors were kept under strict anaerobic conditions in the same period (240 h). Two methods for calculating hydrolysis rates based on soluble COD were compared. Two-way ANOVA with the Bonferroni post-test was performed in order to register any significant difference between reactors with intermittent aeration and strictly anaerobic conditions respectively. The experiment demonstrated a statistically significant difference in favor of the reactors with intermittent aeration showing a tendency towards accelerated anaerobic hydrolysis rates due to application of intermittent aeration. The conclusion of the work is thus that intermittent aeration applied in the activated return sludge process (ARP) can improve the treatment capacity further in full scale applications.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, EnviDan A/S, Technical University of Denmark
Authors: Jensen, T. R. (Ekstern), Lastra Milone, T. (Ekstern), Petersen, G. (Ekstern), Andersen, H. R. (Intern)
Pages: 1944-1951
Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: Water Science and Technology
Volume: 75
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Ratings:
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SJR 0.429 SNIP 0.574 CiteScore 1.34
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.3 SJR 0.404 SNIP 0.637
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.464 SNIP 0.594 CiteScore 1.19
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.585 SNIP 0.683 CiteScore 1.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.571 SNIP 0.701 CiteScore 1.3
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.597 SNIP 0.659 CiteScore 1.13
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.594 SNIP 0.631 CiteScore 1.25
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.529 SNIP 0.597
Web of Science (2010): Indexed yes
Acclimation of ammonia tolerant methanogenic consortia using different bioreactor types

**General information**
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Mancini, E. (Intern), Fotidis, I. (Intern), Tian, H. (Intern), Angelidaki, I. (Intern)
Number of pages: 1
Publication date: 2017

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Title of host publication: Book of Abstracts Sustain 2017
Place of publication: Kgs. Lyngby, Denmark
Publisher: Technical University of Denmark (DTU)
Article number: Sustain Abstract E-11
Main Research Area: Technical/natural sciences
Conference: Sustain 2017, Kgs. Lyngby, Denmark, 06/12/2017 - 06/12/2017
Electronic versions:
ABSTRACT BOOK
SustainAbstracts2017c.compressed_52.pdf

Acclimation to extremely high ammonia levels during continuous biomethanation process

**General information**
State: Published
A Critical Analysis of the Environmental Dossiers from the OECD Sponsorship Programme for the Testing of Manufactured Nanomaterials

In 2015, the OECD finally published the findings of its seven year testing programme for manufactured nanomaterials. Here, we present the first in-depth analysis of the published OECD dossiers with regards to data on physical and chemical properties, environmental fate and ecotoxicology. Each individual study in the dossiers was reviewed with regard to, among other, which OECD Test Guidelines (TG) were used, and the reliability assigned to the study. We furthermore analyzed in detail the suspension methods used, how media quality was quantified and physical and chemical characterization performed prior, during and/or at the end of the study. We find that the information in the dossiers present an incomplete portfolio of nanomaterial ecotoxicological evaluations that are difficult to draw substantive conclusions from and that most of the studies were not designed to investigate the validity of the OECD Test Guidelines. We acknowledge the effort of the OECD WP MN and recommend that a follow-on program is established with well-defined goals, end-points and direct funding to qualified research laboratories to ensure valid, rigorous, reproducible and efficient research.

General information
A critical and in-depth analysis of the environmental aspect of the OECD SP dossiers

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Arizona State University
Authors: Hansen, S. F. (Intern), Hjorth, R. (Intern), Skjolding, L. M. (Intern), Bowman, D. M. (Ekstern), Maynard, A. (Ekstern), Baun, A. (Intern)
Pages: 91-91
Publication date: 2017

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Publisher: National research centre for the working environment
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Conference: 8th international symposium on nanotechnology, occupational and environmental health, Elsinore, Denmark, 29/05/2017 - 29/05/2017
Electronic versions: Nanotech_symp_A_critical_and_in_depth.pdf
A critical and in-depth anEcotoxicity testing of nanoparticles - The quest for disclosing the nano-effect

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Baun, A. (Intern), Skjolding, L. M. (Intern), Sørensen, S. N. (Intern), Hjorth, R. (Intern), Hansen, S. F. (Intern), Hartmann, N. B. (Intern)
Pages: 48-48
Publication date: 2017

Host publication information
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Publisher: National research centre for the working environment
Main Research Area: Technical/natural sciences
Conference: 8th international symposium on nanotechnology, occupational and environmental health, Elsinore, Denmark, 29/05/2017 - 29/05/2017
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Nanotech_symposiumEcotoxicity.pdf

Acute and semi-chronic toxicity of vanadium tested on copepods of the species Temora longicornis

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Environmental Engineering, Environmental Chemistry, Technical University of Denmark
Authors: Kristiansen, M. H. (Ekstern), Iversen, N. H. (Ekstern), Koski, M. (Intern), Trapp, S. (Intern)
Number of pages: 1
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Acute toxicity of copper oxide nanoparticles to Daphnia magna under different test conditions
The acute toxicity of monodispersed 6 nm and <100 nm poly-dispersed copper oxide nanoparticles toward Daphnia magna was assessed using 48 h immobilization tests. CuSO₄ was used as a reference. Four different exposure conditions were tested, to study whether the toxicity of the nanoparticle suspensions changed in a way similar to what is known for dissolved Cu: first in ISO standard test conditions (pH 7.8), second with slight acidity (pH 6.5), third in the presence of citric acid, and fourth in the presence of humic acid. For all four exposure conditions, the toxicity of Cu employed in the three forms followed the same sequence, i.e., CuSO₄ > monodispersed 6 nm CuO >> poly-dispersed CuO. The toxicity of all Cu forms decreased from pH 6.5, ≫ pH 7.8, > pH 7.8 + citric acid, to ≫ pH 7.8 + humic acid. This pattern is in agreement with concentrations of Cu²⁺ calculated using the equilibrium model MINTEQ. These findings show that the acute toxicity of copper oxide nanoparticles is governed by test water composition and the chemical species Cu²⁺.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Roskilde University, Technical University of Denmark
Authors: Thit, A. (Ekstern), Huggins, K. (Ekstern), Selck, H. (Ekstern), Baun, A. (Intern)
Environmental Chemistry, Pollution, Health, Toxicology and Mutagenesis, Copper oxide nanoparticles, crustacean, dissolved organic matter, speciation, toxicity, Biological materials, Citric acid, Copper, Copper oxides, Nanoparticles, Organic acids, Suspensions (fluids), Dissolved organic matters, Equilibrium modeling, Exposure conditions, Nanoparticle suspension, Water composition, Toxicity

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Source-ID: 2348795630
Publication: Research - peer-review › Journal article – Annual report year: 2016
Adaptation to flood risk: Results of international paired flood event studies

As flood impacts are increasing in large parts of the world, understanding the primary drivers of changes in risk is essential for effective adaptation. To gain more knowledge on the basis of empirical case studies, we analyze eight paired floods, that is, consecutive flood events that occurred in the same region, with the second flood causing significantly lower damage. These success stories of risk reduction were selected across different socioeconomic and hydro-climatic contexts. The potential of societies to adapt is uncovered by describing triggered societal changes, as well as formal measures and spontaneous processes that reduced flood risk. This novel approach has the potential to build the basis for an international data collection and analysis effort to better understand and attribute changes in risk due to hydrological extremes in the framework of the IAHSs Panta Rhei initiative. Across all case studies, we find that lower damage caused by the second event was mainly due to significant reductions in vulnerability, for example, via raised risk awareness, preparedness, and improvements of organizational emergency management. Thus, vulnerability reduction plays an essential role for successful adaptation. Our work shows that there is a high potential to adapt, but there remains the challenge to stimulate measures that reduce vulnerability and risk in periods in which extreme events do not occur.

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A data assimilation system combining CryoSat-2 data and hydrodynamic river models

There are numerous hydrologic studies using satellite altimetry data from repeat-orbit missions such as Envisat or Jason over rivers. This study is one of the first examples for the combination of altimetry from drifting-ground track satellite missions, namely CryoSat-2, with a river model. CryoSat-2 SARIn Level 2 data is used to improve a 1D hydrodynamic model of the Brahmaputra River in South Asia, which is based on the Saint-Venant equations for unsteady flow and set up in the MIKE HYDRO River software. After calibration of discharge and water level the hydrodynamic model can accurately and bias-free represent the spatio-temporal variations of water levels. A data assimilation framework has been developed and linked with the model. It is a flexible framework that can assimilate water level data which are arbitrarily distributed in time and space. The setup has been used to assimilate CryoSat-2 water level observations over the Assam valley for the years 2010 to 2015, using an Ensemble Transform Kalman Filter (ETKF). Performance improvement in terms of discharge forecasting skill was then evaluated. For experiments with synthetic CryoSat-2 data the continuous ranked probability score (CRPS) was improved by up to 32%, whilst for experiments assimilating real data it could be improved by up to 10%. The developed methods are expected to be transferable to other rivers and altimeter missions. The model setup and calibration is based almost entirely on globally available remote sensing data.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, DHI Denmark
Authors: Schneider, R. (Intern), Ridler, M. (Ekstern), Godiksen, P. N. (Ekstern), Madsen, H. (Ekstern), Bauer-Gottwein, P. (Intern)
Advancing from underground to above-ground model predictive control in urban drainage

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Lund, N. S. V. (Intern), Borup, M. (Intern), Halvgaard, R. F. (Intern), Falk, A. K. V. (Intern), Mark, O. (Ekstern), Madsen, H. (Ekstern), Mikkelsen, P. S. (Intern)
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A fast surrogate model tailor-made for real time control
A surrogate model of a detailed hydraulic urban drainage model is created for supplying inflow forecasts to an MPC model for 31 separate locations. The original model is subdivided into 66 relationships extracted from the original model. The surrogate model is 9000 times faster than the original model, with just a minor deviation from the original model results.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Borup, M. (Intern), Thrysøe, C. (Intern), Arnbjerg-Nielsen, K. (Intern), Righetti, F. (Intern), Mikkelsen, P. S. (Intern)
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A gain-loss framework based on ensemble flow forecasts to switch the urban drainage-wastewater system management towards energy optimization during dry periods
Precipitation is the cause of major perturbation to the flow in urban drainage and wastewater systems. Flow forecasts, generated by coupling rainfall predictions with a hydrologic runoff model, can potentially be used to optimize the operation of integrated urban drainage-wastewater systems (IUDWSs) during both wet and dry weather periods. Numerical weather prediction (NWP) models have significantly improved in recent years, having increased their spatial and temporal resolution. Finer resolution NWP are suitable for urban-catchment-scale applications, providing longer lead time than radar extrapolation. However, forecasts are inevitably uncertain, and fine resolution is especially challenging for NWP. This uncertainty is commonly addressed in meteorology with ensemble prediction systems (EPSs). Handling uncertainty is challenging for decision makers and hence tools are necessary to provide insight on ensemble forecast usage and to support the rationality of decisions (i.e., forecasts are uncertain and therefore errors will be made; decision makers need tools to justify their choices, demonstrating that these choices are beneficial in the long run).

This study presents an economic framework to support the decision-making process by providing information on when acting on the forecast is beneficial and how to handle the EPS. The relative economic value (REV) approach associates
economic values with the potential outcomes and determines the preferential use of the EPS forecast. The envelope curve of the REV diagram combines the results from each probability forecast to provide the highest relative economic value for a given gain-loss ratio. This approach is traditionally used at larger scales to assess mitigation measures for adverse events (i.e. the actions are taken when events are forecast). The specificity of this study is to optimize the energy consumption in IUDWS during low-flow periods by exploiting the electrical smart grid market (i.e. the actions are taken when no events are forecast). Furthermore, the results demonstrate the benefit of NWP neighbourhood post-processing methods to enhance the forecast skill and increase the range of beneficial uses.

**General information**

State: Published  
Organisations: Department of Environmental Engineering, Urban Water Systems, Krüger A/S  
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Scopus rating (2008): SJR 1.726 SNIP 1.408  
Scopus rating (2007): SJR 1.125 SNIP 1.142  
Scopus rating (2006): SJR 0.659 SNIP 0.76  
Scopus rating (2005): SJR 0.779 SNIP 0.73
Algal Biomass for Bioenergy and Bioproducts Production in Biorefinery Concepts

The fast population growth is increasing the demand for energy and resources. However, the reserves of oil are diminishing and greenhouse emissions associated to its combustion are affecting the global climate causing global warming. Therefore the need for alternative resources and processes is becoming impellent.

Macro- and microalgae have the ability to transform nutrients into valuable biomass. Being a good source of vitamins, minerals, lipids, proteins and pigments, they represent a promising source of various products. However these biomasses are still very little explored as biorefinery feedstocks.

Biorefinery represents an important tool towards the development of a sustainable economy. Within the biorefinery framework several bioproducts, such as food, feed and biofuels, can be produced from biomass. The specific composition of the biomass feedstock determines the potential final product that can be obtained.

In this thesis, micro- and macroalage were investigated as biorefinery feedstocks. The main aim of this work was developing different biorefinery strategies for the production of high value products, such as proteins or pigments, to be employed in the pharmaceutical or nutraceutical industry. The macroalgae used in this work were Laminaria digitata and Saccharina latissima, while the microalgae were Chlorella sorokiniana, Chlorella vulgaris and Chlorella protothecoides. Moreover, an evaluation of the effect of the harvesting season and location on the composition of high value products such as total phenolics and on the biogas potential for L. digitata and S. latissima was done. Both these factors had a significant impact on the accumulation of total phenolics in the algal biomass and on the biogas production. In particular, samples harvested in summer, because of the high content of sugars, showed to be the most promising feedstock in the development of biorefinery processes, containing 0.5 mgTPC gDM-1 and having a biomethane potential of 343.7 NmLCH4 g VS-1.

Moreover, proteins being an interesting valuable product to be used as food and feed supplement, diverse industrial methods to produce amino acids and proteins were analyzed. Innovative techniques to increase the protein content in the final biomass, such as microalgae or microorganisms to be used as single cell proteins (SCP), were also investigated. The combination of phototropic growth of C. sorokiniana with Methyllococcus capsulatus led to an innovative solution where two products rich in proteins (up to 43 %DM) were obtained.

Another strategy developed in this thesis work was based on the combination of micro- and macroalgae to enhance protein production. Indeed, the microalgae C. protothecoides was grown heterotrophically in the macroalgae L. digitata hydrolyzed. The final composition of the microalgal biomass showed that the protein content was increased from 0.07 ± 0.01 gProtein gDM-1 to 0.44 ± 0.04 gProtein DM-1. The results obtained show that this solution may represent an interesting strategy to be applied in a biorefinery approach.

Finally, a microalgae biorefinery strategy was developed. Lutein represents a very important pigment present in the macular region of the human eye. It is crucial in the protection against light-induced retinal damages and responsible for maintaining human bone health and preventing some diseases. Lutein and proteins were extracted by developing innovative methods specifically designed for microalgae species. From the initial algal biomass were extracted 0.8 ± 0.1 mg Lutein gDM-1 with a purity of 92.5 ± 1.2% and a calculated yield of 95%. Moreover, the final protein content in the fraction was 82.7 ± 3.1% w w-1 with a protein yield of 55%. Finally, from the residues of this extraction processes, 372.7 ± 19.0 NmLCH4 gVS-1 of biogas were produced.

The results obtained in this thesis work show that macro- and microalgae are promising biomasses for the development of the future biorefineries.
Algal toxicity of the alternative disinfectants performic acid (PFA), peracetic acid (PAA), chlorine dioxide (ClO2) and their by-products hydrogen peroxide (H2O2) and chlorite (ClO2−)

Environmental effect evaluation of disinfection of combined sewer overflow events with alternative chemical disinfectants requires that the environmental toxicity of the disinfectants and the main by-products of their use are known. Many disinfectants degrade quickly in water which should be included in the evaluation of both their toxicity as determined in standardized tests and their possible negative effect in the water environment. Here we evaluated according to the standardized ISO 8692 test the toxicity towards the green microalgae, Pseudokirchneriella subcapitata, of three disinfectants: performic acid (PFA), peracetic acid (PAA) and chlorine dioxide (ClO2) as well as two by-products of their use: hydrogen peroxide (H2O2) and chlorite. All of the five chemicals investigated showed clear toxicity to the algae with well-defined dose response curves. The EC50 values ranged from 0.16 to 2.9 mg/L based on nominal concentrations leading to the labeling of the chemicals as either toxic or very toxic. The five investigated chemicals decreased in toxicity in the order chlorine dioxide, performic acid, peracetic acid, chlorite and hydrogen peroxide. The stability of the chemicals increased in the same order as the toxicity decrease. This indicates that even though ClO2 has the highest environmental hazard potential, it may still be suitable as an alternative disinfectant due to its rapid degradation in water.
Currently there are several world maps showing the water stress in regions or nations. They give a good indication of water stress on a larger scale, but do not have information on a local scale that may assist a water utility in their prioritization of well fields to lower the overall pressure on the water resource. Furthermore a local water stress indicator is necessary for benchmarking regional water supplies against each other.

AWaRe is the freshwater impact recommended by the Lifecycle Initiative (developed by WULCA). It is defined as the inverse function of Availability Minus Demand (AMD) which is compared to the world average AMD. The AMD represents the water remaining after human consumption and environmental requirements. This is done for a grid of 50x50km worldwide, but it does not give sufficient information on a local scale. Therefore we modified the AWaRe indicator so that it can account for differences at the local scale and termed it AWaRe*. We have applied AWaRe* on four different demarcations for three public water supplies of the largest cities in Denmark.

The results of the local scales will be presented and compared with the results from the AWaRe found for non agricultural water use (found by WULCA). The AWaRe* differs between different demarcations. For the four locale scales water supply C ranks as the most water stressed. This fits well with the water stress experienced by the three water supplies. For two out of four demarcations, the ranking between the cases are the same. As expected for the local scales we see the highest impact factor for the smallest scale. For the water stress found by WULCA, the water stress is lowest for water supply C and case A and B have similar water stress, which is opposite of the ranking from the local scales. For the AWaRe scale, we obtain results that do not comply with the expected outcome from the water supply. Further work should be given to increase resolution of AWaRe data.

Not only is the applied method crucial to the outcome, but also the scale applied and the data used. The locale scale shows the highest water stress at water supply C, which is the city with most inhabitants and a water supply that experience water stress. AWaRe* on the locale scale represents the expected water stress for the water supplies.
Ammonia tolerant inocula provide a good base for anaerobic digestion of microalgae in third generation biogas process

This study investigated the ability of an ammonia-acclimatized inoculum to digest efficiently protein-rich microalgae for continuous 3rd generation biogas production. Moreover, we investigated whether increased C/N ratio could alleviate ammonia toxicity. The biochemical methane potential (BMP) of five different algae (Chlorella vulgaris)/manure (cattle) mixtures showed that the mixture of 80/20 (on VS basis) resulted in the highest BMP value (431 mL CH₄ g VS⁻¹), while the BMP of microalgae alone (100/0) was 415 mL CH₄ g VS⁻¹. Subsequently, anaerobic digestion of those two substrates was tested in continuous stirred tank reactors (CSTR). Despite of the high ammonium levels (3.7-4.2 g NH₄⁺-N L⁻¹), CSTR reactors using ammonia tolerant inoculum resulted in relatively high methane yields (i.e. 77.5% and 84% of the maximum expected, respectively) These results demonstrated that ammonia tolerant inocula could be a promising approach to successfully digest protein-rich microalgae and achieve a 3rd generation biogas production.

General information

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Anaerobic granular sludge for simultaneous biomethanation of synthetic wastewater and CO with focus on the identification of CO-converting microorganisms

CO is a main component of syngas, which can be produced from the gasification of organic wastes and biomass. CO can be converted to methane by anaerobic digestion (AD), however, it is still challenging due to its toxicity to microorganisms and limited knowledge about CO converting microorganisms. In the present study, anaerobic granular sludge (AGS) was used for the simultaneous biomethanation of wastewater and CO. Batch experiments showed that AGS tolerated CO partial pressure as high as 0.5 atm without affecting its ability for synthetic wastewater degradation, which had higher tolerance of CO compared to suspended sludge (less than 0.25 atm) as previously reported. Continuous experiments in upflow anaerobic sludge blanket (UASB) reactors showed AGS could efficiently convert synthetic wastewater and CO into methane by applying gas-recirculation. The addition of CO to UASB reactor enhanced the hydrogenotrophic CO-oxidizing pathway, resulted in the increase of extracellular polymeric substances, changed the morphology of AGS and significantly altered the microbial community compositions of AGS. The microbial species relating with CO conversion and their functions were revealed by metagenomic analysis. It showed that 23 of the 70 reconstructed genome bins (GBs), most of which were not previously characterized at genomic level, were enriched and contained genes involved in CO conversion upon CO addition. CO-converting microorganisms might be taxonomically more diverse than previously known and have multi-functions in the AD process. The reductive tricarboxylic acid (TCA) cycle in combination with the oxidation of the CO was probably crucial for CO utilization by the majority of the GBs in the present study.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Fudan University, University of Padua
An assessment of the importance of exposure routes to the uptake and internal localisation of fluorescent nanoparticles in zebrafish (Danio rerio), using light sheet microscopy

A major challenge in nanoecotoxicology is finding suitable methods to determine the uptake and localisation of nanoparticles on a whole-organism level. Some uptake methods have been associated with artefacts induced by sample preparation, including staining for electron microscopy. This study used light sheet microscopy (LSM) to define the uptake and localisation of fluorescently labelled nanoparticles in living organisms with minimal sample preparation. Zebrafish (Danio rerio) were exposed to fluorescent gold nanoparticles (Au NPs) and fluorescent polystyrene NPs via aqueous or dietary exposure. The in vivo uptake and localisation of NPs was investigated using LSM at different time points (1, 3 and 7 days). A time-dependent increase in fluorescence was observed in the gut after dietary exposure to both Au NPs and polystyrene NPs. No fluorescence was observed within gut epithelia regardless of the NP exposure route indicating no or limited uptake via intestinal villi. Fish exposed to polystyrene NPs through the aqueous phase emitted fluorescence signals from the gills and intestine. Fluorescence was also detected in the head region of the fish after aqueous exposure to polystyrene NPs. This was not observed for Au NPs. Aqueous exposure to Au NPs resulted in increased relative swimming distance, while no effect was observed for other exposures. This study supports that the route of exposure is essential for the uptake and subsequent localisation of nanoparticles in zebrafish. Furthermore, it demonstrates that the localisation of NPs in whole living organisms can be visualised in real-time, using LSM.
An environmental assessment of landfill gas mitigation, using a biocover system

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Møller, J. (Ekstern), Kjeldsen, P. (Intern), Scheutz, C. (Intern)
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An MFA-based optimization model for increased resource efficiency: Phosphorus flows in Denmark

Phosphorus (P) is present in large amounts in agricultural residues and organic wastes from human consumption, from which it can be recovered as fertiliser, reducing dependence on primary P. Crucial for a secondary resource is its ability to fulfill the functions of the resource intended to be substituted. This quality of secondary resources is not captured well by material flow analysis (MFA). A static MFA of the Danish anthropogenic P cycle was adapted for optimization via linear programming to minimize primary P imports. The MFA system was adapted to reflect typical nutrient availability from various secondary-P fertilisers, to allow for exchange of secondary-P fertilisers between regions (sewage sludge incineration ash and composted organic household waste), and to reflect the system's development over 3 annual time steps. Since P accumulating in agricultural soil gradually becomes available for plants over time, the outcome showed both a gradual decline of mineral P fertiliser inputs and net additions to soil P stocks stabilising at distinctly lower levels than evident from the static MFA. The optimization model's outcome, accounting for the dynamic aspects of transport and P availability to crops over time, suggests a substitution potential of over 80% (9.8 Gg primary P) by P recovered from sewage sludge and household biowaste, compared to 35% in the static MFA.
A novel archaeal species belonging to Methanoculleus genus identified via de-novo assembly and metagenomic binning process in biogas reactors

Recently, a first comprehensive catalogue of microbial genomes populating biogas reactors treating manure and agro-industrial residues was determined by sequencing samples collected from 22 biogas reactors including laboratory and full scale. Among the archaeal community, one of the most abundant methanogens belongs to Methanoculleus genus and for this reason it was provisionally named Methanoculleus sp. DTU006. Its full length 16S rRNA sequence is 97% similar to Methanoculleus marisnigri JR1 and to Methanoculleus palmolei DSM 4273. Despite the high similarity of the 16S gene sequence, Average Nucleotide Identity calculation (ANI) calculated on all protein encoding genes indicated that the two most similar species, Methanoculleus bourgensis MS2T and Methanoculleus sp. MAB1, are divergent enough to define Methanoculleus sp. DTU006 as new archaeal species. Its genome (2.15 Mbp) has an estimated completeness around 93%. Analysis of the metabolic pathways using KEGG confirmed that it is a hydrogenotrophic methanogen and therefore it is proposed the Candidatus status by naming it as "Candidatus Methanoculleus thermohydrogenotrophicum".
An overview of electron acceptors in microbial fuel cells

Microbial fuel cells (MFC) have recently received increasing attention due to their promising potential in sustainable wastewater treatment and contaminant removal. In general, contaminants can be removed either as an electron donor via microbial catalyzed oxidization at the anode or removed at the cathode as electron acceptors through reduction. Some contaminants can also function as electron mediators at the anode or cathode. While previous studies have done a thorough assessment of electron donors, cathodic electron acceptors and mediators have not been as well described. Oxygen is widely used as an electron acceptor due to its high oxidation potential and ready availability. Recent studies, however, have begun to assess the use of different electron acceptors because of the (1) diversity of redox potential, (2) needs of alternative and more efficient cathode reaction, and (3) expanding of MFC based technologies in different areas. The aim of this review was to evaluate the performance and applicability of various electron acceptors and mediators used in MFCs. This review also evaluated the corresponding performance, advantages and disadvantages, and future potential applications of select electron acceptors (e.g., nitrate, iron, copper, perchlorate) and mediators.

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Antibiotic Resistance Genes and Correlations with Microbial Community and Metal Resistance Genes in Full-Scale Biogas Reactors As Revealed by Metagenomic Analysis

Digested residues from biogas plants are often used as biofertilizers for agricultural crops cultivation. The antibiotic resistance genes (ARGs) in digested residues pose a high risk to public health due to their potential spread to the disease-causing microorganisms and thus reduce the susceptibility of disease-causing microorganisms to antibiotics in medical treatment. A high-throughput sequencing (HTS)-based metagenomic approach was used in the present study to investigate the variations of ARGs in full-scale biogas reactors and the correlations of ARGs with microbial communities and metal resistance genes (MRGs). The total abundance of ARGs in all the samples varied from $7 \times 10^{-3}$ to $1.08 \times 10^{-1}$ copy of ARG/copy of 16S-rRNA gene, and the samples obtained from thermophilic biogas reactors had a lower total abundance of ARGs, indicating the superiority of thermophilic anaerobic digestion for ARGs removal. ARGs in all the samples were composed of 175 ARG subtypes; however, only 7 ARG subtypes were shared by all the samples. Principal component analysis and canonical correspondence analysis clustered the samples into three groups (samples from manure-based mesophilic reactors, manure-based thermophilic reactors, and sludge-based mesophilic reactors), and substrate, temperature, and hydraulic retention time (HRT) as well as volatile fatty acids (VFAs) were identified as crucial environmental variables affecting the ARGs compositions. Procrustes analysis revealed microbial community composition was the determinant of ARGs composition in biogas reactors, and there was also a significant correlation between ARGs composition and MRGs composition. Network analysis further revealed the co-occurrence of ARGs with specific microorganisms and MRGs.

**General information**

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Application of a Mechanistic Model as a Tool for On-line Monitoring of Pilot Scale Filamentous Fungal Fermentation Processes - The Importance of Evaporation Effects: Mechanistic model for pilot scale monitoring

A mechanistic model-based soft sensor is developed and validated for 550L filamentous fungus fermentations operated at Novozymes A/S. The soft sensor is comprised of a parameter estimation block based on a stoichiometric balance, coupled to a dynamic process model. The on-line parameter estimation block models the changing rates of formation of product, biomass, and water, and the rate of consumption of feed using standard, available on-line measurements. This parameter estimation block, is coupled to a mechanistic process model, which solves the current states of biomass, product, substrate, dissolved oxygen and mass, as well as other process parameters including kLa, viscosity and partial pressure of CO2. State estimation at this scale requires a robust mass model including evaporation, which is a factor not often considered at smaller scales of operation. The model is developed using a historical dataset of eleven batches from the fermentation pilot plant (550L) at Novozymes A/S. The model is then implemented on-line in 550L fermentation processes operated at Novozymes A/S in order to validate the state estimator model on fourteen new batches utilizing a new strain. The product concentration in the validation batches was predicted with an average root mean sum of squared error (RMSSE) of 16.6%. In addition, calculation of the Janus coefficient for the validation batches shows a suitably calibrated model. The robustness of the model prediction is assessed with respect to the accuracy of the input data. Parameter estimation uncertainty is also carried out. The application of this on-line state estimator allows for on-line monitoring of pilot scale batches, including real-time estimates of multiple parameters which are not able to be monitored on-line. With successful application of a soft sensor at this scale, this allows for improved process monitoring, as well as opening up further possibilities for on-line control algorithms, utilizing these on-line model outputs. This article is protected by copyright. All rights reserved

General information
State: Published
Organisations: Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, Department of Environmental Engineering, Novozymes AS
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Application of a New Point Measurement Device to Quantify Groundwater-Surface Water Interactions at the Interface

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Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, University of Kansas
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Application of a new point measurement to estimate groundwater-surface water exchange

The StreamBed Point Velocity Probe (SBPVP), a new point measurement device, measures in situ groundwater velocities at the groundwater-surface water interface (GWSWI, based on a mini-tracer test on the probe surface. This device yields velocities without reliance on estimations of hydraulic conductivity (K), porosity (n), or hydraulic gradients. The SBPVP was applied to a meander of the Grindsted stream (Denmark) to determine patterns of groundwater-surface water exchange (GWSWE). Analysis of the spatial distribution of velocity values suggests the sediments in the Grindsted streambed are highly heterogeneous. Calculated discharges were combined with geochemical data to determine the mass discharge of specific solutes (PCE, TCE, cis-DCE, and VC). Total mass discharge of the contaminants was found to be concentrated in several “hot spots” that occurred in locations determined by both magnitudes of concentrations and velocities. Given these localized hot spots, detailed information about flow at the GWSWI could be vital to understanding solute, and, by extension, nutrient, movement in ecosystems affected by exchange. Such information could be crucial to effective remediation design.

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Organisations: Department of Environmental Engineering, Water Resources Engineering, University of Kansas
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Application of CryoSat-2 altimetry data for river analysis and modelling

Availability of in situ river monitoring data, especially of data shared across boundaries, is decreasing, despite growing challenges for water resource management across the entire globe. This is especially valid for the case study of this work, the Brahmaputra Basin in South Asia. Commonly, satellite altimeters are used in various ways to provide information about such river basins. Most missions provide virtual station time series of water levels at locations where their repeat orbits cross rivers. CryoSat-2 is equipped with a new type of altimeter, providing estimates of the actual ground location seen in the reflected signal. It also uses a drifting orbit, challenging conventional ways of processing altimetry data to river water levels and their incorporation in hydrologic–hydrodynamic models. However, CryoSat-2 altimetry data provides an unprecedentedly high spatial resolution. This paper suggests a procedure to (i) filter CryoSat-2 observations over rivers to extract water-level profiles along the river, and (ii) use this information in combination with a hydrologic–hydrodynamic model to fit the simulated water levels with an accuracy that cannot be reached using information from globally available digital elevation models (DEMs) such as from the Shuttle Radar Topography Mission (SRTM) only. The filtering was done based on dynamic river masks extracted from Landsat imagery, providing spatial and temporal resolutions high enough to map the braided river channels and their dynamic morphology. This allowed extraction of river water levels over previously unmonitored narrow stretches of the river. In the Assam Valley section of the Brahmaputra River, CryoSat-2 data and Envisat virtual station data were combined to calibrate cross sections in a 1-D hydrodynamic model of the river. The hydrologic–hydrodynamic model setup and calibration are almost exclusively based on openly available remote sensing data and other global data sources, ensuring transferability of the developed methods. They provide an opportunity to achieve forecasts of both discharge and water levels in a poorly gauged river system.

General information
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Pages: 751-764
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Applying LCA in decision making - the need and the future perspective

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Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, Department of Civil Engineering, Centre for oil and gas – DTU, Transport DTU, Transport Modelling, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis, Department of Environmental Engineering, Urban Water Systems, National Food Institute, Research Group for Genomic Epidemiology, Section for Structural Engineering
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A probabilistic approach to urban flooding from sea surges in Copenhagen

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Organisations: Department of Applied Mathematics and Computer Science, Statistics and Data Analysis, Department of Environmental Engineering, Urban Water Systems
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A pumping and tracer test in a limestone aquifer and impacts on contaminated site risk assessment and management

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Organisations: Department of Environmental Engineering, Water Resources Engineering, GEO, Region Hovedstaden
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Aquaporin based biomimetic membrane in forward osmosis: Chemical cleaning resistance and practical operation

Aquaporin plays a promising role in fabricating high performance biomimetic forward osmosis (FO) membranes. However, aquaporin as a protein also has a risk of denaturation caused by various chemicals, resulting in a possible decay of membrane performance. The present study tested a novel aquaporin based biomimetic membrane in simulated membrane cleaning processes. The effects of cleaning agents on water flux and salt rejection were evaluated. The membrane showed a good resistance to the chemical agents. The water flux after chemical cleaning showed significant increases, particularly after cleaning with NaOCl and Alconox. Changes in the membrane structure and increased hydrophilicity in the surrounding areas of the aquaporin may be accountable for the increase in water permeability. The membrane shows stable salt rejection up to 99% after all cleaning agents were tested. A 15-day experiment with secondary wastewater effluent as the feed solution and seawater as the draw solution showed a stable flux and high salt rejection. The average rejection of the dissolved organic carbon from wastewater after the 15-day test was 90%. The results demonstrated that the aquaporin based biomimetic FO membrane exhibits chemical resistance for most agents used in membrane cleaning procedures, maintaining a stable flux and high salt rejection.

General information
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Organisations: Department of Environmental Engineering, Water Technologies, Northwest Agriculture and Forestry University, King Abdullah University of Science and Technology, Clemson University
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Aquatic Ecotoxicity of Microplastics and Nanoplastics: Lessons Learned from Engineered Nanomaterials

The widespread occurrence of microplastics in the aquatic environment is well documented through international surveys and scientific studies. Further degradation and fragmentation, resulting in the formation of nanosized plastic particles – nanoplastics – has been highlighted as a potentially important issue. In the environment, both microplastics and nanoplastics may have direct ecotoxicological effects, as well as vector effects through the adsorption of co-contaminants. Plastic additives and monomers may also be released from the polymer matrix and cause adverse effects on aquatic organisms. Although limited information regarding the ecotoxicological effects of nano- and microplastics is available at present, their small size gives rise to concern with respect to the adverse effects and dislocation of these particles inside organisms – similar to issues often discussed for engineered nanomaterials. In the same way, transport of co-contaminants and leaching of soluble substances are much debated issues with respect to the ecotoxicology of nanomaterials.

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10.1007/978-3-319-61615-5_2
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Aquatic toxicity testing of liquid hydrophobic chemicals – Passive dosing exactly at the saturation limit

The aims of the present study were (1) to develop a passive dosing approach for aquatic toxicity testing of liquid substances with very high Kow values and (2) to apply this approach to the model substance dodecylbenzene (DDB, Log Kow = 8.65). The first step was to design a new passive dosing format for testing DDB exactly at its saturation limit. Silicone O-rings were saturated by direct immersion in pure liquid DDB, which resulted in swelling of >14%. These saturated O-rings were used to establish and maintain DDB exposure exactly at the saturation limit throughout 72-h algal growth inhibition tests with green algae Raphidocelis subcapitata. Growth rate inhibition at DDB solubility was 13 ± 5% (95% CI) in a first and 8 ± 3% (95% CI) in a repeated test, which demonstrated that improved exposure control can lead to good precision and repeatability of toxicity tests. This moderate toxicity at chemical activity of unity was higher than expected relative to a reported hydrophobicity cut-off in toxicity, but lower than expected relative to a reported chemical activity range for baseline toxicity. The present study introduces a new effective approach for toxicity testing of an important group of challenging chemicals, while providing a basis for investigating toxicity cut-off theories.
A regional and nonstationary model for partial duration series of extreme rainfall
Regional extreme value models for estimation of extreme rainfall intensities are widely applied, but their underlying assumption of stationarity is challenged. Many recent studies show that the rainfall extremes worldwide exhibit a nonstationary behavior. This paper presents a spatiotemporal model of extreme rainfall. The framework is built on a partial duration series approach with a nonstationary, regional threshold value. The model is based on generalized linear regression solved by generalized estimation equations. It allows a spatial correlation between the stations in the network and accounts furthermore for variable observation periods at each station and in each year. Marginal regional and temporal regression models solved by generalized least squares are used to validate and discuss the results of the full spatiotemporal model. The model is applied on data from a large Danish rain gauge network for four durations ranging from 10 min to 24 h. The observation period differs between stations, and the number of stations with more than 10 years of observations has increased over the years. A spatiotemporal model for the threshold is suggested, applying the mean annual precipitation and time as the explanatory variables in the regional and temporal domain, respectively. Further analysis of partial duration series with nonstationary and regional thresholds shows that the mean exceedances also exhibit a significant variation in space and time for some rainfall durations, while the shape parameter is found to be constant.

General information
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Organisations: Department of Environmental Engineering, Water Resources Engineering, Urban Water Systems, DHI Denmark
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BFI (2015): BFI-level 2
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Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 2.442 SNIP 1.668 CiteScore 3.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
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Scopus rating (2012): SJR 2.127 SNIP 1.586 CiteScore 3.12
ISI indexed (2012): ISI indexed yes
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Scopus rating (2011): SJR 1.937 SNIP 1.48 CiteScore 2.92
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A review of the potential to establish a global, operational river monitoring based on Sentinel-3 water surface elevation observations

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Organisations: Department of Environmental Engineering, Water Resources Engineering
Authors: Kittel, C. M. M. (Intern), Bauer-Gottwein, P. (Intern)
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A review on prospects and challenges of biological H₂S removal from biogas with focus on biotrickling filtration and microaerobic desulfurization
The production of biogas from sulfate-rich materials under anaerobic digestion results in the formation of hydrogen sulfide (H₂S). The recommended level of H₂S in the produced biogas for direct combustion purposes is in the range of 0.02 to 0.05% w/w (200 to 500 ppm), therefore, desulfurization is required to avoid damages to combustion equipment and prevent the formation of sulfur dioxide (SO₂) which is an acid rain precursor. It has been well documented that physical, thermal, and chemical desulfurization approaches suffer from high operation costs as well as waste production needing to be disposed of. Accordingly, a great deal of efforts has been put into biological methods because of being more environmentally friendly and more economically advantageous in comparison with the other techniques. Biotrickling filtration (BTF) and microaerobic desulfurization have shown a high potential for H₂S removal at pilot- and large-scale plants. Despite all the progress made and the promising aspects keeping these methods at the core of interest, there are
still challenges to be addressed. The present article attempts to briefly review and discuss the challenges and future prospects of BTF and microaerobic desulfurization.

Assessing the chemical contamination dynamics in a mixed land use stream system

Traditionally, the monitoring of streams for chemical and ecological status has been limited to surface water concentrations, where the dominant focus has been on general water quality and the risk for eutrophication. Mixed land use stream systems, comprising urban areas and agricultural production, are challenging to assess with multiple chemical stressors impacting stream corridors. New approaches are urgently needed for identifying relevant sources, pathways and potential impacts for implementation of suitable source management and remedial measures. We developed a method for risk assessing chemical stressors in these systems and applied the approach to a 16-km groundwater-fed stream corridor (Grindsted, Denmark). Three methods were combined: (i) in-stream contaminant mass discharge for source quantification, (ii) Toxic Units and (iii) environmental standards. An evaluation of the chemical quality of all three stream compartments – stream water, hyporheic zone, streambed sediment – made it possible to link chemical stressors to their respective sources and obtain new knowledge about source composition and origin. Moreover, toxic unit estimation and comparison to environmental standards revealed the stream water quality was substantially impaired by both geogenic and diffuse anthropogenic sources of metals along the entire corridor, while the streambed was less impacted. Quantification of the contaminant mass discharge originating from a former pharmaceutical factory revealed that several 100 kgs of chlorinated ethenes and pharmaceutical compounds discharge into the stream every year. The strongly reduced redox conditions in the plume result in high concentrations of dissolved iron and additionally release arsenic, generating the complex contaminant mixture found in the narrow discharge zone. The fingerprint of the plume was observed in the stream several km downgradient, while nutrients, inorganics and pesticides played a minor role for the stream health. The results emphasize future investigations should include multiple compounds and stream compartments, and highlight the need for holistic approaches when risk assessing these dynamic systems.
Assessing the impact of groundwater contamination on stream water quality by multiple approaches at the groundwater-surface water interface (Invited Presentation)

Contaminants such as chlorinated solvents and pesticides, as well as new classes of compounds or emerging micropollutants are extensively produced, utilized and then discarded in society and subsequently released to streams from multiple point and diffuse sources. Sustainable management of water resources requires assessment of multiple contamination sources within a watershed in order to assess their direct impact on water quality. Determination of flow paths and groundwater fluxes are essential for evaluating the transport, fate and potential impact of contaminant plumes discharging to streams. This implies that investigators have the tools to evaluate the governing parameters, including an appreciation of the scale of variability, as well as conceptual and numerical models that incorporate the various mechanisms affecting flow and transport.

A major multidisciplinary field scale investigation of the Grindsted stream area including geology, hydrogeology, geophysics, environmental chemistry, ecology and environmental engineering was carried out in 2012-2017, to develop the scientific basis for conducting risk assessments for contaminated sites impacting surface waters. The Grindsted stream area is a well-studied site, affected by many polluting sources including the plume from a former pharmaceutical factory. Our overall aim of the field investigations was to (i) test the applicability of different methods for mapping groundwater pollution as it enters streams at a complex site, and (ii) perform a source identification and risk assessment of the stream’s chemical and ecological status.

The study included development of a geological and hydrogeological model, numerical modeling of the flow and transport, mapping of the contaminant plume, and detailed field investigations at the main entry point of the plume. We quantified the contaminant mass discharge and attenuation of the plume at the groundwater-surface interface by different approaches (control planes at stream bank, in the hyporheic zone and in the stream using traditional and innovative tools and models for determination of flow and contaminant fluxes).

The field methods and key findings regarding contaminant mass discharge, and challenges with respect to multiple stressor impact on streams will be discussed in the presentation.

General information
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Assessing the importance of spatio-temporal RCM resolution when estimating sub-daily extreme precipitation under current and future climate conditions

The increase in extreme precipitation is likely to be one of the most significant impacts of climate change in cities due to increased pluvial flood risk. Hence, reliable information on changes in sub-daily extreme precipitation is needed for robust adaptation strategies. This study explores extreme precipitation over Denmark generated by the regional climate model (RCM) HIRHAM-ECEARTH at different spatial resolutions (8, 12, 25 and 50km), three RCM from the RiskChange project at 8km resolution and three RCMs from ENSEMBLES at 25km resolution at temporal aggregations from 1 to 48h. The performance of the RCM simulations in current climate as well as projected changes for 2081-2100 is evaluated for non-central moments of order 1-3 and for the 2- and 10-year events. The comparison of the RCM simulations and observations shows that the higher spatial resolution simulations (8 and 12km) are more consistent across all temporal aggregations in the representation of high-order moments and extreme precipitation. The biases in the spatial pattern of extreme
precipitation change across temporal and spatial resolution. The hourly extreme value distributions of the HIRHAM-
ECEARTH simulations are more skewed than the observational dataset, which leads to an overestimation by the higher
spatial resolution simulations. Nevertheless, in general, under current conditions RCM simulations at high spatial
resolution represent extreme events and high-order moments better. The changes projected by the RCM simulations
depend on the global climate model (GCM)-RCM combination, spatial resolution and temporal aggregation. The
simulations disagree on the magnitude and spatial pattern of the changes. However, there is an agreement on higher
changes for lower temporal aggregation and higher spatial resolution. Overall, the results from this study show the
influence of the spatial resolution on the precipitation outputs from RCMs. The biases of the RCM simulations increase,
and the projected changes decrease for decreasing spatial resolution of the simulations. This points towards the need for
high spatial and temporal resolution RCMs to obtain reliable information on changes in sub-daily extreme precipitation.

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Web of Science (2017): Indexed yes
Scopus rating (2017): SNIP 1.516 SJR 1.797 CiteScore 3.7
Scopus rating (2016): CiteScore 3.49 SJR 1.916 SNIP 1.535
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.015 SNIP 1.434 CiteScore 3.28
Scopus rating (2014): CiteScore 3.49 SJR 1.954 SNIP 1.538
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.094 SNIP 1.702 CiteScore 3.32
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.038 SNIP 1.515 CiteScore 2.88
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.842 SNIP 1.559 CiteScore 2.85
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Assessment of a combined dry anaerobic digestion and post-composting treatment facility for source-separated organic household waste, using material and substance flow analysis and life cycle inventory

The fate of total solids, volatile solids, total organic carbon, fossil carbon, biogenic carbon and 17 substances (As, Ca, CaCO₃, Cd, Cl, Cr, Cu, H, Hg, K, Mg, Ni, O, P, Pb, S, Zn) in a combined dry anaerobic digestion and post-composting facility were assessed. Mass balances showed good results with low uncertainties for non-volatile substances, while balances for nitrogen, carbon, volatile solids and total organic carbon showed larger but reasonable uncertainties, due to volatilisation and emissions into the air. Material and substance flow analyses were performed in order to obtain transfer coefficients for a combined dry anaerobic digestion and post-composting facility. All metals passed through the facility and ended up in compost or residues, but all concentrations of metals in the compost complied with legislation. About 23% of the carbon content of the organic waste was transferred to the biogas, 24% to the compost, 13% to residues and 40% into the atmosphere. For nitrogen, 69% was transferred to the compost, 10% volatilised to the biofilter, 11% directly into the atmosphere and 10% to residues. Finally, a full life cycle inventory was conducted for the combined dry anaerobic digestion and post-composting facility, including waste received, fuel consumption, energy use, gaseous emissions, products, energy production and chemical composition of the compost produced.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Jensen, M. B. (Intern), Møller, J. (Intern), Scheutz, C. (Intern)
Pages: 23-35
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Waste Management
Volume: 66
ISSN (Print): 0956-053X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.456 SNIP 2.059 CiteScore 4.94
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.407 SNIP 2.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.732 SNIP 2.263 CiteScore 4.33
Web of Science (2015): Indexed yes
Assessment of a Danish sludge treatment reed bed system and a stockpile area, using substance flow analysis

Sludge treatment reed bed (STRB) systems combine dewatering, stabilisation and long-term storage of sludge. The main objective of this study was to investigate how substance concentrations change in the sludge residue during treatment and to conduct substance flow analyses covering the flow of substances in an STRB system over a 12-year treatment period, followed by three months’ post-treatment in a stockpile area (SPA). Samples of sludge, reject water and sludge residue of different ages were collected at two Danish STRB system facilities and analysed for content of relevant substances. Concentrations of carbon and nitrogen in the sludge residue residing in an STRB system changed as a function of treatment time, mainly due to mineralisation; only a negligible part was lost to reject water. Considering metals and phosphorus, the main share was accumulated in the sludge residue; only minor fractions were lost to mineralisation or reject water. Post-treatment in an SPA resulted in an increase in dry matter content from 24% to 32%. After treatment, the concentrations of heavy metals (lead, cadmium, nickel, zinc, copper and chromium) in the sludge residue met the
threshold values stated by the Danish Environmental Protection Agency and the EU.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Orbicon
Authors: Larsen, J. D. (Intern), Nielsen, S. M. (Ekstern), Scheutz, C. (Intern)
Number of pages: 13
Pages: 2291-2303
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Water Science and Technology
Volume: 76
Issue number: 9
ISSN (Print): 0273-1223
Ratings:

BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SJR 0.429 SNIP 0.574 CiteScore 1.34
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.3 SJR 0.404 SNIP 0.637
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.464 SNIP 0.594 CiteScore 1.19
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.585 SNIP 0.683 CiteScore 1.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.571 SNIP 0.701 CiteScore 1.3
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.597 SNIP 0.659 CiteScore 1.13
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.594 SNIP 0.631 CiteScore 1.25
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.529 SNIP 0.597
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.592 SNIP 0.693
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.583 SNIP 0.694
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.736 SNIP 0.766
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.696 SNIP 0.789
Web of Science (2006): Indexed yes
Assessment of attenuation processes in a chlorinated ethene plume by use of stream bed Passive Flux Meters, streambed Point Velocity Probes and contaminant mass balances

Chlorinated ethenes (CE) are abundant groundwater contaminants and pose risk to both groundwater and surface water bodies, as plumes can migrate through aquifers to streams. After release to the environment, CE may undergo attenuation. The hyporheic zone is believed to enhance CE attenuation, however studies contradicting this have also been reported. Since dilution commonly reduces contaminant concentrations in streams to below quantification limits, use of mass balances along the pathway from groundwater to stream is unusual.

Our study is conducted at the low-land Grindsted stream, Denmark, which is impacted by a contaminant plume. CE have been observed in the stream water; hence our study site provides an unusual opportunity to study attenuation processes in a CE plume as it migrates through the groundwater at the stream bank, through the stream bed and further to the point of fully mixed conditions in the stream.

The study undertook the determination of redox conditions and CE distribution from bank to stream; streambed contaminant flux estimation using streambed Passive Flux Meters (sPFM); and quantification of streambed water fluxes using temperature profiling and streambed Point Velocity Probes (SBPVP). The advantage of the sPFM is that it directly measures the contaminant flux without the need for water samples, while the advantage of the SBPVP is its ability to measure the vertical seepage velocity without the need for additional geological parameters. Finally, a mass balance assessment along the plume pathway was conducted to account for any losses or accumulations.

The results show consistencies in spatial patterns between redox conditions and extent of dechlorination; between contaminant fluxes from sPFM and concentrations from water samples; and between seepage velocities from SBPVP and temperature-based water fluxes. Mass balances and parent-metabolite compound ratios indicate limited degradation between the bank and the point of fully mixed stream water. Since the plume at the bank mainly consists of cis-DCE and vinyl chloride, this implies high and persistent stream water concentrations of these compounds. Finally, this study demonstrates the usefulness and complementary nature of sPFM and SBPVP measurements for assessing the attenuation processes through mass balance calculations.
Assessment of groundwater contamination impacting stream ecosystems

**General information**
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Bielefeld University, Aarhus University
Authors: Bjerg, P. L. (Intern), Sonne, A. T. (Intern), Rasmussen, J. J. (Ekstern), Höss, S. (Ekstern), Rønde, V. (Intern), Traunspurger, W. (Ekstern), McKnight, U. S. (Intern)
Pages: 98-98
Publication date: 2017

**Host publication information**
Title of host publication: 14th International Conference on Sustainable Use and Management of Soil : Book of abstracts
Place of publication: Lyon, France
Main Research Area: Technical/natural sciences
Conference: 14th International Conference Sustainable Use and Management of Soil, Sediment and Water Resources (AquaConSoil), Lyon, France, 26/06/2017 - 26/06/2017
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Assessment of methane production from shredder waste in landfills: The influence of temperature, moisture and metals

In this study, methane (CH4) production rates from shredder waste (SW) were determined by incubation of waste samples over a period of 230 days under different operating conditions, and first-order decay kinetic constants (k-values) were calculated. SW and sterilized SW were incubated under different temperatures (20-25°C, 37°C, and 55°C), moisture contents (35% and 75% w/w) and amounts of inoculum (5% and 30% of the samples wet weight). The biochemical methane potential (BMP) from different types of SW (fresh, old and sieved) was determined and compared. The ability of metals (iron, aluminum, zinc, and copper) contained in SW to provide electrons for methanogens resulting in gas compositions with high CH4 contents and very low CO2 contents was investigated. The BMP of SW was 1.5-6.2 kg CH4/ton waste. The highest BMP was observed in fresh SW samples, while the lowest was observed in sieved samples (fine fraction of SW). Abiotic production of CH4 was not observed in laboratory incubations. The biotic experiments showed that when the moisture content was 35% w/w and the temperature was 20-25°C, CH4 production was extremely low. Increasing the temperature from 20-25°C to 37°C resulted in significantly higher CH4 production while increasing the temperature from 37°C to 55°C resulted in higher CH4 production, but to a lower extent. Increasing the moisture and inoculum content also increased CH4 production. The k-values were 0.033-0.075 yr⁻¹ at room temperature, 0.220-0.429 yr⁻¹ at 37°C and 0.235-0.488 yr⁻¹ at 55°C, indicating that higher temperatures resulted in higher k-values. It was observed that H2 can be produced by biocorrosion of iron, aluminum, and zinc and it was shown that produced H2 can be utilized by hydrogenotrophic methanogens to convert CO2 to CH4. Addition of iron and copper to SW resulted in inhibition of CH4 production, while addition of aluminum and zinc resulted in higher CH4 production. This suggested that aluminum and zinc contribute to high CH4 production from SW by providing H2 for hydrogenotrophic methanogens. Gas compositions with higher CH4 and lower CO2 observed in landfilled SW are thus most likely due to the consumption of existing CO2 in the produced biogas and the produced H2 by biocorrosion of aluminum and zinc by methanogens.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Fathi Aghdam, E. (Intern), Scheutz, C. (Intern), Kjeldsen, P. (Intern)
Pages: 226-237
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Waste Management
Volume: 63
ISSN (Print): 0956-053x
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.456 SNIP 2.059 CiteScore 4.94
Web of Science (2017): Indexed yes
Assessment of Urban Pluvial Flood Risk and Efficiency of Adaptation Options Through Simulations – A New Generation of Urban Planning Tools

We present a new framework for flexible testing of flood risk adaptation strategies in a variety of urban development and climate scenarios. This framework couples the 1D-2D hydrodynamic simulation package MIKE FLOOD with the agent-based urban development model DANCE4Water and provides the possibility to systematically test various flood risk adaptation measures ranging from large infrastructure changes over decentralised water management to urban planning policies. We have tested the framework in a case study in Melbourne, Australia considering 9 scenarios for urban development and climate and 32 potential combinations of flood adaptation measures. We found that the performance of adaptation measures strongly depended on the considered climate and urban development scenario and the other implementation measures implemented, suggesting that adaptive strategies are preferable over one-off investments. Urban planning policies proved to be an efficient means for the reduction of flood risk, while implementing property buyback and pipe increases in a guideline-oriented manner was too costly. Random variations in location and time point of urban development could have significant impact on flood risk and would in some cases outweigh the benefits of less efficient adaptation strategies. The results of our setup can serve as an input for robust decision making frameworks and thus support the identification of flood risk adaptation measures that are economically efficient and robust to variations of climate and urban layout.

General information

State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Monash University, DHI Denmark
Authors: Löwe, R. (Intern), Urich, C. (Ekstern), Sto. Domingo, N. D. F. (Ekstern), Mark, O. (Ekstern), Deletic, A. (Ekstern), Arnbjerg-Nielsen, K. (Intern)
Pages: 355–367
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information

Journal: Journal of Hydrology
Volume: 550
ISSN (Print): 0022-1694
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.71 SJR 1.832 CiteScore 4.06
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 1.813 SNIP 1.772
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.686 SNIP 1.761 CiteScore 3.54
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.667 SNIP 1.993 CiteScore 3.45
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.714 SNIP 1.974 CiteScore 3.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.914 SNIP 1.994 CiteScore 3.38
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.742 SNIP 1.833 CiteScore 3.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.786 SNIP 1.712
A Stochastic Method to Manage Delay and Missing Values for In-Situ Sensors in an Alternating Activated Sludge Process

In the alternating activated sludge process with rule-based control, online N-measurements are of great importance for maintaining good control. These measurements can be delayed due to sensor processing time, turbulence at the location in the aeration tank where the sensor is placed, etc. The measurements may also be temporarily unavailable because of recalibration, communication faults or other errors. Here we present a method that handles such delay and missing observations. The model is based on zero order hold stochastic differential equations which use binary signals for influent flow and aeration to determine the state of the alternating process. It also uses measured ammonium and nitrate concentrations, which are shifted to account for delay. The method is developed and tested with data from a WWTP located in Kolding, Denmark. Results indicate that even though the model is simple, the model residuals and parameters are uncorrelated and the model predictions are 60% closer to the true values (measurements shifted to account for delay) than the delayed measurements are.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Department of Environmental Engineering, Urban Water Systems, Krüger A/S
Authors: Stentoft, P. A. (Intern), Munk-Nielsen, T. (Ekstern), Mikkelsen, P. S. (Intern), Madsen, H. (Intern)
Number of pages: 10
Publication date: 2017

Host publication information
Title of host publication: Proceedings of the 12th IWA Specialized Conference on Instrumentation, Control & Automation
Main Research Area: Technical/natural sciences
Conference: 12th IWA Specialized Conference on Instrumentation, Control & Automation, Québec, Canada, 11/06/2017 - 11/06/2017
Grey box, WWTP, Stochastic, Sensor delay, Alternating, ASP, Online control, In-situ sensor, Rule-based control
Source: PublicationPreSubmission
Source-ID: 140797706
Publication: Research - peer-review » Article in proceedings – Annual report year: 2017
A systematic methodology to extend the applicability of a bioconversion model for the simulation of various co-digestion scenarios

Detailed simulation of anaerobic digestion (AD) requires complex mathematical models and the optimization of numerous model parameters. By performing a systematic methodology and identifying parameters with the highest impact on process variables in a well-established AD model, its applicability was extended to various co-digestion scenarios. More specifically, the application of the step-by-step methodology led to the estimation of a general and reduced set of parameters, for the simulation of scenarios where either manure or wastewater were co-digested with different organic substrates. Validation of the general parameter set involved the simulation of laboratory-scale data from three continuous co-digestion experiments, treating mixtures of different organic residues either at thermophilic or mesophilic conditions. Evaluation of the results showed that simulations using the general parameter set fitted experimental data quite well, indicating that it offers a reliable reference point for future simulations of anaerobic co-digestion scenarios.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Kovalovszki, A. (Intern), Alvarado-Morales, M. (Intern), Fotidis, I. (Intern), Angelidaki, I. (Intern)
Pages: 157-166
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Bioresource Technology
Volume: 235
ISSN (Print): 0960-8524
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.029 SNIP 1.799 CiteScore 6.28
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.308 SNIP 2.507 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.089 SNIP 2.344
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.915 SNIP 2.236
A systematic model identification method for chemical transformation pathways – the case of heroin biomarkers in wastewater

This study presents a novel statistical approach for identifying sequenced chemical transformation pathways in combination with reaction kinetics models. The proposed method relies on sound uncertainty propagation by considering parameter ranges and associated probability distribution obtained at any given transformation pathway levels as priors for parameter estimation at any subsequent transformation levels. The method was applied to calibrate a model predicting the transformation in untreated wastewater of six biomarkers, excreted following human metabolism of heroin and codeine. The method developed was compared to parameter estimation methods commonly encountered in literature (i.e., estimation of all parameters at the same time and parameter estimation with fix values for upstream parameters) by assessing the model prediction accuracy, parameter identifiability and uncertainty analysis. Results obtained suggest that the method developed has the potential to outperform conventional approaches in terms of prediction accuracy, transformation pathway identification and parameter identifiability. This method can be used in conjunction with optimal experimental designs to effectively identify model structures and parameters. This method can also offer a platform to promote a closer interaction between analytical chemists and modellers to identify models for biochemical transformation pathways, being a prominent example for the emerging field of wastewater-based epidemiology.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, Environmental Chemistry, Water Resources Engineering
Authors: Ramin, P. (Intern), Valverde Pérez, B. (Intern), Polesel, F. (Intern), Locatelli, L. (Intern), Plósz, B. G. (Intern)
Number of pages: 11
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Scientific Reports
Volume: 7
Issue number: 1
Article number: 9390
ISSN (Print): 2045-2322
Ratings:
BFI (2018): BFI-level 1
A taste of plastic - quantifying micro- and nanoplastic ingestion and interactions with feeding in daphnia magna (E)

Aquatic ecosystems worldwide are polluted by microplastics and they are ingested by a broad range of organisms. Although research so far mainly focused on marine ecosystems, freshwater organisms are just as affected. Approaches to study microplastic ingestion are predominantly qualitative since quantitative measures are analytically challenging. The aim of this study was to develop and apply a quantitative approach to measure particle body burden to study uptake and depuration of micro- and nanoplastics in the freshwater flea Daphnia magna, using fluorescent polystyrene beads. The animals were first exposed to a particle concentration of 1 mg/l for 24 h (uptake) and thereafter transferred to clean medium for another 24 h (depuration). During both phases animals were sampled and particle body burdens were determined by measuring particle fluorescence in the dissolved tissue. To analyze the influence of particle size, the study was done with beads of 2 µm and 100 nm. It was furthermore analyzed how the processes are affected by food availability and how the particles in turn affect the feeding rate of D. magna. Both particle sizes were readily taken up and body burdens increased with exposure time. The 2 µm beads were taken up in a higher quantity. Likewise, depuration was more efficient for the bigger particles. Smaller particles remain in the organism for a longer time, potentially increasing their hazard. Food availability strongly influenced particle body burdens, with lower levels in the presence of food. In turn, the particles can potentially alter the animals' feeding rate, which could lead to impairments of physiology and fitness.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Rist, S. (Intern), Baun, A. (Intern), Hartmann, N. B. (Intern)
Number of pages: 1
Publication date: 2017
Event: Abstract from ALSO 2017 Aquatic Sciences Meeting , Honolulu, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
ASLO_Abstract_Sinja_Rist.pdf
Links:
Atmospheric deposition, CO$_2$, and change in the land carbon sink

Concentrations of atmospheric carbon dioxide (CO$_2$) have continued to increase whereas atmospheric deposition of sulphur and nitrogen has declined in Europe and the USA during recent decades. Using time series of flux observations from 23 forests distributed throughout Europe and the USA, and generalised mixed models, we found that forest-level net ecosystem production and gross primary production have increased by 1% annually from 1995 to 2011. Statistical models indicated that increasing atmospheric CO$_2$ was the most important factor driving the increasing strength of carbon sinks in these forests. We also found that the reduction of sulphur deposition in Europe and the USA lead to higher recovery in ecosystem respiration than in gross primary production, thus limiting the increase of carbon sequestration. By contrast, trends in climate and nitrogen deposition did not significantly contribute to changing carbon fluxes during the studied period. Our findings support the hypothesis of a general CO$_2$-fertilization effect on vegetation growth and suggest that, so far unknown, sulphur deposition plays a significant role in the carbon balance of forests in industrialized regions. Our results show the need to include the effects of changing atmospheric composition, beyond CO$_2$, to assess future dynamics of carbon-climate feedbacks not currently considered in earth system/climate modelling.
Automatiseret simplificering af 1D hydraulisk model – med hensyn til 1D-2D oversvømmelsesberegninger

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Löwe, R. (Intern), Davidsen, S. (Intern), Thrysøe, C. (Intern), Arnbjerg-Nielsen, K. (Intern)
Pages: 26-31
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: EVA : Erfaringsudveksling i vandmiljøteknikken
Volume: 30
Issue number: 2
ISSN (Print): 1901-3663
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions: 2017_02_EVA_blad.pdf

Bibliographical note
s. 26 og følgende<br/>fra: http://www.evanet.dk/bladet/
Source: PublicationPreSubmission
Source-ID: 137167051
Publication: Research - peer-review › Journal article – Annual report year: 2017

Bacteria from Wheat and Cucurbit Plant Roots Metabolize PAHs and Aromatic Root Exudates: Implications for Rhizodegradation

The chemical interaction between plants and bacteria in the root zone can lead to soil decontamination. Bacteria which degrade PAHs have been isolated from the rhizospheres of plant species with varied biological traits, however, it is not known what phytochemicals promote contaminant degradation. One monocot and two dicotyledon plants were grown in PAH-contaminated soil from a manufactured gas plant (MGP) site. A phytotoxicity assay confirmed greater soil decontamination in rhizospheres when compared to bulk soil controls. Bacteria were isolated from plant roots (rhizobacteria) and selected for growth on anthracene and chrysene on PAH-amended plates. Rhizosphere isolates metabolized 3- and 4-ring PAHs and PAH catabolic intermediates in liquid incubations. Aromatic root exudate compounds, namely flavonoids and simple phenols, were also substrates for isolated rhizobacteria. In particular, the phenolic compounds - morin, caffeic acid, and protocatechuic acid - appear to be linked to bacterial degradation of 3- and 4- ring PAHs in the rhizosphere.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Central Connecticut State University
Authors: Ely, C. S. (Ekstern), Smets, B. F. (Intern)
Pages: 877-883
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: International Journal of Phytoremediation
Volume: 19
Issue number: 10
ISSN (Print): 1522-6514
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.888 SJR 0.592 CiteScore 2.14
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.04 SJR 0.617 SNIP 0.875
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.702 SNIP 1.081 CiteScore 2.17
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.761 SNIP 0.973 CiteScore 1.9
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.641 SNIP 0.741 CiteScore 1.51
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.605 SNIP 0.643 CiteScore 1.32
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.624 SNIP 0.851 CiteScore 1.27
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.766 SNIP 0.866
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.59 SNIP 0.785
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.617 SNIP 0.593
Scopus rating (2007): SJR 0.749 SNIP 0.777
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.719 SNIP 0.777
Scopus rating (2005): SJR 0.645 SNIP 0.846
Scopus rating (2004): SJR 0.506 SNIP 0.612
Scopus rating (2003): SJR 0.514 SNIP 0.801
Scopus rating (2002): SJR 1.122 SNIP 1.053
Scopus rating (2001): SJR 0.396 SNIP 0.505
Scopus rating (2000): SJR 0.133 SNIP 0.017
Original language: English
flavonoids, polycyclic aromatic hydrocarbons, rhizosphere, siderophores
Electronic versions:
27_3_2017_Bacteria_f.pdf. Embargo ended: 11/06/2018
DOIs:
10.1080/15226514.2017.1303805
Source: FindIt
Source-ID: 2355592780
Publication: Research - peer-review › Journal article – Annual report year: 2017

Batch, fed-batch and CSTR reactors as cultivation systems to acclimate ammonia tolerant methanogenic consortia

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Fotidis, I. (Intern), Tian, H. (Intern), Mancini, E. (Intern), Angelidaki, I. (Intern)
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Bioaugmentation with hydrolytic microbes to improve the anaerobic biodegradability of lignocellulosic agricultural residues

Bioaugmentation with hydrolytic microbes was applied to improve the methane yield of bioreactors fed with agricultural wastes. The efficiency of Clostridium thermocellum and Melioribacter roseus to degrade lignocellulosic matter was evaluated in batch and continuously stirred tank reactors (CSTRs). Results from batch assays showed that C. thermocellum enhanced the methane yield by 34%. A similar increase was recorded in CSTR during the bioaugmentation period; however, at steady-state the effect was noticeably lower (7.5%). In contrast, the bioaugmentation with M. roseus did not promote markedly the anaerobic biodegradability, as the methane yield was increased up to 10% in batch and no effect was shown in CSTR. High-throughput 16S rRNA amplicon sequencing was used to assess the effect of bioaugmentation strategies on bacterial and archaeal populations. The microbial analysis revealed that both strains were not markedly resided into biogas microbiome. Additionally, the applied strategies did not alter significantly the microbial communities.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark, University of Padua, National University of Athens
Authors: Tsapekos, P. (Intern), Kougias, P. (Intern), Vasileiou, S. A. (Ekstern), Treu, L. (Intern), Campanaro, S. (Ekstern), Lyberatos, G. (Ekstern), Angelidaki, I. (Intern)
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Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
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BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Bioavailability and bioaccessibility of polycyclic aromatic hydrocarbons from (post-pyrolytically treated) biochars

Bioavailability data of PAHs from biochar produced under real world conditions is scarce and the influence of feedstock and various post-pyrolysis treatments common in agriculture, such as co-composting or lacto-fermentation to produce silage fodder, on their bioavailability and bioaccessibility has hardly been studied. The total (Ctotal), and freely dissolved (i.e., bioavailable) concentrations (Cfree) of the sum of 16 US EPA PAHs of 43 biochar samples produced and treated in such ways ranged from 0.4 to almost 2000 mg/kg, and from 12 to 81 ng/L, respectively, which resulted in very high biochar-water partition coefficients (4.2 ≤ log KD ≤ 8.8 L/kg) for individual PAHs. Thirty three samples were incubated in contaminant traps that combined a diffusive carrier and a sorptive sink. Incubations yielded samples only containing desorption-resistant PAHs (Cres). The desorption resistant PAH fraction was dominant, since only eight out of 33 biochar samples showed statistically significant bioaccessible fractions (fbioaccessible = 1 - Cres/Ctotal). Bioavailability correlated positively with Ctotal/surface area. Other relationships of bioavailability and -accessibility with the investigated post-pyrolysis processes or elemental composition could not be found. PAH exposure was very limited (low Cfree, high Cres) for all samples with low to moderate Ctotal, whereas higher exposure was determined in some biochars with Ctotal > 10 mg/kg.

**Bioaugmentation, Clostridium thermocellum, High throughput sequencing, Melioribacter roseus, Methane yield**

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**Bioavailability and bioaccessibility of polycyclic aromatic hydrocarbons from (post-pyrolytically treated) biochars**

Bioavailability data of PAHs from biochar produced under real world conditions is scarce and the influence of feedstock and various post-pyrolysis treatments common in agriculture, such as co-composting or lacto-fermentation to produce silage fodder, on their bioavailability and bioaccessibility has hardly been studied. The total (Ctotal), and freely dissolved (i.e., bioavailable) concentrations (Cfree) of the sum of 16 US EPA PAHs of 43 biochar samples produced and treated in such ways ranged from 0.4 to almost 2000 mg/kg, and from 12 to 81 ng/L, respectively, which resulted in very high biochar-water partition coefficients (4.2 ≤ log KD ≤ 8.8 L/kg) for individual PAHs. Thirty three samples were incubated in contaminant traps that combined a diffusive carrier and a sorptive sink. Incubations yielded samples only containing desorption-resistant PAHs (Cres). The desorption resistant PAH fraction was dominant, since only eight out of 33 biochar samples showed statistically significant bioaccessible fractions (fbioaccessible = 1 - Cres/Ctotal). Bioavailability correlated positively with Ctotal/surface area. Other relationships of bioavailability and -accessibility with the investigated post-pyrolysis processes or elemental composition could not be found. PAH exposure was very limited (low Cfree, high Cres) for all samples with low to moderate Ctotal, whereas higher exposure was determined in some biochars with Ctotal > 10 mg/kg.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Agroscope, Aarhus University, Norwegian Geotechnical Institute, Ithaka Institute for Carbon Strategies
Authors: Hilber, I. (Ekstern), Mayer, P. (Intern), Gouliarmou, V. (Ekstern), Hale, S. E. (Ekstern), Cornelissen, G. (Ekstern), Schmidt, H. P. (Ekstern), Bucheli, T. D. (Ekstern)
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  - Scopus rating (2017): SJR 1.435 SNIP 1.448 CiteScore 4.62
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- BFI (2015): BFI-level 2
  - Scopus rating (2015): SJR 1.497 SNIP 1.567 CiteScore 4.04
  - Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
  - Scopus rating (2014): SJR 1.59 SNIP 1.639 CiteScore 3.76
  - Web of Science (2014): Indexed yes
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  - Scopus rating (2013): SJR 1.721 SNIP 1.751 CiteScore 3.92
  - ISI indexed (2013): ISI indexed yes
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- BFI (2012): BFI-level 2
  - Scopus rating (2012): SJR 1.794 SNIP 1.618 CiteScore 3.5
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  - Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
  - Scopus rating (2011): SJR 1.962 SNIP 1.508 CiteScore 3.61
  - ISI indexed (2011): ISI indexed yes
  - Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 2
  - Scopus rating (2010): SJR 1.879 SNIP 1.424
  - Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 2
  - Scopus rating (2009): SJR 1.842 SNIP 1.572
  - Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 1
  - Scopus rating (2008): SJR 1.658 SNIP 1.58
  - Web of Science (2008): Indexed yes
- Scopus rating (2007): SJR 1.5 SNIP 1.605
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- Scopus rating (2006): SJR 1.418 SNIP 1.673
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- Scopus rating (2005): SJR 1.479 SNIP 1.558
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- Scopus rating (2004): SJR 1.627 SNIP 1.479
  - Web of Science (2004): Indexed yes
- Scopus rating (2003): SJR 1.321 SNIP 1.323
  - Web of Science (2003): Indexed yes
- Scopus rating (2002): SJR 0.902 SNIP 1.06
  - Web of Science (2002): Indexed yes
Biodegradation of hydrocarbon mixtures in surface waters at environmentally relevant levels - Effect of inoculum origin on kinetics and sequence of degradation

Biodegradation is a dominant removal process for many organic pollutants, and biodegradation tests serve as tools for assessing their environmental fate within regulatory risk assessment. In simulation tests, the inoculum is not standardized, varying in microbial quantity and quality, thereby potentially impacting the observed biodegradation kinetics. In this study we investigated the effect of inoculum origin on the biodegradation kinetics of hydrocarbons for five inocula from surface waters varying in urbanization and thus expected pre-exposure to petroleum hydrocarbons. A new biodegradation method for testing mixtures of hydrophobic chemicals at trace concentrations was demonstrated: Aqueous solutions containing 9 hydrocarbons were generated by passive dosing and diluted with surface water resulting in test systems containing native microorganisms exposed to test substances at ng-μg/L levels. Automated Headspace Solid Phase Microextraction coupled to GC-MS was applied directly to these test systems to determine substrate depletion relative to abiotic controls. Lag phases were generally less than 8 days. First order rate constants were within one order of magnitude for each hydrocarbon in four of the five waters but lower in water from a rural lake. The sequence of degradation between the 9 hydrocarbons showed similar patterns in the five waters indicating the potential for using selected hydrocarbons for benchmarking between biodegradation tests. Degradation half-times were shorter than or within one order of magnitude of BioHCwin predictions for 8 of 9 hydrocarbons. These results showed that location choice is important for biodegradation kinetics and can provide a relevant input to aquatic exposure and fate models.
Biodegradation testing of chemicals with high Henry's constants – separating mass and effective concentration reveals higher rate constants

During simulation-type biodegradation tests, volatile chemicals will continuously partition between water phase and headspace. This study addressed how (1) this partitioning affects biodegradation test results and (2) it can be accounted for by combining mass balance and dynamic biodegradation models. An aqueous mixture of 9 (semi)volatile chemicals was first prepared using passive dosing and then diluted with environmental surface water to produce test systems containing concentrations in the ng/L to µg/L range. After incubation for 2 hours to 4 weeks, automated Headspace Solid Phase Microextraction (HS-SPME) was applied directly on the test systems to measure substrate depletion by biodegradation relative to abiotic controls. HS-SPME was also applied to determine air to water partitioning ratios. Water phase biodegradation rate constants, kwater, were up to 72 times higher than test system biodegradation rate constants, ksystem. True water phase degradation rate constants facilitate extrapolation to other air-water systems and are more suitable input parameters for aquatic exposure and fate models. As such, they should be considered more appropriate for...
risk assessments than test system rate constants.

Biodegradation testing of chemicals with high Henry's constants – Separating mass and effective concentration reveals higher rate constants

Biodegradation, Surface water, Partitioning, Degradation
Electronic versions:
Abstract_1_volatile_chemicals_FINAL.pdf
Source: PublicationPreSubmission
Source-ID: 133788762
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Biodegradation testing of chemicals with high Henry's constants – Separating mass and effective concentration reveals higher rate constants

Biodegradation, Surface water, Partitioning, Degradation
Electronic versions:
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Source: PublicationPreSubmission
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Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017
Scopus rating (2011): SJR 1.962 SNIP 1.508 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
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Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.658 SNIP 1.58
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.5 SNIP 1.605
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.418 SNIP 1.673
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.479 SNIP 1.558
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.627 SNIP 1.479
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.321 SNIP 1.323
Web of Science (2003): Indexed yes
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Web of Science (2002): Indexed yes
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Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.022 SNIP 0.844
Original language: English
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Biodegradation testing of hydrophobic chemicals in mixtures at low concentrations – covering the chemical space of petroleum hydrocarbons

Petroleum products are complex mixtures of varying composition containing thousands of hydrocarbons each with their own physicochemical properties and degradation kinetics. One approach for risk assessment of these products is therefore to group the hydrocarbons by carbon number and chemical class i.e. hydrocarbon blocks. However, the biodegradation kinetic data varies in quantity and quality for the different hydrocarbon blocks, hampering the characterization of their fate properties. In this study, biodegradation kinetics of a large number of hydrocarbons aiming to cover the chemical space of petroleum hydrocarbons, were therefore determined at ng/L to µg/L concentrations in surface water, seawater and activated sludge filtrate. Two hydrocarbon mixtures were prepared, comprising a total of 53 chemicals including paraffins, naphthenics and aromatic hydrocarbons from C8 to C20. Passive dosing from silicone rod loaded with the mixtures was used to prepare stock solutions. Test systems were then prepared using stock solution diluted with the surface water, seawater or activated sludge filtrate. Test systems were incubated at 20 °C on a roller for up to 98 days and analyzed using GC-MS and fully automated Solid Phase Micro Extraction. Results were normalized to parallel measurements of abiotic controls prior to evaluation of biodegradation kinetics. Degradation was generally faster in the activated sludge filtrate than in the seawater and lakewater. In the activated sludge filtrate lag phases were < 9 days for the 49 hydrocarbons that were degraded within test duration. Degradation rate constants and corresponding half-lives were determined for 44 of the hydrocarbons. In lakewater and seawater, less test chemicals were degraded within the test duration compared to the activated sludge filtrate.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Bioelectrochemical systems serve anaerobic digestion process for process monitoring and biogas upgrading

Bioelectrochemical systems (BES), which employ microbes as catalysts to convert chemical energy stored in organic matter into sustainable electricity and high-value chemicals, is an emerging and promising technology. BES have broad applications including wastewater treatment, chemical production, resource recovery and waste remediation. Recently, new concepts of been proposed. The purpose of this work was to optimize the AD process using BES in two aspects: developing a new volatile fatty acid (VFA) monitoring system which can be used as the AD process indicator, and for improving biogas quality by removing CO₂. In this thesis, a microbial desalination cell (MDC) was developed for measuring VFAs concentrations. The MDC was composed of three chambers, namely an anode, a cathode and a middle chamber. The samples were measured in the middle chamber, which was separated from the anode by an ionized form contained in the sample, diffused through AEM to the anode where they were microbially oxidized and produced current signals. The effect of operating parameters such as ionic strength and external resistance on the performance of the MDC-typed biosensor were assessed. High ionic strength and small external resistance were advantageous for current signal amplification. Two linear relationships between current outputs and VFA concentrations were observed. The response time was approx. 5 h and the detection range was 1 to 200 mM. The selectivity of the biosensor was demonstrated since organic matter such as protein and lipids were retained by the AEM and their interference was eliminated. The reliability was proved by real AD effluents. In order to reduce the construction cost and simplify the VFA biosensor, a new configuration was developed. The number of chambers was reduced from three to two. The new configuration was a microbial electrolysis cell (MEC). The anode and cathode chambers were separated by an AEM and a small additional voltage was supplied to the cell. The samples were measured in the cathode. The effect of different parameters such as external voltage, ionic strength and VFA composition ratio on the MEC-typed biosensor performance was evaluated. Higher current signals were observed under larger external voltage and higher ionic strengths. The current output was mainly contributed by acetate which was always dominant in AD reactors. The current density increased linearly along with VFAs concentrations ranging from 5 to 100 mM. The response of the biosensor was now only 1 h due to the faster transfer of VFAs supported by the external voltage. The interference from other non-ionic organic matter (glucose, cellulose, lipids and protein) could be eliminated since they were retained by the membrane. During the process, hydrogen (H₂) was generated from water hydrolysis. The produced H₂ could potentially contribute to the energy needs for operating the biosensor and thereby to a self-sustaining system. Moreover, the biosensor was successfully validated both with synthetic and real AD effluents. To improve biogas quality, a microbial electrolytic capture, separation and regeneration cell (MESC) was developed. The effects of external voltage and inlet gas flow rate were elucidated. The current output increased along with the gas flow rate, while cathodic pH and upgrading performance showed opposite
trends. The current output, cathodic pH and upgrading performance increased with the increasing external voltage supply. In MESC, acid and alkaline generation, CO2 capture, biogas upgrading and COD removal were simultaneously achieved. Under the optimum condition at 1.2 V external voltage and 19.6 mL/h gas flow rate, pH in the regeneration and cathode chambers could reach 1.34±0.04 and 9.19±0.11, respectively; the maximum methane content was up to 97.0±0.2% and COD removal efficiency reached 98.2±2.6%. The energy consumption for biogas upgrading was around 0.17 kWh/m3 raw biogas. Moreover, the generated H2 from water hydrolysis could potentially compensate for 23.4% of the energy consumption. It has been proved that the development of efficient, cheap, fast and reliable VFA monitoring with a wide detection range can be realized in BES which is sustainable and environmental friendly. The development technology could easily be installed as online monitoring system for optimizing the AD process. Moreover, BES could be a sustainable economic technology to upgrade biogas to biomethane and thereby increase the value of biogas. The proof-of-concept study in lab-scale offers ideas for expanding BES application.

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Bio-electrolytic sensor for rapid monitoring of volatile fatty acids in anaerobic digestion process
This study presents an innovative biosensor that was developed on the basis of a microbial electrolysis cell for fast and reliable measurement of volatile fatty acids (VFA) during anaerobic digestion (AD) process. The bio-electrolytic sensor was first tested with synthetic wastewater containing varying concentrations of VFA. A linear correlation (R2 = 0.99) between current densities (0.03 ± 0.01 to 2.43 ± 0.12 A/m2) and VFA concentrations (5–100 mM) was found. The sensor performance was then investigated under different affecting parameters such as the external voltage, VFA composition ratio, and ionic strength. Linear relationship between the current density and VFA concentrations was always observed. Furthermore, the bio-electrolytic sensor proved ability to handle interruptions such as the presence of complex organic matter, anode exposure to oxygen and low pH. Finally, the sensor was applied to monitor VFA concentrations in a lab-scale AD reactor for a month. The VFA measurements from the sensor correlated well with those from GC analysis which proved the accuracy of the system. Since hydrogen was produced in the cathode as byproduct during monitoring, the system could be energy self-sufficient. Considering the high accuracy, short response time, long-term stability and additional benefit of H2 production, this bio-electrolytic sensor could be a simple and cost-effective method for VFA monitoring during AD and other anaerobic processes.

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Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Jin, X. (Intern), Li, X. (Intern), Zhao, N. (Intern), Zhang, Y. (Intern), Angelidaki, I. (Intern)
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BFI (2017): BFI-level 2
Biological caproate production by Clostridium kluysteri from ethanol and acetate as carbon sources

Caproate is a valuable industrial product and chemical precursor. In this study, batch tests were conducted to investigate the fermentative caproate production through chain elongation from acetate and ethanol. The effect of acetate/ethanol ratio and initial ethanol concentration on caproate production was examined. When substrate concentration was controlled at 100 mM total carbon, hydrogen was used as an additional electron donor. The highest caproate concentration of 3.11 g/L was obtained at an ethanol/acetate ratio of 7:3. No additional electron donor was needed upon an ethanol/acetate ratio ≥7:3. Caproate production increased with the increase of carbon source until ethanol concentration over 700 mM, which inhibited the fermentation process. The highest caproate concentration of 8.42 g/L was achieved from high ethanol strength wastewater with an ethanol/acetate ratio of 10:1 (550 mM total carbon). Results obtained in this study can pave the way towards efficient chain elongation from ethanol-rich wastewater.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Tsinghua University
Authors: Yin, Y. (Exterrn), Zhang, Y. (Intern), Karakashev, D. B. (Intern), Wang, J. (Exterrn), Angelidaki, I. (Intern)
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Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
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Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
Web of Science (2015): Indexed yes
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Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
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BFI (2012): BFI-level 2
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ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.308 SNIP 2.507 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.089 SNIP 2.344
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Butanol fermentation of the brown seaweed Laminaria digitata by Clostridium beijerinckii DSM-6422
Seaweed represents an abundant, renewable, and fast-growing biomass resource for 3rd generation biofuel production. This study reports an efficient butanol fermentation process carried out by Clostridium beijerinckii DSM-6422 using enzymatic hydrolysate of the sugar-rich brown seaweed Laminaria digitata harvested from the coast of the Danish North Sea as substrate. The highest butanol yield (0.42g/g-consumed-substrates) compared to literature was achieved, with a significantly higher butanol:acetone-butanol-ethanol (ABE) molar ratio (0.85) than typical (0.6). This demonstrates the possibility of using the seaweed L. digitata as a potential biomass for butanol production. For the first time, consumption of alginate components was observed by C. beijerinckii DSM-6422. The efficient utilization of sugars and lactic acid further highlighted the potential of using this strain for future development of large-scale cost-effective butanol production based on (ensiled) seaweed.
By-product reuse in drinking water softening: influence of operating conditions on calcium carbonate pellet characteristics

Water utilities are becoming increasingly aware of the environmental sustainability of drinking water production and distribution, while still producing water meeting regulatory guidelines in a cost-effective manner. In areas with high water hardness, central drinking water softening can provide both socio-economic and environmental benefits. However, optimal implementation of softening requires a holistic approach including e.g. possibilities for by-product reuse. A pellet reactor is one widely used softening technology that may produce up to 350 kg calcium carbonate pellets per 1000 m³ softened water. As of yet, no overview exists of how the physical and chemical properties of pellets are affected by operating conditions, such as placement in the water treatment train and which seeding material is used (quartz sand or calcium carbonate). The aim of this study was to characterize pellets formed under different operating conditions in pilot scale experiments at 8 Danish water treatment plants softening 16 water types. Results showed that iron concentrations, measured with ICP-MS, varied from 19 to 9,200 mg/kg and manganese varied from 0.5 to 980 mg/kg. The concentrations depended on both the raw water quality and the location of softening in the treatment train. Despite differences in chemical dosage, chemical composition of influent water, and seeding material, XRD analyzes showed that all pellets crystallized as calcite and have a relatively low reactivity of 7.4 to 26 % measured by the Sauerbeck & Rietz method. Our study showed that some pellet characteristics, e.g. the concentrations of iron and manganese, can be controlled in the design of the softening process. This allows for optimization of pellets with respect to environmentally sustainable reuse and ensure a pellet composition with high market value e.g. in markets such as glass or chemical industries. Our results assist the circular economy thinking in drinking water production.

General information
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Organisations: Department of Environmental Engineering, Urban Water Systems, HOFOR A/S, NIRAS A/S
Authors: Tang, C. (Intern), Rosshaug, P. S. (Ekstern), Kristensen, J. B. (Ekstern), Rygaard, M. (Intern), Albrechtsen, H. (Intern)
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Calibration of the comprehensive NDHA-N₂O dynamics model for nitrifier-enriched biomass using targeted respirometric assays
The NDHA model comprehensively describes nitrous oxide (N₂O) producing pathways by both autotrophic ammonium oxidizing and heterotrophic bacteria. The model was calibrated via a set of targeted extant respirometric assays using enriched nitrifying biomass from a lab-scale reactor. Biomass response to ammonium, hydroxylamine, nitrite and N₂O additions under aerobic and anaerobic conditions were tracked with continuous measurement of dissolved oxygen (DO) and N₂O. The sequential addition of substrate pulses allowed the isolation of oxygen-consuming processes. The parameters to be estimated were determined by the information content of the datasets using identifiability analysis. Dynamic DO profiles were used to calibrate five parameters corresponding to endogenous, nitrite oxidation and ammonium oxidation processes. The subsequent N₂O calibration was not significantly affected by the uncertainty propagated from the DO calibration because of the high accuracy of the estimates. Five parameters describing the individual contribution of three biological N₂O pathways were estimated accurately (variance/mean < 10% for all estimated parameters). The NDHA model response was evaluated with statistical metrics (F-test, autocorrelation function). The 95%
confidence intervals of DO and N2O predictions based on the uncertainty obtained during calibration are studied for the first time. The measured data fall within the 95% confidence interval of the predictions, indicating a good model description. Overall, accurate parameter estimation and identifiability analysis of ammonium removal significantly decreases the uncertainty propagated to N2O production, which is expected to benefit N2O model discrimination studies and reliable full scale applications.

**General information**

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Organisations: Department of Environmental Engineering, Water Technologies, Department of Chemical and Biochemical Engineering, PROSYS - Process and Systems Engineering Centre, Technical University of Denmark
Authors: Domingo-Felez, C. (Intern), Calderó-Pascual, M. (Ekstern), Sin, G. (Intern), Plósz, B. G. (Intern), Smets, B. F. (Intern)
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Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
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Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
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Carbon Sequestration by Urban Trees

Carbon dioxide (CO2) is the most prominent component of anthropogenic greenhouse gas emissions, resulting mainly from fuel combustion in the built environment – for activities such as heating of buildings, urban mobility and cooking. The concentration of near-surface CO2 in cities is affected by a range of factors, including traffic density and atmospheric stability. Plants have the capacity to sequester CO2 through photosynthesis, and can therefore store carbon in plant biomass and in the soil. Green areas in the city may significantly affect local concentrations of atmospheric CO2, as observed in urban-to-rural comparisons showing lower CO2 concentration in the presence of vegetation. CO2 sequestration over the ‘urban forest’ displays diurnal variation during the growing period, with uptake during daytime when plants are photosynthetically active, and nocturnal emissions in response to respiration. High atmospheric CO2 concentrations represent a fertilizer for plants, promoting more efficient photosynthesis. However, urban plants often experience environmental stresses which compromise the photosynthetic apparatus, and in extreme cases may turn plants from carbon sinks into carbon sources. In this chapter, we review the most recent studies and highlight emerging research needs for a better understanding of present and future roles of urban trees in removing CO2 from the atmosphere.
Caries affected by calcium and fluoride in drinking water and family income

Water quality and socioeconomics influence caries in populations. This study broadens previous studies on how caries is associated with fluoride and calcium in drinking water and with family income by quantifying the combined effect of the three independent variables. The effects of calcium and fluoride can be described as independent effects of the two ions or, alternatively, in the form of saturation with respect to fluorite (CaF\(_2\)). A general linear model describes this relationship with high significance and the model confirms the important protective effect of calcium and fluoride, independently against caries. From the model, the relative importance of fluoride and calcium to protect against caries is quantified. The relationship between caries and family income is also highly significant. It is illustrated how the linear model can be applied in planning and analyzing drinking water softening in relation to caries.
Categorization of Advanced Materials and European Environmental Regulation

General information
State: Published
Authors: Hansen, S. F. (Intern), Pelsy, F. (Ekstern), Broomfield, M. (Ekstern), Kobe, A. (Ekstern)
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Cellular networks for reliable urban rainfall monitoring

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Fencl, M. (Intern)
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**Challenge of material recycling at large public events**

Large public events such as festivals, sports events or national celebrations tend to attract a considerable number of people. While some of the events are important sources of entertainment for the participants, such gatherings create a challenge to organize and maintain a functioning infrastructure. Sound waste management is one of the challenges. Some preliminary results presented here, concern waste material flows at a large public event, illustrated on the example of Roskilde Festival (Denmark). Roskilde Festival is a large annual event, which attracts more than 120,000 participants and generates more than 2000 tonnes of waste over eight days. In 2016, approximately 16% of the total waste generated was either recycled or sent to special treatment, the remaining (approximately 85%) ended up as residual waste and was sent to a waste-to-energy facility. While measures to promote material recycling at the festival have been implemented, our preliminary results suggest that there is currently large potential to recover additional materials for recycling and improve sustainability at large public events.

**Challenges in using allylthiourea and chlorate as specific nitrification inhibitors**

Allylthiourea (ATU) and chlorate (ClO3-) are often used to selectively inhibit nitritation and nitratation. In this work we identified challenges with use of these compounds in inhibitory assays with filter material from a biological rapid sand filter for groundwater treatment. Inhibition was investigated in continuous-flow lab-scale columns, packed with filter material from a full-scale filter and supplied with NH4+ or NO2-. ATU concentrations of 0.1-0.5 mM interfered with the indophenol blue method for NH4+ quantification leading to underestimation of the measured NH4+ concentration. Interference was stronger at higher ATU levels and resulted in no NH4+ detection at 0.5 mM ATU. ClO3- at typical concentrations for inhibition assays (1-10 mM) inhibited nitratation by less than 6%, while nitritation was instead inhibited by 91% when NH4+ was supplied. On the other hand, nitratation was inhibited by 67-71% at 10-20 mM ClO3- when NO2- was supplied, suggesting significant nitratation inhibition at higher NO2- concentrations. No chlorite (ClO2-) was detected in the effluent, and thus we could not confirm that nitration inhibition was caused by ClO3- reduction to ClO2-. In conclusion, ATU and ClO3- should be used with caution in inhibition assays, because analytical interference and poor selectivity for the targeted process may affect the experimental outcome and compromise result interpretation.
Challenges to a circular economy – the presence of impurities in wood waste for recycling

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering
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Challenges to application of the three points approach (3PA) - ambiguity in definition of event magnitude, spatial scales and goals

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Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Management Engineering, Technology and Innovation Management
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Changes in intermittent aeration regimes are effective tools to manage bio-granule size and microbial communities in partial nitritation-anammox SBRs

General information
Changes in phenology and the influence on the carbon sequestration in a Danish beech forest over 20 years

Observations of carbon sequestration in a Danish beech forest over the last 20 years have shown a steady increase in NEE. Earlier studies (Pilegaard et al. 2011) have shown, that about half of the increase can be attributed to an increase in the growing season length. The growing season has been determined as the carbon uptake period (CUP); i.e. the period with net uptake, determined from flux data. Additionally, we have determined the period with leaves (LP) from the attenuation of light below the canopy. In this analysis we add information from a phenology camera with data from the last 6 years using the R package Phenopix (Filippa et al. 2016). The new data is compared with CUP and LP to give more detailed information on the phenology. The information is used to examine the evolution of net ecosystem exchange (NEE) over the 20 year period.

Characterisation of wood combustion ashes

The combustion of wood chips and wood pellets for the production of renewable energy in Denmark increased from 5.7 PJ to 16 PJ during the period 2000-2015, and further increases are expected to occur within the coming years. In 2012, about 22,300 tonnes of wood ashes were generated in Denmark. Currently, these ashes are mainly landfilled, despite Danish legislation allowing their application onto forest and agricultural soils for fertilising and/or liming purposes.

During this PhD work, 16 wood ash samples generated at ten different Danish combustion plants were collected and characterised for their composition and leaching properties. Despite the relatively large variations in the contents of nutrients and trace metals, the overall levels were comparable to typical ranges reported in the literature for other wood combustion ashes, as well as with regards to leaching. In general, the composition of the ashes complied with Danish ash quality criteria, indicating that they may be applied onto forest soil. However, according to EU landfill waste acceptance criteria, the leachates corresponded to "non-hazardous" or "hazardous" waste, thereby suggesting that recirculation of the same ashes to forestry land may constitute an environmental issue as a result of leaching, especially with regards to Cr and Se.

The release of nutrients and contaminants from two selected wood ash samples (corresponding to one mixed ash sample and one fly ash sample) was estimated based on selected pH conditions and data for both short- and long-term leaching. Acidic conditions relevant for typical forest soils in Denmark indicated considerably higher releases of Cd, Mg, Zn and P compared with releases of the natural ash pH (more than two orders of magnitude difference). The leaching of Cl, K, Na and S was rather pH-independent, high during the initial leaching and most likely governed by the availability of these elements in the ash matrix. On the other hand, the leaching of Al, Ba, Ca, Cr, Mg, Sb, V and Zn was distributed over a wider liquid-to-solid (L/S) interval and differences of at least one order of magnitude were shown between the observed cumulative releases at L/S 10 L/kg and L/S 1000 L/kg. Relatively large fractions of P (i.e. 33 % and 48 % of the fly ash and
mixed ash P contents, respectively) were observed to dissolve after extraction with neutral ammonium citrate, which indicated the potential use of wood ashes as a P supplement for the soil.

The release of major elements such as Al, Ba, Ca, Fe, Mg, Si, P and S was governed mainly by mineral solubility. The most likely minerals governing the release of these elements were found to be in general agreement with mineral phases identified in the literature for other wood combustion ashes, but also municipal solid waste incineration ashes. The leaching of trace elements, such as Cu, Cr, Pb and Zn, was described adequately as a combination of mineral solubility, adsorption onto Al/Fe (hydr-) oxides and complexation with dissolved organic matter.

The influence of common ash pre-treatments, such as hardening (also known as ageing or maturing) and granulation, on ash chemistry, liming potential and leaching behaviour was investigated through a series of laboratory experiments. Ash granules were relatively hard (barely breakable by finger-pinch) and demonstrated a reduced leaching compared to loose ashes, an effect that appeared to be related to the specific surface area granules. Ash granules may be used in actual field applications to minimise dust generation. Hardening affected the mineralogical structure of the ashes, but their overall acid neutralisation capacity remained practically constant. Column leaching tests showed that hardened ashes presented pH levels about two units lower than fresh ashes and a reduced leaching of alkalinity. The leaching of As, P, Sb and V increased after hardening, while the leaching of Ba, Ca, Pb and Zn was generally reduced to concentration levels below or close to limit of quantitation levels. Ash hardening was observed to be a relatively simple and fast treatment. Preferably, this process should be carried out under controlled conditions, before the ashes are applied, as this will minimise their overall reactivity as well as the leaching of most trace elements.

The effects of ash application on the mobility of nutrients and trace elements in soil pore water were evaluated through a series of column experiments. The two uppermost soil horizons of a Danish nutrient-poor forest soil were tested against three ash dosages, namely 3, 9 and 30 tonnes/ha. Ash application promoted the release of nutrients such as K and P during the entire duration of the experiment, corresponding to about eight field-scale years. A short-term release of Cl, K, Mg and S was also observed within the first 500 L/m² of infiltrating water (corresponding to fewer than two years on the field scale). While an overall increase in the leached amounts of As and Cu from the organic soil horizon were observed in the case of ash application (from 2.2 to 5.0-5.8 mg/m² for As and from 2.0 to 4.9-7.6 mg/m² for Cu), their concentration levels in the percolating soil solutions was generally within Danish groundwater quality criteria. Though the effects of both the 3 and 9 tonnes/ha dosages were limited and comparable, the use of 30 tonnes/ha indicated considerably larger amounts of K, Mg, S and Si within the first 500 L/m² (at least five times larger than the soil controls). Furthermore, because of the low mobility of many trace elements, such as Cd, Cr, Ni, Pb and Zn, potential accumulation of these elements on the forest floor should be evaluated. Consequently, such high dosages cannot be recommended based on these experiments.
Characteristics of volatile compound emission and odor pollution from municipal solid waste treating/disposal facilities of a city in Eastern China

Transfer station, incineration plant, and landfill site made up the major parts of municipal solid waste disposal system of S city in Eastern China. Characteristics of volatile compounds (VCs) and odor pollution of each facility were investigated from a systematic perspective. Also major index related to odor pollution, i.e., species and concentration of VCs, olfactory odor concentration, and theoretic odor concentration, was quantified. Oxygenated compounds and hydrocarbons were the most abundant VCs in the three facilities. Different chemical species were quantified, and the following average concentrations were obtained: transfer station, 54 VCs, 2472.47 μg/m³; incineration plant, 75 VCs, 33,129.25 μg/m³; and landfill site, 71 VCs, 1694.33 μg/m³. Furthermore, the average olfactory odor concentrations were 20,388.80; 50,677.50; and 4951.17, respectively. The highest odor nuisance was detected in the waste tipping port of the incineration plant. A positive correlation between the olfactory and chemical odor concentrations was found with R² = 0.918 (n = 15, P < 0.01). The result shows odor pollution risk transfer from landfill to incineration plant when adopting thermal technology to deal with the non-source-separated waste. Strong attention thus needs to be paid on the enclosed systems in incineration plant to avoid any accidental odor emission.

General information
Characterization of the planktonic microbiome in upflow anaerobic sludge blanket reactors during adaptation of mesophilic methanogenic granules to thermophilic operational conditions

Upflow anaerobic sludge blanket (UASB) technology refers to reactor technology where granules, i.e. self-immobilised microbial associations, are the biological catalysts involved in the anaerobic digestion process. During the start-up period, UASB reactors operate at relatively long HRT and therefore the liquid phase of the reactor becomes a favourable environment for microbial growth. The current study aimed to elucidate the dynamicity of the suspended microbial community in UASB reactors, during the transition from mesophilic to thermophilic conditions. High throughput 16S rRNA amplicon sequencing was used to characterize the taxonomic composition of the microbiome. The results showed that the microbial community was mainly composed by hydrolytic and fermentative bacteria. Results revealed relevant shifts in the microbial community composition, which is mainly determined by the operational conditions and the reactor performance. Finally, shared OTUs between the microbial consortia of the suspended and the granular sludge showed that planktonic microbiota is significantly influencing the granule microbial community composition.

General information
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Characterization of waste from nanoenabled products: Occurrence, distribution, fate and nanoparticle release

In the last decades, benefits provided by nanotechnology have been utilised for example to increase the sustainability and functionality of consumer products. Engineered nanomaterials (ENMs) are widely used in consumer products across different applications, but their use in nanoproducts has not been regulated specifically - as is the case for other chemicals and substances. This has caused concern regarding the possible release and effects of ENMs during the life cycle of nanoproducts. Specifically knowledge regarding the end-of-life phase is limited. In order to assess the potential environmental exposure or risks associated with ENMs in waste from nanoproducts, it is necessary to investigate what ENMs are being used and to which extent, how they are treated at the end-of-life of the nanoproduct and, finally, what is the likelihood of them being released during waste treatment. This PhD project addressed these knowledge gaps by mapping and analysing available nano-enabled products, developing a method for categorising waste material fractions of nanoproducts and estimating their likely waste treatment. Furthermore, new experimental data regarding ENM release from nano-enabled products was provided, applying a standardised waste characterisation test. To investigate the abundance and distribution of nanoproducts, different product inventories exist, such as BUND, PEN CPI and The Nanodatabase. However, they are all limited by the lack of available quantitative information about ENM mass or particle number in the products. Overall, the most common product applications for ENMs are the “Health & Fitness” or “Home & Garden” sector, which was still the case, despite the increasing number of nanoproducts. The product inventories PEN CPI and The Nanodatabase are based on manufacturers’ claims regarding nanotechnology, which are often unsubstantial leading to many products being registered with an unknown ENM, such as 64% of all products registered on The Nanodatabase. It was discovered that out of all ENMs registered on The Nanodatabase nano-Ag was used in the greatest number of products and in a range of product applications (e.g. in cosmetics, textiles and food containers). By utilising The Nanodatabase product inventory, a method was developed for analysing the distribution of ENMs in waste, which involved the estimation of ENM fate in selected waste treatments based on their main matrix material. This information was included on The Nanodatabase to enable the online analysis of different waste treatment scenarios. The waste treatment analysis revealed that the most significant waste material fraction was “Plastic packaging” followed by “Electronic”, “Textile” and “Multi material” waste. “Plastic packaging” waste involved mainly the large number of products sold in plastic containers, meaning that the remaining ENM mass at the time of disposal is expected to be minor. Nano-Ag was
widespread across the identified waste fractions, thereby corresponding with the wide use of the material in different product categories. Furthermore, titanium-, silicon- and carbon-based ENMs were also present in several different waste material fractions (i.e. “Electronic”, “Multi material”, “Unknown”, “Plastic, other” and “Plastic, packaging”), whereas nano-phosphate and bamboo charcoal were only found in “Batteries” and “Textile” waste, respectively. In terms of waste treatment, it was estimated that on average in the EU around 50% of nano-enabled products are recycled, 19% are incinerated and 26% landfilled. However, these percentages depend on the specific waste treatments available in the investigated region. It is also expected that more ENMs will eventually enter a landfill, since they may accumulate in sewage sludge or waste incineration ashes, both of which are often landfilled. Another prerequisite for ENM characterisation in a waste scenario is the ability to quantify the potential ENM release from a nanowaste matrix. Experimental characterisation of ENM release from nano-enabled products or waste matrices is scarce, and most studies are limited by analytical constraints to detect the ENMs, or have investigated an artificial or “spiked” waste matrix. These studies cannot identify the behaviour of ENMs released from a real nano-enabled product nor how realistic environmental conditions will influence this release. The main challenges facing experimental nanowaste characterisation relate to the complexity of the matrices (both the waste matrix itself and the variety of ENM and product matrix combinations), the low concentration of ENMs present in the waste and, for some ENMs, the background quantities of natural particles being high making it near impossible to distinguish between engineered and natural entities. In this thesis, selected nanoproducts were investigated using a standardised waste characterisation test and the potential ENM release was characterised using nano-specific methods, namely single particle-ICP-MS, TEM/EDX and zeta potential. Since more than 50% of ENMs are expected to be landfilled on a global scale, a standardised batch leaching test was applied to characterise the nanoproducts. The case studies represented two different types of ENMs and product matrices: self-cleaning ceramic tiles with a nano-TiO2 coating and wood painted with nano-CuO wood protection paint. Different environmental conditions were mimicked i.e. high ionic strength (added CaCl2) and addition of organic matter. For both materials, the potential ENM release under these conditions was considered to be low, but they indicated that, there was an effect of media conditions on the particles released from a nano-enabled product. For nano-TiO2-coated tiles, total titanium release was approximately 0.01 µg/g material or below detection limit, slightly higher concentrations were found in leachates from nano-enabled tiles. Particle sizes and number concentrations were below calculated limits of detection (with the exception of one sample, “Ti CAL”) and the sp-ICP-MS analysis generally suffered interference from calcium. For wood painted with nano-CuO paint, presence of nano-Cu particles, of approximately 60-80nm in size, was confirmed using sp-ICP-MS. However, these findings are associated with uncertainty, and so additional tests are needed to assess quantitatively the nano-CuO release in terms of particle size and number concentration. While these two case studies showed limited release, it cannot be excluded that other matrix and ENM combinations may cause more significant releases. New approaches concerning nanowaste characterisation, both indirect and direct methods, were presented in this thesis, but further research is needed to develop and validate these methods. Future studies, assessing the potential release of ENMs from waste, should apply nano-enabled products and different product matrix combinations to take into account the transformations of the ENMs which may occur during the product life cycle. The development of analytical methods is promising e.g. the use of fingerprinting or other tracer techniques for ENMs, and sp-ICP-MS is becoming a routine analysis, though large challenges regarding matrix complexity and interferences still persist. Considering the large number of nanoproducts available, the potential release of ENMs from these products would have to be understood to perform a risk assessment of these products. Since ENMs are considered possible contaminants of the solid waste, it is important to include nano-specific characterisation tests in waste characterisation to ensure a safe disposal of the nanowaste.

General information
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Characterizing Climate Change Adaptation In Copenhagen
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Chemical disinfection of combined sewer overflows

In Copenhagen, a significant number of harbour bathing areas are occasionally closed for recreational activities, due to the discharge of untreated combined sewer overflows (CSOs). A CSO event occurs when the designed capacity of the combined sewer system is exceeded during major rainfall events. A CSO, a variable mixture of wastewater and rainwater, is discharged into the nearby surface water, which renders surface water unusable for recreational activities, such as bathing. This is because the microbial water quality receiving waters is not of a suitable quality as mentioned in the EU directive 2006/7/EC. Nordic countries have a short summer season, and the frequent closures of harbour bathing areas in prime weeks for recreational activities are due mainly to the discharge of untreated CSO. Disinfecting a CSO in the existing CSO structure, before discharging it to the surface water, would be a quick way to maintain limits on the indicator bacteria of 500 MPN Escherichia coli (E. coli) per 100 mL and 200 MPN Enterococcus spp per 100 mL in the receiving waters. Disinfecting CSO has not been practiced before in Denmark, but it would increase the usability of surface waters for recreational activities. The occurrence of a CSO event, and its quality and quantity, is unpredictable, so the disinfectants employed for such a task should be robust, in order to treat water varying in quality.

The present thesis provides a solution to designing a CSO disinfection system, without changing CSO overflow structures. An overview of the chemical disinfection of a CSO, from the batch scale to the full-scale, was studied, and disinfection efficiency was evaluated by calculating the removal of bacteria from a CSO and quantifying disinfectants during treatment. Residual toxicity was studied for a preliminary risk assessment of disinfectants entering the aquatic ecosystem in the receiving water’s post-disinfection discharge.

Performic acid (PFA) and peracetic acid (PAA) are used to disinfect CSO water, in order to reduce the number of indicator bacteria. Moreover, PFA and PAA do not form toxic by-products when they react with the ammonia present in the CSO. Disinfectant dose and contact time in the present study were designed by disinfecting a laboratory-simulated CSO with different wastewater concentrations. Degradation kinetics of PFA and PAA in the simulated CSO as well as the disinfection efficiency were studied. PAA degradation in the simulated CSO was slower compared to the degradation of PFA, the latter of which, at a dose (1-8 mg/L) and with 10 minutes’ contact time, efficiently removed 4.2 logs of E. coli and 3 logs of Enterococcus spp from the simulated CSO. Furthermore, the ecotoxicity of the residual disinfectants PFA, PAA and chlorine dioxide (ClO2), and their degradation products hydrogen peroxide and chlorite, in relation to organisms in the aquatic ecosystem was studied. With the help of ecotoxicity data, a preliminary environmental risk assessment of PFA, PAA and ClO2 in disinfected CSO water was done, to ensure the safety of the aquatic ecosystem in the receiving waters. This assessment could also be used to obtain permission from authorities for full-scale disinfection. Based on the maximum allowable concentration quality standards for the freshwater and predicted residual concentrations of PFA, PAA and ClO2, a minimum dilution factor (590 times for PFA, 138 times for PAA and 700 times for ClO2) is needed for discharge into the surface water, to avoid the risk of toxic effect in the aquatic environment, albeit the rapid degradation of PFA and ClO2 in water will not have an acute toxic effect, and lower dilution factors may also be safe for the receiving waters.

PFA and PAA were applied for the full-scale disinfection of CSO in two different Danish CSO structures. In the first CSO events, 2-8 mg/L PFA with 20 minutes’ contact time efficiently reduced E. coli and Enterococcus spp below the limit mentioned in EU directive 2006/7/EC, when treated CSO was diluted into the Øresund strait. In the second CSO event, however, low PFA (1-4 mg/L) failed to reduce the number of E. coli and Enterococcus spp bacteria below the limit mentioned in the EU directive, even after dilution, entering the Øresund. PAA was used for full-scale disinfection when CSO was pretreated with chemical coagulation and through the HydroSeparator to remove suspended solids. During the CSO event, 10 mg/L PAA reduced Enterococcus spp from 105.5 MPN per 100 mL to 103.7 MPN per 100 mL with 10 minutes’ contact time. Microbial profiles, made by measuring Enterococcus spp before and after a CSO event, revealed that the numbers of Enterococcus spp post-disinfection were almost the same as pre-existing Enterococcus spp in the first recipient. To summarise, frequent closures of recreational areas can be minimised by chemically disinfecting CSOs before discharging into surface waters.
Cloud-shadow removal for Unmanned Aerial System multispectral imagery based on tensor decomposition methods

Multispectral images acquired on board of Unmanned Aerial Systems (UAS) provide unprecedented opportunities to monitor vegetation status and functioning at spatial scales compatible with field instrumentation and field management. UAS such as hexacopters acquire overlapping images that are mosaicked into larger images to produce ortho-photomaps. Frequently, especially in northern latitudes, the images to be mosaicked have been acquired under varying irradiance conditions due to moving clouds that create artifacts in the detected signal unrelated to physical changes in vegetation properties. In order to exploit the full potential of UAS, correction methods should be developed to provide ortho-rectified images that can provide robust estimates of vegetation properties. We applied a Tucker tensor decomposition method to reconstruct images using a four-way factorization scheme. By doing so, this study succeeded to remove the cloud shadow effects and image noise in UAS imagery providing normalized reflectance. The comparison between the corrected and un-corrected images shows a significant improvement for reflectance estimation in the shadow areas. Further, analysis of vegetation indices e.g. normalized difference vegetation index derived from the corrected and un-corrected images also showed improvement. This method could also have the ability to resolve artifacts, such as temporary objects (e.g. humans, tractors etc.) from the vegetation background.
Co-cultivation of Green Microalgae and Methanotrophic Bacteria for Single Cell Protein Production from Wastewater

Conventional water treatment technologies remove nutrients via resource intensive processes. However, new approaches for residual nutrient recycling are needed to provide food to the increasing world population. This work explores the use of microbial biomass – methane oxidizing bacteria and green microalgae – as a means to recover nutrients from industrial wastewater and upcycle them to feed grade single cell protein. Results demonstrated that both algae and bacteria could remove or assimilate most of the organic carbon present in the wastewater. However, their growth stopped before nutrients and substrates in the gas phase (i.e., methane and oxygen for methanotrophs and carbon dioxide for algae) were depleted. Likely, algal growth was light limited and stopped after organic carbon was consumed, whilst growth of methanotrophic bacteria could be limited by trace elements (e.g., copper). Nevertheless, the amino acid profile of both the monocultures and the algal-bacteria consortium was suitable for substitution of conventional protein sources. Further research should focus on increasing productivity of biomass grown on wastewater resources.

General information
State: Published
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ABSTRACT

Co-existence of Anaerobic Ammonium Oxidation Bacteria and Denitrifying Anaerobic Methane Oxidation Bacteria in Sewage Sludge: Community Diversity and Seasonal Dynamics

Anaerobic ammonium oxidation (ANAMMOX) and denitrifying anaerobic methane oxidation (DAMO) have been recently discovered as relevant processes in the carbon and nitrogen cycles of wastewater treatment plants. In this study, the seasonal dynamics of ANAMMOX and DAMO bacterial community structures and their abundance in sewage sludge collected from wastewater treatment plants were analysed. Results indicated that ANAMMOX and DAMO bacteria co-existed in sewage sludge in different seasons and their abundance was positively correlated (P < 0.05). The high abundance of ANAMMOX and DAMO bacteria in autumn and winter indicated that these seasons were the preferred time to favour the growth of ANAMMOX and DAMO bacteria. The community structure of ANAMMOX and DAMO bacteria could also shift with seasonal changes. The “Candidatus Brocadia” genus of ANAMMOX bacteria was mainly recovered in spring and summer, and an unknown cluster was primarily detected in autumn and winter. Similar patterns of seasonal variation in the community structure of DAMO bacteria were also observed. Group B was the dominant in spring and summer, whereas in autumn and winter, group A and group B presented almost the same proportion. The redundancy analysis revealed that pH and nitrate were the most significant factors affecting community structures of these two groups (P < 0.01). This study reported the diversity of ANAMMOX and DAMO in wastewater treatment plants that may be the basis for new nitrogen removal technologies.

General information
State: Published
Organisations: Department of Environmental Engineering, Tsinghua University
Authors: Xu, S. (Ekstern), Lu, W. (Ekstern), Mustafa, M. F. (Ekstern), Caicedo, L. M. (Ekstern), Guo, H. (Intern), Fu, X. (Ekstern), Wang, H. (Ekstern)
Number of pages: 9
Co-fermentation of onion and whey: A promising synbiotic combination

Juice from three different onion varieties was mixed with sweet whey and used as growth substrate for four lactic acid bacteria strains, isolated from agri-food by-products, to evaluate the possibility to exploit such substrates, known to be rich in bioactive molecules, as fermented drinks for human consumption. Results show good growth performance for Lactobacillus fabifermantans, L. plantarum and Streptococcus macedonicus. On the contrary S. thermophilus did not grow in the mixture while S. macedonicus did not develop in pure onion juice. After 48 h the overall sugar content decreased significantly. In particular, glucose was not utilized while inulin was completely preserved. Moreover, MS/MS analysis revealed the presence of the rare trisaccharide lactosucrose. In the light of these considerations, the formulation obtained may be considered a potential synbiotic product with pleasant taste and beneficial effects for consumers and also an eco-friendly solution to convert an agro-food by-product into value added products.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padova, Universidade Federal de Ouro Preto
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Scopus rating (2016): CiteScore 3.49 SJR 1.19 SNIP 1.255
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.327 SNIP 1.571 CiteScore 4.31
Web of Science (2015): Indexed yes
Scopus rating (2014): SJR 1.304 SNIP 1.639 CiteScore 3.94
Scopus rating (2013): SJR 1.517 SNIP 2.134 CiteScore 5.12
ISI indexed (2013): ISI indexed yes
Scopus rating (2012): SJR 1.154 SNIP 1.425 CiteScore 2.91
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Food Science, Medicine (miscellaneous), Nutrition and Dietetics, Functional food, Lactobacillus, Lactosucrose, Prebiotic, Streptococcus

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Comammox Nitrospira are key nitrifiers in diverse groundwater-fed drinking water filters

Nitrification is a dominant process in groundwater-fed rapid sand filters (RSFs) used for drinking water purification. Near complete removal of ammonium and nitrite is required in the EU and Denmark due to strict regulatory limits that enable high water stability in the distribution system. RSFs are a unique environment harboring diverse microbial communities including a range of ammonia oxidizers (AOs); Betaproteobacterial ammonia oxidizers (Nitrosomonas, Nitrosospira), ammonia oxidizing archaea, diverse heterotrophs and a large fraction of Nitrospira spp., which in one studied filter have been shown to comprise both nitrite oxidizers as well as complete nitrifying (comammox) Nitrospira spp. (Palomo et al. 2016). We developed a new qPCR assay for the quantification of the comammox Nitrospira amoA gene which amplifies both clades A and B and applied this assay to the study of 12 drinking water treatment plants across Denmark. We further sequenced amplicons of the 16S rRNA gene of total Bacteria and amoA gene of Nitrospira to examine the microbial biodiversity present in the filters. Our results show that comammox Nitrospira are present in high abundance making up an average of 19% of the microbial communities in the examined filters. While members of both clades A (41 sequence variants) and B (47 sequence variants) were both present in high abundance, the majority of comammox diversity (70-90% in each filter) was made up by clade B. Ordination analysis with variance partitioning was performed on the total microbial communities and the comammox Nitrospira communities to identify physicochemical parameters of the influent water, filter material, or operational parameters which influenced the community structures in an effort to understand the success of comammox Nitrospira in these filters. Temperature as well as the sulfate and calcium content of the influent water made significant contributions towards explaining the total and comammox community structures, while the iron content of the filter material made a significant contribution to explaining only the structure of the comammox Nitrospira communities. Further examination of groundwater-fed RSFs with higher variability in microbial communities and physicochemical parameters may provide further information on the ecology of comammox Nitrospira and explain their success in the groundwater-fed filters examined in this study. Together this work provides a new assay for the simultaneous detection of clade A and B comammox Nitrospira and expands our current knowledge of the diversity of comammox Nitrospira, while attempting to explain the success of comammox Nitrospira in these groundwater-fed filters.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Fowler, J. (Intern), Palomo, A. (Intern), Smets, B. F. (Intern)
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Main Research Area: Technical/natural sciences
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AEESPAbstractFowler.pdf
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Combined forward osmosis-reverse osmosis for the treatment of brewery wastewater

General information
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Organisations: Department of Environmental Engineering, Water Technologies
Authors: Schneider, C. (Intern), Zarebska, A. (Intern), Hélix-Nielsen, C. (Intern)
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Forward osmosis, Brewery wastewater, Water extraction, Cleaning
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Abstract book
Source: PublicationPreSubmission
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Combined UV treatment and ozonation for the removal of by-product precursors in swimming pool water

Both UV treatment and ozonation are used to reduce different types of disinfection by-products (DBPs) in swimming pools. UV treatment is the most common approach, as it is particularly efficient at removing combined chlorine. However, the UV treatment of pool water increases chlorine reactivity and the formation of chloro-organic DBPs such as trihalomethanes. Based on the similar selective reactivity of ozone and chlorine, we hypothesised that the created reactivity to chlorine, as a result of the UV treatment of dissolved organic matter in swimming pool water, might also be expressed as increased reactivity to ozone. Moreover, ozonation might saturate the chlorine reactivity created by UV treatment and mitigate increased formation of a range of volatile DBPs. We found that UV treatment makes pool water highly reactive to ozone. The subsequent reactivity to chlorine decreases with increasing ozone dosage prior to contact with chlorine. Furthermore, ozone had a half-life of 5 min in non-UV treated pool water whereas complete consumption of ozone was obtained in less than 2 min in UV treated pool water. The ozonation of UV-treated pool water induced the formation of some DBPs that are not commonly reported in this medium, in particular trichloronitromethane, which is noteworthy for its genotoxicity, though this issue was removed by UV treatment when repeated combined UV/ozone treatment interchanging with chlorination was conducted over a 24-h period. The discovered reaction could form the basis for a new treatment method for swimming pools.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
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Scopus rating (2017): SJR 2.601 SNIP 2.358 CiteScore 7.55
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Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.592 SNIP 2.192
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.319 SNIP 2.224
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.073 SNIP 2.178
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.94 SNIP 2.184
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.902 SNIP 2.233
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.113 SNIP 2.334
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.209 SNIP 2.108
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.702 SNIP 1.908
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.568 SNIP 1.757
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.319 SNIP 1.69
Web of Science (2001): Indexed yes
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Source-ID: 127622078
Publication: Research - peer-review → Journal article – Annual report year: 2017

Comment on "Assessing Aromatic-Hydrocarbon Toxicity to Fish Early Life Stages Using Passive-Dosing Methods and Target-Lipid and Chemical-Activity Models"

General information
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Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Mayer, P. (Intern), Nørgaard Schmidt, S. (Intern)
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Journal: Environmental Science and Technology
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Comparative assessment of Vibrio virulence in marine fish larvae

Vibronaceae infections are a major obstacle for marine larviculture; however, little is known about virulence differences of Vibrio strains. The virulence of Vibrio strains, mostly isolated from vibriosis outbreaks in farmed fish, was tested in larval challenge trials with cod (Gadus morhua), turbot (Scophthalmus maximus) and halibut (Hippoglossus hippoglossus) using a multiwell dish assays with single-egg/larvae cultures. The strains differed significantly in virulence as some caused a high mortality of larva reaching 100% mortality after a few days, while others had no or only marginal effects on survival. Some Vibrio strains were pathogenic in all of the larva species, while some caused disease only in one of the species. Twenty-nine of the Vibrio anguillarum strains increased the mortality of larvae from at least one fish species; however, pathogenicity of the strains differed markedly. Other Vibrio species had no or less pronounced effects on larval mortalities. Iron uptake has been related to V. anguillarum virulence; however, the presence or absence of the plasmid pJM1 encoding anguibactin did not correlate with virulence. The genomes of V. anguillarum were compared (D. Castillo, P.W. D'Alvise, M. Middelboe & L. Gram, unpublished data) and most of the high-virulent strains had acquired virulence genes from other pathogenic Vibrio.

General information
State: Published
Organisations: Department of Systems Biology, Bacterial Ecophysiology and Biotechnology, Department of Environmental Engineering, National Food Institute, Department of Biotechnology and Biomedicine, Bacterial Ecophysiology and Biotechnology, University of Copenhagen, University of Bergen, Fishlab, Institute of Marine Research
Authors: Rønneseth, A. (Ekstern), Castillo, D. (Ekstern), D'Alvise, P. (Intern), Tønnesen, Ø. (Ekstern), Haugland, G. (Ekstern), Grotkjær, T. (Intern), Engell-Sørensen, K. (Ekstern), Nørremark, L. (Ekstern), Bergh, Ø. (Ekstern), Wergeland, H. I. (Ekstern), Gram, L. (Intern)
Pages: 1373-1385
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.12
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.71
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.99
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.74
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.7
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.09
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Comparative LCA of repairing flooded houses versus construction of a dam

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Management Engineering, Quantitative Sustainability Assessment
Authors: Hennequin, T. (Intern), Sørup, H. J. D. (Intern), Dong, Y. (Intern), Ambjerg-Nielsen, K. (Intern)
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Comparative use of different emission measurement approaches to determine methane emissions from a biogas plant

A sustainable anaerobic biowaste treatment has to mitigate methane emissions from the entire biogas production chain, but the exact quantification of these emissions remains a challenge. This study presents a comparative measurement campaign carried out with on-site and ground-based remote sensing measurement approaches conducted by six measuring teams at a Swedish biowaste treatment plant. The measured emissions showed high variations, amongst others caused by different periods of measurement performance in connection with varying operational states of the plant. The overall methane emissions measured by ground-based remote sensing varied from 5 to 25kg/h-1 (corresponding to a methane loss of 0.6-3.0% of upgraded methane produced), depending on operating conditions and the measurement method applied. Overall methane emissions measured by the on-site measuring approaches varied between 5 and 17kg/h-1 (corresponding to a methane loss of 0.6 and 2.1%) from team to team, depending on the number of measured emission points, operational state during the measurements and the measurement method applied. Taking the operational conditions into account, the deviation between different approaches and teams could be explained, in that the two largest methane-emitting sources, contributing about 90% of the entire site's emissions, were found to be the open digestate storage tank and a pressure release valve on the compressor station.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Deutsches Biomasseforschungszentrum gemeinnützige GmbH, SP Technical Research Institute of Sweden
Authors: Reinelt, T. (Ekstern), Delre, A. (Intern), Westerkamp, T. (Ekstern), Holmgren, M. A. (Ekstern), Liebetrau, J. (Ekstern), Scheutz, C. (Intern)
Comparison of approaches for assessing sustainable remediation of contaminated sites

It has been estimated that there are approximately 2.5 million potentially contaminated sites in Europe. Of these, approximately 340,000 sites are thought to be contaminated to a degree that may require remediation (Joint Research Center, 2014). Until recently, remediation was considered to be inherently green or sustainable since it removes a contaminant problem. However, it is now broadly recognized that while remediation is intended to address a local environmental threat, it may cause other local, regional and global impacts on the environment, society and economy. Over the last decade, the broader assessment of these criteria is occurring in a movement toward ‘sustainable remediation’. This paper aims to review the available methods for assessing the sustainability of remediation alternatives.

Sustainable remediation seeks to reduce direct contaminant point source impacts on the environment, while minimizing the indirect cost of remediation to the environment, society and economy. Here we present and compare the available tools and methods for assessing the sustainability of remedial solutions and discuss some of the key issues and future challenges. The aim of a sustainability assessment is to compare the sustainability of two or more remedial solutions for a contaminated site. A sustainability assessment does not provide an absolute measure of whether remediation of a specific site is sustainable. Instead it provides a relative measure which can be used to select the most sustainable solution from amongst a number of defined remedial scenarios.

Results of the review show that most approaches use multi-criteria assessment methods (MCA) to structure a decision support process because it allows the combined assessment of criteria which may be either quantitatively or qualitatively assessed. Different combinations of environmental, social and economic criteria are employed, and are assessed either in qualitative or quantitative forms with various tools such as life cycle assessment and cost benefit analysis. Stakeholder involvement, which is a key component of sustainable remediation, is conducted in various ways. Some approaches involve stakeholders directly in the evaluation or weighting of criteria, whereas other approaches only indirectly consider stakeholder preferences.

This study has reviewed available methods for assessing and comparing the sustainability of contaminated site remediation alternatives. It is concluded that MCA methods are very useful when comparing remediation alternatives, since they allow for a joint assessment of many types of indicators; however the available tools and methods differ substantially, for instance in their selection of indicators, criteria evaluation methods, and approaches to stakeholder involvement and uncertainty analysis. Further work is needed in order to test the assessment approaches for real case studies, since to date only few documented case applications have been published. The presentation will give specific examples of approaches ranging from more qualitative assessments to more quantitative assessments of criteria.
Comparison of Fenton, UV-Fenton and nano-Fe$_3$O$_4$ catalyzed UV-Fenton in degradation of phloroglucinol under neutral and alkaline conditions: Role of complexation of Fe$^{3+}$ with hydroxyl group in phloroglucinol

Phloroglucinol degradation at initial pH from 7.0 to 9.0 has been investigated in Fenton, UV-Fenton and nano-Fe$_3$O$_4$ catalyzed UV-Fenton (Hetero-Fenton). Within the reaction time given in this study (not more than 4 h), 150 mgÅ·L$^{-1}$ phloroglucinol was completely removed, while there was some difference in TOC removal efficiency: about 90% for UV-Fenton, nearly 60% for Fenton and Hetero-Fenton. Increasing initial pH from 7.0 to 9.0, there was an obvious decline in the degradation rate. The average values of H$2$O$2$ utilization efficiency were 0.65 ± 0.01 for Fenton, 0.66 ± 0.09 for UV-Fenton, and 1.35 ± 0.15 for Hetero-Fenton, suggesting Hetero-Fenton required less H$2$O$2$ consumption. Solution pH could decrease to strongly acidic conditions of pH <4.0 and the generation of organic acids including formic, acetic, oxalic, and maleic acids depended on the type of oxidation process. The spectrophotometric study showed phloroglucinol would complex with Fe(III) at pH 7.0 to form homogeneous aqueous solution which exhibited strong light absorption in the wavelength range of 400 nm to 600 nm. Therefore, formation of Fe(III)-phloroglucinol complex and pH decrease to strongly acidic condition played important roles in Fenton degradation under neutral and alkaline pH. The result of effect of pollutant content showed phloroglucinol at lower concentrations of 20 and 50 mgÅ·L$^{-1}$ could still be completely removed by all Fenton-based systems at pH 7.0, however, in Fenton with 20 mgÅ·L$^{-1}$ phloroglucinol, a significantly decreased degradation rate was observed due to the slowdown of pH drop and inhibited formation of Fe(III)-phloroglucinol complex.
Comparison of radar and numerical weather model rainfall forecasts in the perspective of urban flood prediction
An early flood warning system has been developed for urban catchments and is currently running in online operation in Copenhagen. The system is highly dependent on the quality of rainfall forecast inputs. An investigation of precipitation inputs from Radar Nowcast (RN), Numerical Weather Prediction (NWP) with assimilation of radar and cloud data (RA3), and Ensemble NWP with 25 members (S05) is conducted by comparing against rain gauge measurements and flood extent. Despite lower spatial and temporal resolution, the ensemble product seems promising for forecasting extreme events. A combination of the three forecast products is expected to yield the optimal input for flood warning.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Technical University of Denmark, Biofos A/S, Krüger A/S, Danish Meteorological Institute
Authors: Lovring, M. M. (Ekstern), Löwe, R. (Intern), Courdent, V. A. T. (Intern), Meneses, E. J. (Ekstern), Petersen, S. O. (Ekstern), Vedel, H. (Ekstern), Petersen, H. M. (Ekstern), Mikkelsen, P. S. (Intern)
Number of pages: 4
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Event: Abstract from 14th IWA/IAHR International Conference on Urban Drainage 2017, Prague, Czech Republic.
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 137133740
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Comparison of the impacts of urban development and climate change on exposing European cities to pluvial flooding
The economic and human consequences of extreme precipitation and the related flooding of urban areas have increased rapidly over the past decades. Some of the key factors that affect the risks to urban areas include climate change, the densification of assets within cities and the general expansion of urban areas. In this paper, we examine and compare quantitatively the impact of climate change and recent urban development patterns on the exposure of four European cities to pluvial flooding. In particular, we investigate the degree to which pluvial floods of varying severity and in different geographical locations are influenced to the same extent by changes in urban land cover and climate change. We have selected the European cities of Odense, Vienna, Strasbourg and Nice for analyses to represent different climatic conditions, trends in urban development and topographical characteristics. We develop and apply a combined remote-sensing and flood-modelling approach to simulate the extent of pluvial flooding for a range of extreme precipitation events for historical (1984) and present-day (2014) urban land cover and for two climate-change scenarios (i.e. representative concentration pathways, RCP 4.5 and RCP 8.5). Changes in urban land cover are estimated using Landsat satellite imagery for the period 1984-2014. We combine the remote-sensing analyses with regionally downscaled estimates of precipitation extremes of current and expected future climate to enable 2-D overland flow simulations and flood-hazard assessments. The individual and combined impacts of urban development and climate change are quantified by examining the variations in flooding between the different simulations along with the corresponding uncertainties. In addition, two different assumptions are examined with regards to the development of the capacity of the urban drainage system in response to urban development and climate change. In the "stationary" approach, the capacity resembles present-day design, while it is updated in the "evolutionary" approach to correspond to changes in imperviousness and precipitation intensities due to urban development and climate change respectively. For all four cities, we find an increase in flood exposure corresponding to an observed absolute growth in impervious surfaces of 7-12% during the past 30 years of urban development. Similarly, we find that climate change increases exposure to pluvial flooding under both the RCP 4.5 and RCP 8.5 scenarios. The relative importance of urban development and climate change on flood exposure varies
considerably between the cities. For Odense, the impact of urban development is comparable to that of climate change under an RCP 8.5 scenario (2081-2100), while for Vienna and Strasbourg it is comparable to the impacts of an RCP 4.5 scenario. For Nice, climate change dominates urban development as the primary driver of changes in exposure to flooding. The variation between geographical locations is caused by differences in soil infiltration properties, historical trends in urban development and the projected regional impacts of climate change on extreme precipitation. Developing the capacity of the urban drainage system in relation to urban development is found to be an effective adaptation measure as it fully compensates for the increase in runoff caused by additional sealed surfaces. On the other hand, updating the drainage system according to changes in precipitation intensities caused by climate change only marginally reduces flooding for the most extreme events.
Compositional data analysis of household waste recycling centres in Denmark

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Girona
Authors: Edjabou, M. E. (Intern), Martín-Fernández, J. A. (Ekstern), Boldrin, A. (Intern), Astrup, T. F. (Intern)
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Compositional data analysis of household waste recycling centres in Denmark

The Danish government has set a target of 50% recycling rates for household waste by 2022. To achieve this goal, the Danish municipalities should increase the source separation of household waste. While significant knowledge and experiences were locally gained, lessons learnt have not been extensively exploited country-wise, an important reason being that the influence of these changes has not been rigorously investigated and quantified, meaning that generalized conclusions could not be drawn so far. One of the reasons is that a consistent calculation method to assess and document the effect of these projects on the recycling rates does not exist. Thus, compositional data analysis technique was applied to analyze consistently waste data. Based on the waste composition obtained from a recycling center in Denmark, we analyzed the composition of waste treatment and disposal options. Zero and non-zero pattern was used to describe historical changes in the definition and components of waste fractions. Variation array was applied to determine the relationship between waste treatment and disposal options. As a result, compositional data analysis technique enables to analyze waste data regardless of the unit (mass or percentage).

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Girona
Authors: Edjabou, M. E. (Intern), Martín-Fernández, J. A. (Ekstern), Boldrin, A. (Intern), Astrup, T. F. (Intern)
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Concentration of downstream effluents from pharmaceutical industry using Aquaporin Inside™ hollow fiber forward osmosis membranes - Influence of flow conditions on membrane performance

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Organisations: Department of Environmental Engineering, Water Technologies, Aquaporin A/S, Technical University of Denmark, GSK Vaccines S.r.l.
Authors: Camilleri Rumbau, M. S. (Forskerdatabase), Vargas, L. C. (Ekstern), Romagnoli, A. (Ekstern), Trzaskus, K. (Ekstern), Gad, E. (Ekstern), Helix-Nielsen, C. (Intern)
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Conceptualization of contamination using depth discrete monitoring of dynamic PCE concentration changes during pumping

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Capital Region of Denmark
Authors: Broholm, M. M. (Intern), Fjordbøge, A. S. (Intern), Mosthaf, K. (Intern), Binning, P. J. (Intern), Brauns, B. (Intern), Bjerg, P. L. (Intern), Kerm-Jespersen, H. (Ekstern)
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Conceptualization of residual contamination using depth discrete monitoring of dynamic PCE concentration changes during and after remedial pumping and pumping test

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Organisations: Department of Environmental Engineering, Water Resources Engineering, Office for Study Programmes and Student Affairs, Office for Innovation & Sector Services, Region Hovedstaden
Authors: Broholm, M. M. (Intern), Fjordbøge, A. S. (Intern), Mosthaf, K. (Intern), Binning, P. J. (Intern), Brauns, B. (Intern), Tsitseli, T. (Intern), Bjerg, P. L. (Intern), Kerm-Jespersen, H. (Ekstern)
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Conceptualization of residual contamination using depth discrete monitoring of dynamic PCE concentration changes during and after remedial pumping and pumping test

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Office for Study Programmes and Student Affairs, Office for Innovation & Sector Services, Capital Region of Denmark
Authors: Broholm, M. M. (Intern), Fjordbøge, A. S. (Intern), Mosthaf, K. (Intern), Binning, P. J. (Intern), Brauns, B. (Intern), Tsitseli, T. (Intern), Bjerg, P. L. (Intern), Kerrn-Jespersen, H. (Ekstern)
Number of pages: 1
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Contaminant mass discharge to streams: Comparing direct groundwater velocity measurements and multi-level groundwater sampling with an in-stream approach

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, University of Kansas
Authors: Rønde, V. (Intern), McKnight, U. S. (Intern), Sonne, A. T. (Intern), Balbarini, N. (Intern), Devlin, J. (Ekstern), Bjerg, P. L. (Intern)
Pages: 43-54
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Web of Science (2018): Indexed yes
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Scopus rating (2017): SJR 0.891 SNIP 1.003 CiteScore 2.36
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.26 SJR 1.037 SNIP 1.077
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.941 SNIP 1.073 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.293 SNIP 1.516 CiteScore 2.4
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.51 SNIP 1.457 CiteScore 3.04
Continuous estimation of gross primary productivity and evapotranspiration from an Unmanned Aerial System

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, National Space Institute, Geodesy, Atmospheric Environment, Technical University of Denmark, European Commission - Joint Research Center
Authors: Wang, S. (Intern), Bandini, F. (Intern), Jakobsen, J. (Intern), Zarco Tejada, P. J. (Ekstern), Liu, X. (Ekstern), Olesen, D. H. (Intern), Ibrom, A. (Intern), Bauer-Gottwein, P. (Intern), Garcia, M. (Intern)
Number of pages: 1
Publication date: 2017
Event: Abstract from 2017 AGU Fall Meeting, New Orleans, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
Controlling sewer systems – a critical review based on systems in three EU cities

The term Real Time Control (RTC) is widely used to describe all types of control systems in sewer systems. Today the term covers everything from the simplest to the most advanced types of control systems, making it difficult to communicate about sewer system control in a precise manner, as well as search and find specific types of control systems for comparison. Through a survey of implemented control systems in three EU cities today and with the perspectives of current research within the field of sewer system control, the needs for a new control system design framework is identified. With the basis of existing frameworks for control system design, a new time-scale dependent framework is proposed. We believe this comprehensive time-scale dependent framework can help water utilities to retrofit and design new control solutions and facilitate knowledge sharing about existing designs.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, HOFOR A/S, Biofos A/S
Authors: Mollerup, A. L. (Ekstern), Mikkelsen, P. S. (Intern), Thornberg, D. (Ekstern), Sin, G. (Intern)
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Main Research Area: Technical/natural sciences

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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 1.39 SJR 0.717 CiteScore 2.14
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.769 SNIP 1.261 CiteScore 1.87
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.584 SNIP 1.13 CiteScore 1.42
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.617 SNIP 1.997 CiteScore 1.67
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.703 SNIP 1.071 CiteScore 1.58
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.709 SNIP 1.275 CiteScore 1.52
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.409 SNIP 0.866 CiteScore 0.88
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.268 SNIP 0.462
Scopus rating (2009): SJR 0.484 SNIP 0.796
Scopus rating (2008): SJR 0.199 SNIP 0.217
Scopus rating (2007): SJR 0.252 SNIP 0.633
Scopus rating (2006): SJR 0.105 SNIP 0.162
Converting wastewater into fertilizing irrigation

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Danish Technological Institute, Minor Change Group, Samse spildevand
Authors: Litty, K. (Ekstern), Lindholst, S. (Ekstern), Mikkelsen, N. (Ekstern), Moestrup, N. (Ekstern), Aagaard, J. (Ekstern), Rasmussen, P. E. (Ekstern), Heinen, N. (Ekstern), Haase, J. (Ekstern), Andersen, H. R. (Intern)
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Editors: Flindt Jørgensen, L., Mosolff Larsen, T., Jensen, B. K.
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Copper dosing enhances nitrification in biofilters treating groundwater

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Water Technologies, Krüger A/S
Authors: Wagner, F. B. (Intern), Borch Nielsen, P. (Ekstern), Diwan, V. (Intern), Boe-Hansen, R. (Ekstern), Smets, B. F. (Intern), Dechesne, A. (Intern), Albrechtsen, H. (Intern)
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Event: Abstract from Water Quality Technology Conference (WQTC) 2017, Portland, United States.
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Correction to Development of Comparative Toxicity Potentials of TiO₂ Nanoparticles for Use in Life Cycle Assessment

General information
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Organisations: Quantitative Sustainability Assessment, Department of Environmental Engineering, Environmental Chemistry, Department of Management Engineering, Technical University of Denmark, Quantis, Radboud University Nijmegen
Authors: Ettrup, K. (Ekstern), Kounina, A. (Ekstern), Hansen, S. F. (Intern), Meesters, J. A. J. (Ekstern), Blikra Vea, E. (Ekstern), Laurent, A. (Intern)
Pages: 7295-7295
Publication date: 2017
Main Research Area: Technical/natural sciences
Corrigendum to "Microbial pesticide removal in rapid sand filters for drinking water treatment - Potential and kinetics" [Water Res. 48 (2014) 71-81]
Coulombic interactions during advection-dominated transport of ions in porous media

Solute transport of charged species in porous media is significantly affected by the electrochemical migration term resulting from the charge-induced interactions among dissolved ions and with solid surfaces. Therefore, the characterization of such Coulombic interactions and their effect on multicomponent ionic transport is of critical importance for assessing the fate of charged solutes in porous media. In this work we present a detailed investigation of the electrochemical effects during conservative multicomponent ionic transport in homogeneous and heterogeneous domains by means of laboratory bench-scale experiments and numerical simulations. The investigation aims at quantifying the key role of small-scale electrostatic interactions in flow-through systems, especially when advection is the dominant mass-transfer process. Considering dilute solutions of strong electrolytes (e.g., MgCl₂ and NaBr) we report results showing the important role of Coulombic interactions in the lateral displacement of the different ionic species for steady-state transport scenarios in which the solutions are continuously injected through different portions of the flow-through chamber [1, 2]. Successively, we focus our attention on transient transport and pulse injection of the electrolytes. In these experiments high-resolution spatial and temporal monitoring of the ions' concentrations (600 samples; 1800 concentration measurements), at closely spaced outlet ports (5 mm), allowed us resolving the effects of charge interactions on the temporal breakthrough and spatial profiles of the cations and anions [3]. The interpretation of the experimental results requires a multicomponent modeling approach with an accurate description of local hydrodynamic dispersion, as well as the explicit quantification of the dispersive fluxes’ cross-coupling due to the Coulombic interactions between the charged species. A new 2-D simulator [4], coupling the solution of the multicomponent ionic transport problem with the geochemical code PHREEQC has been developed and used to quantitatively interpret the experimental results.

General information
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Organisations: Department of Environmental Engineering, Water Resources Engineering, Technical University of Denmark
Authors: Muniruzzaman, M. (Ekstern), Stolze, L. (Intern), Rolle, M. (Intern)
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Conference: EGU General Assembly 2017, Vienna, Austria, 24/04/2017 - 24/04/2017
Counter-diffusion biofilms have lower N\textsubscript{2}O emissions than co-diffusion biofilms during simultaneous nitrification and denitrification: Insights from depth-profile analysis

The goal of this study was to investigate the effectiveness of a membrane-aerated biofilm reactor (MABR), a representative of counter-current substrate diffusion geometry, in mitigating nitrous oxide (N2O) emission. Two laboratory-scale reactors with the same dimensions but distinct biofilm geometries, i.e., a MABR and a conventional biofilm reactor (CBR) employing co-current substrate diffusion geometry, were operated to determine depth profiles of dissolved oxygen (DO), nitrous oxide (N2O), functional gene abundance and microbial community structure. Surficial nitrogen removal rate was slightly higher in the MABR (11.0 ± 0.80 g-N/(m\textsuperscript{2} day)) than in the CBR (9.71 ± 0.94 g-N/(m\textsuperscript{2} day)), while total organic carbon removal efficiencies were comparable (96.9 ± 1.0% for MABR and 98.0 ± 0.8% for CBR). In stark contrast, the dissolved N2O concentration in the MABR was two orders of magnitude lower (0.011 ± 0.001 mg N2O-N/L) than that in the CBR (1.38 ± 0.25 mg N2O-N/L), resulting in distinct N2O emission factors (0.0058 ± 0.0005% in the MABR vs. 0.72 ± 0.13% in the CBR). Analysis on local net N2O production and consumption rates unveiled that zones for N2O production and consumption were adjacent in the MABR biofilm. Real-time quantitative PCR indicated higher abundance of denitrifying genes, especially nitrous oxide reductase (nosZ) genes, in the MABR versus the CBR. Analyses of the microbial community composition via 16S rRNA gene amplicon sequencing revealed the abundant presence of the genera Thauera (31.2 ± 11%), Rhizobium (10.9 ± 6.6%), Stenotrophomonas (6.8 ± 2.7%), Sphingobacteria (3.2 ± 1.1%) and Brevundimonas (2.5 ± 1.0%) as potential N2O-reducing bacteria in the MABR.
Covalent organic polymer functionalization of activated carbon surfaces through acyl chloride for environmental clean-up

Nanoporous networks of covalent organic polymers (COPs) are successfully grafted on the surfaces of activated carbons, through a series of surface modification techniques, including acyl chloride formation by thionyl chloride. Hybrid...
composites of activated carbon functionalized with COPs exhibit a core-shell formation of COP material grafted to the outer layers of activated carbon. This general method brings features of both COPs and porous carbons together for target-specific environmental remediation applications, which was corroborated with successful adsorption tests for organic dyes and metals.
Cross validation of two partitioning-based sampling approaches in mesocosms containing PCB contaminated field sediment, biota, and activated carbon amendment

The Gold Standard for determining freely dissolved concentrations (C_free) of hydrophobic organic compounds in sediment interstitial water would be in situ deployment combined with equilibrium sampling, which is generally difficult to achieve. In the present study, ex situ equilibrium sampling with multiple thicknesses of silicone and in situ pre-equilibrium sampling with low density polyethylene (LDPE) loaded with performance reference compounds were applied independently to measure polychlorinated biphenyls (PCBs) in mesocosms with (1) New Bedford Harbor sediment (MA, USA), (2) sediment and biota, and (3) activated carbon amended sediment and biota. The aim was to cross validate the two different sampling approaches. Around 100 PCB congeners were quantified in the two sampling polymers, and the results confirmed the good precision of both methods and were in overall good agreement with recently published silicone to LDPE partition ratios. Further, the methods yielded C_free in good agreement for all three experiments. The average ratio between C_free determined by the two methods was factor 1.4±0.3 (range: 0.6-2.0), and the results thus cross-validated the two sampling approaches. For future investigations, specific aims and requirements in terms of application, data treatment, and data quality requirements should dictate the selection of the most appropriate partitioning-based sampling approach.

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Organisations: Department of Environmental Engineering, Environmental Chemistry, Northeastern University, US Army Corps of Engineers, University of Maryland Baltimore County, U.S. Environmental Protection Agency
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.535 SNIP 1.941 CiteScore 6.58
Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 6.26 SJR 2.559 SNIP 1.902
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.546 SNIP 1.838 CiteScore 5.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.777 SNIP 2.003 CiteScore 5.5
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.952 SNIP 2.102 CiteScore 5.52
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.115 SNIP 2.043 CiteScore 5.17
ISI indexed (2012): ISI indexed yes
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CryoSat-2 Altimetry Applications over Rivers and Lakes

Monitoring the variation of rivers and lakes is of great importance. Satellite radar altimetry is a promising technology to do this on a regional to global scale. Satellite radar altimetry data has been used successfully to observe water levels in lakes and (large) rivers, and has also been combined with hydrologic/hydrodynamic models. Except CryoSat-2, all radar altimetry missions have been operated in conventional low resolution mode with a short repeat orbit (35 days or less). CryoSat-2, carrying a Synthetic Aperture Radar (SAR) altimeter, has a 369-day repeat and a drifting ground track pattern and provides new opportunities for hydrologic research. The narrow inter-track distance (7.5 km at the equator) makes it possible to monitor many lakes and rivers and SAR mode provides a finer along-track resolution, higher return power and speckle reduction through multi-looks. However, CryoSat-2 challenges conventional ways of dealing with satellite inland water altimetry data because virtual station time series cannot be directly derived for rivers. We review the CryoSat-2 mission characteristics, data products, and its use and perspectives for inland water applications. We discuss all the important steps in the workflow for hydrologic analysis with CryoSat-2, and conclude with a discussion of promising future research directions.
CryoSat-2 radar altimetry for monitoring freshwater resources of China

Surface water bodies (lakes, reservoirs, and rivers) are key components of the water cycle and are important water resources. Water level and storage vary greatly under the impacts of climate change and human activities. Due to sparse in-situ monitoring networks, a comprehensive national-scale monitoring dataset of surface water bodies in China is not available. Over the last two decades, satellite altimetry has been used successfully for inland water monitoring. Here, we use CryoSat-2 radar altimetry to monitor water level variations of large lakes, reservoirs and rivers across China and demonstrate its potential to complement available in-situ monitoring datasets for the country.

In this study, over 1000 lakes and reservoirs, and 6 large rivers are investigated. The results show that surface water varied greatly over the past 6 years, e.g. in the Tibetan Plateau, the Junggar Basin, the Northeast China Plain, and the central Yangtze River basin. Estimated changes in volume indicate that surface water variation contributes significantly to terrestrial storage variation, especially in the Qaidam Basin and the Tibetan Plateau. CryoSat-2 is capable of measuring regional-scale river level at high spatial resolution and competitive accuracy as demonstrated by comparison with available in-situ gauging data. The results are encouraging with RMSE values ranging from 0.24 to 0.35 m for the Heilongjiang-Amur River, 0.22 to 0.6 m for the Yellow River and 0.22 to 0.5 m for the Songhua River. Comparatively, accuracy is much lower over the Yangtze and Pearl Rivers (RMSE ~ 2.6 m and ~ 3.3 m), probably due to intensive inland waterway navigation. CryoSat-2 shows great potential for monitoring surface water at national scale in China.
**CryoSat-2 satellite radar altimetry for river analysis and modelling**

The global coverage of in situ observations of surface water dynamics is insufficient to effectively manage water resources. Moreover, the availability of these data is decreasing, due to the lack of gauging stations and data sharing. Satellite radar altimetry, initially developed to monitor ocean water levels, also offers measurements of water levels of rivers and lakes on a global scale. Because of the continuous upstart of new missions, and sensor and processing innovations, the importance of satellite altimetry data for the hydrologic community is increasing.

CryoSat-2, launched by the European Space Agency (ESA) in 2010, is one of the more recent additions to the set of satellite altimeters. It is unique due to two characteristics. First, its radar altimetry instrument provides, besides conventional observations in Low Resolution mode (LRM), observations in Synthetic Aperture Radar (SAR) and Synthetic Aperture Radar Interferometric (SARIn) mode. SAR and SARIn have reduced footprint size in the along-track direction owing to delay/Doppler processing, potentially increasing observation accuracy. Second, CryoSat-2 is placed on a unique long-repeat orbit with a cycle of 369 days. This is different from previous and current satellite altimetry missions, which are in short-repeat orbits with cycles of 10 to 35 days.

The orbit configuration of CryoSat-2 is a challenge for hydrologic applications. Short-repeat missions allow deriving time series at locations where the satellite ground track repeatedly intersects with the river – the so-called virtual stations. Because of the long repeat cycle of CryoSat-2, its virtual station time series have a temporal resolution of 369 days, which is inadequate for most hydrologic applications. This requires rethinking some methods to process such data, distribute them to the hydrologic community and combine them with river models. However, the orbit configuration of CryoSat-2 also results in a small inter-track distance, providing measurements with unprecedented spatial resolution along rivers. These points were the main motivation for this PhD study.

Two case studies were chosen; the Po River in Italy, and the Brahmaputra River in South Asia. CryoSat-2 level 2 data, i.e. point observations of surface height, were filtered over high resolution river masks derived from Landsat imagery. This yielded roughly 340 observations per year over the Po River, and roughly 1300 per year over the Brahmaputra River. The CryoSat-2 observations were validated against in situ observations along the Po River. The average root mean square error (RMSE) between CryoSat-2 and in situ observations was found to be 0.38m, which is comparable to previous missions.

The CryoSat-2 water level observations then were used to parameterize 1-dimensional (1D) hydrodynamic river models. For the Po River, where surveyed cross sections are available, CryoSat-2 was used to calibrate channel roughness. The distributed CryoSat-2 data allowed calibrating channel roughness with a higher spatial resolution than possible in a conventional approach using in situ data. Over the ungauged Brahmaputra River, CryoSat-2 data were used to calibrate shapes of synthetic cross sections. For the calibrated model, the RMSE between simulated and CryoSat-2 observed water levels is 1.24m. It is assumed to accurately reproduce water level-discharge relationships; without relying on river cross section information.

Finally, the potential of CryoSat-2 data for updating hydrodynamic models was evaluated based on the Brahmaputra River case study. A flexible Data Assimilation (DA) framework was developed, which can assimilate observations of river state with any spatio-temporal resolution to a DHI MIKE HYDRO River 1D hydrodynamic model. DA can, amongst others, improve flood forecasting. Synthetic tests showed a high potential of CryoSat-2, improving discharge predictions of the model in terms of Continuous Ranked Probability Score (CRPS) by up to 32%, while real tests could improve the CRPS by up to 10%. Also, synthetic experiments were conducted to evaluate the impact of increased observation accuracy and different sampling patterns.

The results from this study highlight the value of CryoSat-2 altimetry data, which delivers water level observations with unprecedented spatial resolution along rivers. The study presented methods to cope with the distinct spatio-temporal distribution of the CryoSat-2 data and move beyond the common concept of virtual stations. Potentially, this flexibility opens up new opportunities for the use of remote sensing data in the hydrologic community.

**General information**

State: Published  
Organisations: Department of Environmental Engineering, Water Resources Engineering, DHI Denmark  
Authors: Schneider, R. (Intern), Bauer-Gottwein, P. (Intern), Madsen, H. (Ekstern)  
Number of pages: 61
Density and distribution of nitrifying guilds in rapid sand filters for drinking water production: Dominance of Nitrospira spp.

We investigated the density and distribution of total bacteria, canonical Ammonia Oxidizing Bacteria (AOB) (Nitrosomonas plus Nitrosospira), Ammonia Oxidizing Archaea (AOA), as well as Nitrobacter and Nitrospira in rapid sand filters used for groundwater treatment. To investigate the spatial distribution of these guilds, filter material was sampled at four drinking water treatment plants (DWTPs) in parallel filters of the pre- and after-filtration stages at different locations and depths. The target guilds were quantified by qPCR targeting 16S rRNA and amoA genes. Total bacterial densities (ignoring 16S rRNA gene copy number variation) were high and ranged from 109 to 1010 per gram (1015 to 1016 per m3) of filter material. All examined guilds, except AOA, were stratified at only one of the four DWTPs. Densities varied spatially within filter (intra-filter variation) at two of the DWTPs and in parallel filters (inter-filter variation) at one of the DWTPs. Variation analysis revealed random sampling as the most efficient strategy to yield accurate mean density estimates, with collection of at least 7 samples suggested to obtain an acceptable (below half order of magnitude) density precision. Nitrospira was consistently the most dominant guild (5–10% of total community), and was generally up to 4 orders of magnitude more abundant than Nitrobacter and up to 2 orders of magnitude more abundant than canonical AOBs. These results, supplemented with further analysis of the previously reported diversity of Nitrospira in the studied DWTPs based on 16S rRNA and nxrB gene phylogeny (Gülay et al., 2016; Palomo et al., 2016), indicate that the high Nitrospira abundance is due to their comammox (complete ammonia oxidation) physiology. AOA densities were lower than AOB densities, except in the highly stratified filters, where they were of similar abundance. In conclusion, rapid sand filters are microbially dense, with varying degrees of spatial heterogeneity, which requires replicate sampling for a sufficiently precise determination of total microbial community and specific population densities. A consistently high Nitrospira to bacterial and archaeal AOB density ratio suggests that non-canonical pathways for nitrification may dominate the examined RSFs.

General information
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Organisations: Department of Environmental Engineering, Urban Water Systems, Water Technologies
Authors: Tatari, K. (Intern), Musovic, S. (Intern), Gülay, A. (Intern), Dechesne, A. (Intern), Albrechtsen, H. (Intern), Smets, B. F. (Intern)
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  - Scopus rating (2017): SJR 2.601 SNIP 2.358 CiteScore 7.55
  - Web of Science (2017): Indexed yes
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  - Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
  - Web of Science (2015): Indexed yes
  - BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.592 SNIP 2.192
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.319 SNIP 2.224
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.073 SNIP 2.178
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.94 SNIP 2.184
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.902 SNIP 2.233
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.113 SNIP 2.334
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.209 SNIP 2.108
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.702 SNIP 1.908
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.568 SNIP 1.757
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.319 SNIP 1.69
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.399 SNIP 1.662
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.432 SNIP 1.55

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DOIs:
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Relations
Activities:
DNA and RNA SIP reveal ammonium and nitrite oxidizers in groundwater fed biofilters
Source: FindIt
Source-ID: 2391857878
Publication: Research - peer-review › Journal article – Annual report year: 2017

Destruction of DBPs and their precursors in swimming pool water by combined uv-treatment and ozonation

General information
Detailed landfill leachate plume mapping using 2D and 3D Electrical Resistivity Tomography - with correlation to ionic strength measured in screens

Leaching of organic and inorganic contamination from landfills is a serious environmental problem as surface water and aquifers are affected. In order to assess these risks and investigate the migration of leachate from the landfill, 2D and large scale 3D electrical resistivity tomography were used at a heavily contaminated landfill in Grindsted, Denmark. The inverted 2D profiles describe both the variations along the groundwater flow as well as the plume extension across the flow directions. The 3D inversion model shows the variability in the low resistivity anomaly pattern corresponding to differences in the ionic strength of the landfill leachate. Chemical data from boreholes agree well with the observations indicating a leachate plume which gradually sinks and increases in size while migrating from the landfill in the groundwater flow direction. Overall results show that the resistivity method has been very successful in delineating the landfill leachate plume and that good correlation exists between the resistivity model and leachate ionic strength.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Aarhus University
Authors: Maurya, P. (Ekstern), Rønde, V. (Intern), Fiandaca, G. (Ekstern), Balbarini, N. (Intern), Auken, E. (Ekstern), Bjerg, P. L. (Intern), Christiansen, A. (Ekstern)
Pages: 1-8
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Main Research Area: Technical/natural sciences

Publication Information
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Volume: 138
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 1.137 SJR 0.636 CiteScore 1.83
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.752 SNIP 1.334 CiteScore 1.72
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.837 SNIP 1.405 CiteScore 1.67
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.903 SNIP 1.725 CiteScore 1.95
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.839 SNIP 1.471 CiteScore 1.74
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
In this study, a full-scale enclosed microalgal air-lift photobioreactor (PBR) module was operated using both defined and industrial wastewater (WW) media. In the effort to establish full-scale operation: a WW ultrafiltration system, two algal productions, and a harvesting microfiltration system were tested. Bioindustrial WW medium was treated with ultrafiltration and was demonstrated to be a viable microalgal growth medium at large scale; however, further treatment is needed for the removal of fecal coliform to meet drinking water standards. The fresh water mesophilic algae Chlorella sorokiniana was successfully grown on bioindustrial WW medium at suboptimal temperatures (<25 °C) and natural lighting with peak specific growth rate (SGR) of 0.48 day⁻¹, consistent with lab-scale results from literature. Optical densities (OD) of the algae at 665, 680, and 735 nm were found to be viable proxies for cell number of C. sorokiniana grown outdoors with daily fluctuations, despite inherent differences in chlorophyll sensitivity at each absorbance wavelength. However, OD measurements at different reactor locations shown to diverge at the onset of growth. Greenhouse temperature and solar insolation were measured, where it was observed that the SGR did not considerably improve from higher solar irradiance during periods of lower temperatures. Finally, the viability of harvested cells after microfiltration was also examined, with a negative exponential correlation between cell death and the volume of remaining filter condensate (R² = 0.9247).

**Detailing the start-up and microalgal growth performance of a full-scale photobioreactor operated with bioindustrial wastewater**

In this study, a full-scale enclosed microalgal air-lift photobioreactor (PBR) module was operated using both defined and industrial wastewater (WW) media. In the effort to establish full-scale operation: a WW ultrafiltration system, two algal productions, and a harvesting microfiltration system were tested. Bioindustrial WW medium was treated with ultrafiltration and was demonstrated to be a viable microalgal growth medium at large scale; however, further treatment is needed for the removal of fecal coliform to meet drinking water standards. The fresh water mesophilic algae Chlorella sorokiniana was successfully grown on bioindustrial WW medium at suboptimal temperatures (<25 °C) and natural lighting with peak specific growth rate (SGR) of 0.48 day⁻¹, consistent with lab-scale results from literature. Optical densities (OD) of the algae at 665, 680, and 735 nm were found to be viable proxies for cell number of C. sorokiniana grown outdoors with daily fluctuations, despite inherent differences in chlorophyll sensitivity at each absorbance wavelength. However, OD measurements at different reactor locations shown to diverge at the onset of growth. Greenhouse temperature and solar insolation were measured, where it was observed that the SGR did not considerably improve from higher solar irradiance during periods of lower temperatures. Finally, the viability of harvested cells after microfiltration was also examined, with a negative exponential correlation between cell death and the volume of remaining filter condensate (R² = 0.9247).
Determining lower threshold concentrations for synergistic effects

Though only occurring rarely, synergistic interactions between chemicals in mixtures have long been a point of focus. Most studies analyzing synergistic interactions used unrealistically high chemical concentrations. The aim of the present study is to determine the threshold concentration below which proven synergists cease to act as synergists towards the aquatic crustacean Daphnia magna. To do this, we compared several approaches and test-setups to evaluate which approach gives the most conservative estimate for the lower threshold for synergy for three known azole synergists. We focus on synergistic interactions between the pyrethroid insecticide, alpha-cypermethrin, and one of the three azole fungicides prochloraz, propiconazole or epoxiconazole measured on Daphnia magna immobilization. Three different experimental setups were applied: A standard 48h acute toxicity test, an adapted 48h test using passive dosing for constant chemical exposure concentrations, and a 14-day test. Synergy was defined as occurring in mixtures where either EC50 values decreased more than two-fold below what was predicted by concentration addition (horizontal assessment) or as mixtures where the fraction of immobile organisms increased more than two-fold above what was predicted by independent action (vertical assessment). All three tests confirmed the hypothesis of the existence of a lower azole threshold concentration below which no synergistic interaction was observed. The lower threshold concentration, however, decreased with increasing test duration from 0.026±0.013μM (9.794±4.897μgL(-1)), 0.425±0.089μM (145.435±30.46μgL(-1)) and 0.757±0.253μM (249.659±83.44μgL(-1)) for prochloraz, propiconazole and epoxiconazole in standard 48h toxicity tests to 0.015±0.004μM (5.651±1.507μgL(-1)), 0.145±0.025μM (49.619±8.555μgL(-1)) and 0.122±0.0417μM (40.236±13.75μgL(-1)), respectively, in the 14-days tests. Testing synergy in relation to concentration addition provided the most conservative values. The threshold values for the vertical assessments in tests where the two could be compared were in general 1.2 to 4.7 fold higher than the horizontal assessments. Using passive dosing rather than dilution series or spiking did not lower the threshold significantly. Below the threshold for synergy, slight antagony could often be observed. This is most likely due to induction of enzymes active in metabolization of alpha-cypermethrin. The results emphasize the importance of test duration when assessing synergy, but also show that azole concentrations within the typically monitored range of up to 0.5μgL(-1) are not likely to cause severe synergy concerning Daphnia magna immobilization.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, University of Copenhagen
Authors: Bjergager, M. A. (Ekstern), Dalhoff, K. (Ekstern), Kretschmann, A. (Ekstern), Nørgaard, K. B. (Ekstern), Mayer, P. (Intern), Cedergreen, N. (Ekstern)
Number of pages: 12
Pages: 79-90
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Volume: 182
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Ratings:
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Web of Science (2018): Indexed yes
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Azole fungicides, Daphnia magna, Mixtures, Pyrethroid insecticides, Synergy, Threshold concentrations

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Source: FindIt
Source-ID: 2347759411

Publication: Research - peer-review › Journal article – Annual report year: 2017
Development and validation of a novel monitoring system for batch flocculant solids settling process
Secondary sedimentation is the main hydraulic bottleneck of effective pollution control WWTP under wetweather flow conditions. Therefore, online monitoring tools are required for control and optimization of the settling process under dynamic conditions. In this work we propose a novel monitoring system able to monitor batch settling tests by tracking the sludge blanket height and solid concentration along the column in the range of 1 to 8 g L⁻¹. The system could be efficiently applied to monitor the batch settling tests of several full scale treatment plants run under different operational conditions.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Technical University of Denmark, Bioras
Authors: Valverde Pérez, B. (Intern), Zhang, X. (Ekstern), Penkarski-Rodon, E. (Ekstern), Wágner, D. S. (Intern), Haecky, P. (Ekstern), Blackburn, N. (Ekstern), Plósz, B. G. (Intern)
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Place of publication: Quebec, Canada
Publisher: IWA Publishing
Main Research Area: Technical/natural sciences
Conference: 12th IWA Specialized Conference on Instrumentation, Control and Automation, Quebec, Canada, 11/06/2017 - 11/06/2017
Sensor development, Image analysis, Sedimentation, Model identification
Electronic versions:
SettlingSenso_ICA2017_final_revised3.pdf
Source: PublicationPreSubmission
Source-ID: 133237310
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Development of Comparative Toxicity Potentials of TiO₂ Nanoparticles for Use in Life Cycle Assessment
Studies have shown that releases of nanoparticles may take place through the life cycle of products embedding nanomaterials, thus resulting in potential impacts on ecosystems and human health. While several life cycle assessment (LCA) studies have assessed such products, only a few of them have quantitatively addressed the toxic impacts caused by released nanoparticles, thus leading to potential biases in their conclusions. Here, we address this gap and aim to provide a framework for calculating characterization factors or comparative toxicity potentials (CTP) for nanoparticles and derive CTP values for TiO₂ nanoparticles (TiO₂-NP) for use in LCA. We adapted the USEtox 2.0 consensus model to integrate the SimpleBox4Nano fate model, and we populated the resulting model with TiO₂-NP specific data. We thus calculated CTP values for TiO₂ nanoparticles for air, water, and soil emission compartments for freshwater ecotoxicity and human toxicity, both cancer effects and noncancer effects. Our results appeared plausible after benchmarking with CTPs for other nanoparticles and substances present in the USEtox database, while large differences were observed with CTP values for TiO₂ nanoparticles published in earlier studies. Assumptions, which were performed in those previous studies because of lack of data and knowledge at the time they were made, primarily explain such discrepancies. For future assessment of potential toxic impacts of TiO₂ nanoparticles in LCA studies, we therefore recommend the use of our calculated CTP.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Department of Management Engineering, Quantitative Sustainability Assessment, Technical University of Denmark, Quantis, Radboud University Nijmegen
Authors: Ettrup, K. (Ekstern), Kounina, A. (Ekstern), Hansen, S. F. (Intern), Meesters, J. A. J. (Ekstern), Blikra Vea, E. (Ekstern), Laurent, A. (Intern)
Pages: 4027-4037
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
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Volume: 51
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Ratings:
BFI (2018): BFI-level 2
Different cultivation methods to acclimatise ammonia-tolerant methanogenic consortia

Bioaugmentation with ammonia tolerant-methanogenic consortia was proposed as a solution to overcome ammonia inhibition during anaerobic digestion process recently. However, appropriate technology to generate ammonia tolerant methanogenic consortia is still lacking. In this study, three basic reactors (i.e. batch, fed-batch and continuous stirred-tank reactors (CSTR)) operated at mesophilic (37°C) and thermophilic (55°C) conditions were assessed, based on methane production efficiency, incubation time, TAN/FAN (total ammonium nitrogen/free ammonia nitrogen) levels and maximum methanogenic activity. Overall, fed-batch cultivation was clearly the most efficient method compared to batch and CSTR. Specifically, by saving incubation time up to 150%, fed-batch reactors were acclimatised to nearly 2-fold higher FAN levels with a 37%-153% methanogenic activity improvement, compared to batch method. Meanwhile, CSTR reactors were inhibited at lower ammonia levels. Finally, specific methanogenic activity test showed that hydrogenotrophic methanogens were more active than aceticlastic methanogens in all FAN levels above 540 mg NH₃-N L⁻¹.

General information

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Tian, H. (Intern), Fotidis, I. (Intern), Mancini, E. (Ekstern), Angelidaki, I. (Intern)
Pages: 1-9
Publication date: 2017
Main Research Area: Technical/natural sciences
Diffusion and sorption of organic micropollutants in biofilms with varying thicknesses

Solid-liquid partitioning is one of the main fate processes determining the removal of micropollutants in wastewater. Little is known on the sorption of micropollutants in biofilms, where molecular diffusion may significantly influence partitioning kinetics. In this study, the diffusion and the sorption of 23 micropollutants were investigated in novel moving bed biofilm reactor (MBBR) carriers with controlled biofilm thickness (50, 200 and 500 μm) using targeted batch experiments (initial concentration = 1 μg L−1, for X-ray contrast media 15 μg L−1) and mathematical modelling. We assessed the influence of biofilm thickness and density on the dimensionless effective diffusivity coefficient f (equal to the biofilm-to-aqueous diffusivity ratio) and the distribution coefficient Kd,eq (L g−1). Sorption was significant only for eight positively charged micropollutants (atenolol, metoprolol, propranolol, citalopram, venlafaxine, erythromycin, clarithromycin and roxithromycin), revealing the importance of electrostatic interactions with solids. Sorption equilibria were likely not reached within the duration of batch experiments (4 h), particularly for the thickest biofilm, requiring the calculation of the distribution coefficient Kd,eq based on the approximation of the asymptotic equilibrium concentration (t > 4 h). Kd,eq values increased with increasing biofilm thickness for all sorptive micropollutants (except atenolol), possibly due to higher porosity and accessible surface area in the thickest biofilm. Positive correlations between Kd,eq and micropollutant properties (polarity and molecular size descriptors) were identified but not for all biofilm thicknesses, thus confirming the challenge of improving predictive sorption models for positively charged compounds. A diffusion-sorption model was developed and calibrated against experimental data, and estimated f values also increased with increasing biofilm thickness. This indicates that diffusion in thin biofilms may be strongly limited (f ≪ 0.1) by the high biomass density (reduced porosity).

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Environmental Chemistry, Aarhus University, Veolia Water Technologies AB
Authors: Torresi, E. (Intern), Polesel, F. (Intern), Bester, K. (Ekstern), Christensson, M. (Ekstern), Smets, B. F. (Intern), Trapp, S. (Intern), Andersen, H. R. (Intern), Plösz, B. G. (Intern)
Publication information
Journal: Water Research
Volume: 123
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.601 SNIP 2.358 CiteScore 7.55
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.663 SNIP 2.563
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.592 SNIP 2.192
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.319 SNIP 2.224
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.073 SNIP 2.178
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.94 SNIP 2.184
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.902 SNIP 2.233
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.113 SNIP 2.334
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.209 SNIP 2.108
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.702 SNIP 1.908
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.568 SNIP 1.757
Microbial communities are directly linked with process performance in several engineered systems. In the last century, intense study of microorganisms has contributed to optimize important environmental biotechnologies such as the activated sludge process or anaerobic digestion. However, less attention has been paid to the role of microorganisms in drinking water treatment technologies. In contrast, much effort has been devoted to eliminate potential pathogens in the drinking water treatment and supply systems. Nevertheless, the role of microbes in some drinking water treatments systems as biological filtration has long been acknowledged and recently been investigated. Biological filtration technology is widely used around the world and is especially important in Denmark as groundwater is the main source water for drinking water production. Because the groundwater has a relative high-quality, aeration followed by biological filtration is the only required treatment before distribution. In the last years, the microbial communities in rapid gravity sand filters, the typical biological filter used in Denmark, have been characterized, but little knowledge had been required about their physiological activity and roles in compound removal from the source water. 

This PhD project focused on a comprehensive investigation of the microbial communities in rapid sand filters beyond their purely taxonomical identification. For this purpose, samples collected from a rapid sand filter were subjected to metagenomics analysis and genome recovery to identify the genetic capacities of the dominant types in the microbial community. Fourteen near-complete population genomes representing the dominant community were recovered comprising the capacity to grow on the typical compounds found in groundwater. The identified population genomes contained capabilities to oxidize ammonium, nitrite, methane, hydrogen sulfide, iron and manganese as well as to assimilate organic compounds. A composite population genome was assigned to Nitrospira. This genus had previously been found in multiple rapid sand filters at an unexplained high abundance. Nitrospira spp. are known to perform the second step of nitrification: oxidation of nitrite to nitrate. The two-step nitrification process disclosed at the end of the 19th century was assumed to be carried out by two different functional groups, ammonia oxidizing prokaryotes and nitrite oxidizing bacteria. Strikingly, the Nitrospira composite population genome not only contained the genes to oxidize nitrite to nitrate, but also the genetic potential to execute the first step of nitrification. Exhaustive bioinformatics investigation ruled out the possibility of genomic contamination and confirmed that the Nitrospira composite population genome harboured the complete ammonium oxidation (comammox) pathway. At the same time, evidence of a single microbe’s capacity to carry out complete nitrification was obtained by three other groups; in all cases the comammox type belonged to the Nitrospira genus. 

To further investigate the genomic capacities of comammox Nitrospira, the Nitrospira composite genome was separated into individual population genomes using a differential coverage binning approach. As a result, five individual genomes were recovered, four of them containing the complete ammonium oxidation pathway. These genomes together with 11 high-quality publically available Nitrospira genomes (seven comammox and four strict nitrite oxidizers) were subject to a comparative genomics analysis. This examination showed specific genome features for comammox, strict nitrite oxidizers and the two comammox clades. Thus, comammox Nitrospira harbour a higher variety of genes related to adaptation to nutrient-limited environments. The two comammox clades differ in their ammonium uptake affinity systems. Additionally, comammox Nitrospira genomes lack the genetic capacity to use nitrite as the only nitrogen source. 

The evolutionary history of comammox Nitrospira was also examined based on protein dissimilarity, gene arrangement and reconciliation analysis. We detected a high probability of horizontal gene transfer events from betaproteobacterial ammonia oxidizers to comammox Nitrospira for genes belonging to the ammonium oxidation pathway as well as from comammox clade B to clade A for a subset of genes. 

I investigated the abundance of comammox Nitrospira in rapid sand filters at 12 different waterworks in Denmark. As these new microorganisms are taxonomially similar to strict Nitrospira nitrite oxidizers, we developed specific primers to exclusively target comammox based on their gene encoding the ammonia monooxygenase subunit A. With these primers, we detected comammox Nitrospira as the dominant nitrifier in the biofilters with an abundance typically one order of magnitude higher than canonical ammonium oxidizing prokaryotes. 

Lastly, I carried out lab-scale experiments with filter material from the top and bottom layers of a rapid sand filter containing different proportions of comammox Nitrospira, and strict nitrite and ammonia oxidizing prokaryotes under different loading conditions. Specifically, I exposed the filter material to distinct ammonium loading, under presence or absence of external carbon source as well as under oxygen limitation. In relation to the nitrifying community three main findings were made: (i) simultaneous growth of comammox Nitrospira and ammonium oxidizing prokaryotes; (ii) lower fitness of ammonium oxidizing archaea at higher temperatures; (iii) selection of comammox clade A over clade B at
increasing ammonium loadings at reference temperature.

Overall, this PhD has provided insights into the genomic capabilities of the main types in the microbial community of a groundwater-fed biological filter. Moreover, the previously observed high abundances of Nitrospira spp. in rapid sand filters, has now been explained, by the discovery of complete ammonium oxidizing (comammox) Nitrospira from metagenomics analysis. In addition, this thesis presents the first extensive analysis of the genomic capabilities of comammox Nitrospira compared to canonical ammonium and nitrite oxidizers.
Domain Specific Language for Modeling Waste Management Systems

In order to develop sustainable waste management systems with considering life cycle perspective, scientists and domain experts in environmental science require readily applicable tools for modeling and evaluating the life cycle impacts of the waste management systems. Practice has proved that modeling these systems with general-purpose tools is a cumbersome task. On one hand, the scientists have to spend considerable amount of time to understand these tools in order to develop their models. On another hand, integrated assessments are becoming gradually common in environmental management and therefore scientists are also faced with the problem of integrating models across scales and domains, which is not a straightforward process.

Domain-Specific Languages (DSLs) are languages which are specialized for a specific application domain and they promise to increase developer productivity by raising the level of abstraction. They allow domain experts, who are non-programmers, to directly encode their domain knowledge about what a system under development should do. In this thesis, we utilize domain-specific languages, on the basis of the flow-based programming (FBP) paradigm, to model and evaluate environmental technologies i.e. solid waste management systems. Flow-based programming is used to support concurrent execution of the processes, and provides a model-integration language for composing processes from homogeneous or heterogeneous domains. And a domain-specific language is used to define atomic processes and domain-specific validation rules for composite processes. We call these DSLs, which are based on FBP paradigm, domain-specific flow based languages and we provide a formal framework to develop them. To this end, we advocate aspect-oriented concepts to FBP to separate cross-cutting concerns, by providing an extension called AOFBP. Afterwards, we propose the framework based on this extension, and we use a formal language called ForSpec, which is an extension of FORMULA, to formally specify the structural and behavioral semantics of the sub-languages proposed in this framework. Finally, we propose a domain specific language for modeling of waste-management systems on the basis of our framework. We evaluate the language by providing a set of case studies. The contributions of this thesis are; addressing separation of concerns in Flow-based programming and providing the formal specification of its syntax and semantics; a formal language and framework to specify domain-specific flow based languages; design and develop domain specific languages for waste management modeling; and finally our work also can be considered as another case study for structural and behavioral semantics specifications in ForSpec and FORMULA.
Dramatic loss of comammox Nitrospira associated with long-term nitrite feeding

Until recently, nitrification was thought to be a strict two-step process where ammonia was first oxidized to nitrite by ammonia-oxidizing bacteria and/or archaea, and subsequently to nitrate by nitrite oxidizing bacteria (NOB). Recent studies in NOB metabolism, however, have revealed that certain Nitrospira are capable of performing both steps, resulting in complete ammonia oxidation (comammox) by single microorganisms. These comammox Nitrospira have been detected in drinking water (Pinto et al., 2015; Palomo et al., 2016) and aquaculture systems (van Kessel et al., 2015), as well as deep oil exploration wells (Daims et al., 2015). The discovery of comammox Nitrospira has significantly changed our understanding of biogeochemical nitrogen cycle. The goal of this experiment was to determine the extent of competition between comammox Nitrospira and canonical Nitrospira in ammonium scarce environment, with nitrite as the main energy source. Community assembly was monitored on well-established biofilms formed on the grains of rapid sand filter (RSF) for drinking water production. RSF sand was placed in laboratory scale column bioreactors and subjected to continuous feeding of tap water spiked with NO2- (1 mg-N/L) for 250 days. The biofilms were then characterized by Illumina MiSeq platform, targeting the 16S rRNA gene. The relative abundance of a putative comammox clade B Nitrospira sequence variant (with 100% 16S rRNA gene similarity to comammox CG24_A assembled genome) identified in the initial RSF sand (Palomo et al., unpublished) at a relative abundance of 12.4±1.1%, was not detected in 4 out of 6 replicates after 250 days. Similar trend was observed for other putative comammox clade B Nitrospira sequence variants. In contrast, we observed significant increase (padj<0.001) in canonical Nitrospira sequences (100% similarity to uncultured Nitrospira sp. clone KC836101 (Pester et al., 2014)). These observations indicate different behavior of Nitrospira in the absence of ammonia and point to a possible competitive advantage of canonical Nitrospira in environments where nitrite is the sole nitrogen, as well as energy source. In addition, the results suggest that other comammox Nitrospira could also be unable to grow in the only presence of nitrite as it was observed for comammox Ca. Nitrospira inopinata (Daims et al., 2015).
Drikkevand – er den danske holdning til vandbehandling tidssvarende?

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Albrechtsen, H. (Intern)
Number of pages: 9
Publication date: 2017

Dynamics of N₂O production pathways analyzed by ¹⁵N/¹⁸O isotope labeling
Nitrous oxide production associated with biological nitrogen transformations can contribute substantially to the CO₂ footprint of both man-made and natural systems, but the pathways and regulation of N₂O production are poorly understood. We developed a ¹⁵N/¹⁸O dual isotope labelling technique to distinguish and quantify these pathways in mixed communities. The use of ¹⁸O-O₂ permits differentiation of hydroxylamine oxidation and nitrifier-denitrification driven N₂O production by ammonium oxidizing bacteria. We analysed N₂O production pathways during biological nitrogen removal at Lynetten wastewater treatment plant. Under anoxia, N₂O accumulated due to denitrification, but N₂O accumulation was ~3 and 1.7 times higher at 30 and 100 µM O₂, respectively. Oxic N₂O production was dominated by nitrifier-denitrification, reaching 73% of the total with the remainder due to hydroxylamine oxidation. Our results demonstrate three active pathways of N₂O production, each with different environmental controls. The dual ¹⁵N/¹⁸O isotope labelling approach can contribute to the development of strategies to minimise N₂O emissions from man-made and natural systems.

General information
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Organisations: Department of Environmental Engineering, Water Technologies
Authors: Jensen, M. M. (Intern), Ma, C. (Ekstern), Lavik, G. (Ekstern), Smets, B. F. (Intern), Thamdrup, B. (Ekstern)
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Eco-efficiency assessment of dairy wastewater reuse
The food processing industry is a major water user in many countries and, for example, in Denmark the food sector’s water use amounts to 43% of the total industrial water use. The large water consumption is related to an equally important wastewater production. Besides being costly, both water supply and wastewater management can limit the production capacity of an industrial facility, when local water resources are under stress or wastewater treatment capacity is limited. In such situations, the industry will seek to increase its water efficiency through implementation of new technology. To evaluate the eco-efficiency of new technologies we have developed a method that aligns assessment of environmental impacts and value creation within a life-cycle boundary of a food processing industry. Using standard life-cycle
assessments and the concept of value added we have demonstrated the method for a proposed decentralized wastewater reuse scheme in a dairy. The life-cycle assessment covered "gate-to-retail" under the assumption that wastewater reuse at the dairy would not affect primary production and consumers' behavior. We included upstream processes like power generation and water production, and downstream processes like centralized wastewater handling and biogas production. Life-cycle assessment followed ILCD guidelines and value added was calculated for all processes likely to change more than 1% by the proposed scheme. The reuse scheme would potentially lead to an 86% reduction in drinking water imports compared to business-as-usual. The decentralized reuse facility was found to slightly increase global warming potential by 0.4 mPE/ton raw milk due to intensified water treatment. On the other hand, large reductions (-1.2 to -19 mPE/ton) were seen for impacts on the freshwater resource and nutrient enrichment. For the dairy facility, the reuse scheme would improve the value added by 1.5€/ton. However, reduced demand for water imports and less wastewater discharges to public utilities will lead to decreased value creation in these parts of the value chain. For the entire system we found a 1€/ton reduction in value added. Further studies will investigate the value added from increased production capacity and potential investment savings at the public utilities. For the specific case study, a wastewater reuse scheme was found to reduce environmental impacts from dairy production, but it comes at the cost of decreased value creation when considering the entire value chain. The applied eco-efficiency method showed the benefits and drawbacks of implementing a new technology for all involved stakeholders and the concept of value added resonates well with the commercial actors involved. The method was a good platform for comparing environmental and economic consequences and ensured consistent boundaries between the two assessments, but also stressed the importance of well-defined system boundaries.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Ryggaard, M. (Intern), Skrydstrup, J. (Intern), Larsen, S. L. (Intern)
Number of pages: 1
Publication date: 2017
Event: Abstract from 9th biennial conference of the International Society for Industrial Ecology (ISIE) and the 25th annual conference of the International Symposium on Sustainable Systems and Technology (ISSST), Chicago, United States.
Main Research Area: Technical/natural sciences

Ecological effects of scrubber water discharge on coastal plankton: Potential synergistic effects of contaminants reduce survival and feeding of the copepod Acartia tonsa
To meet the oncoming requirements for lower sulphur emissions, shipping companies can install scrubbers where the exhaust is sprayed with seawater and subsequently discharged to the sea. The discharge water has a pH around 3 and contains elevated concentrations of vanadium, nickel, lead and hydrocarbons. We investigated 1) the threshold concentrations of scrubber discharge water for survival, feeding and reproduction of the copepod Acartia tonsa, 2) whether the effects depend on the exposure route and 3) whether exposure to discharge water can be detected in field-collected organisms. A direct exposure to discharge water increased adult copepod mortality and reduced feeding at metal concentrations which were orders of magnitude lower than the lethal concentrations in previous single-metal studies. In contrast, reproduction was not influenced by dietary uptake of contaminants. Scrubber water constituents could have synergistic effects on plankton productivity and bioaccumulation of metals, although the effects will depend on their dilution in the marine environment.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Environmental Engineering, Environmental Chemistry
Authors: Koski, M. (Intern), Stedmon, C. (Intern), Trapp, S. (Intern)
Pages: 374-385
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Environmental Research
Volume: 129
ISSN (Print): 0141-1136
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Ecological effects of scrubber water discharge on coastal plankton: Potential synergistic effects of contaminants reduce survival and feeding of the copepod *Acartia tonsa*

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Environmental Engineering, Environmental Chemistry
Authors: Koski, M. (Intern), Stedmon, C. (Intern), Trapp, S. (Intern)
Number of pages: 1
Publication date: 2017

Scrubber discharge water, Copepod, Survival, Feeding, Metals, Synergistic effects

DoIs: 10.1016/j.marenvres.2017.06.006
Source: FindIt
Source-ID: 2371615509
Publication: Research - peer-review › Journal article – Annual report year: 2017
Ecological restoration of groundwater-dependent vegetation in the arid Ejina Delta: evidences from satellite evapotranspiration

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Chinese Academy of Sciences, Technical University of Denmark
Authors: Kai, L. (Ekstern), Garcia, M. (Intern), Yu, J. (Ekstern), Zhang, Y. (Ekstern), Wang, P. (Ekstern), Wang, S. (Intern), Liu, X. (Ekstern)
Number of pages: 1
Publication date: 2017
Conference: EGU General Assembly 2017, Vienna, Austria, 24/04/2017 - 24/04/2017
Main Research Area: Technical/natural sciences

Publication Information
Journal: Geophysical Research Abstracts
Volume: y
Article number: EGU2017-19121-2
ISSN (Print): 1607-7962
Ratings:
Web of Science (2014): Indexed yes
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2009): BFI-level 1
Original language: English
Electronic versions:
EGU2017_19121_2.pdf
Publication: Research - peer-review › Conference abstract in journal – Annual report year: 2017

Ecosystem Resilience to Drought and Temperature Anomalies in the Mekong River Basin
Climate change is leading to an increasing in the frequency and intensity of extreme weather events, which significantly affect ecosystems stability. In this study, ecological stability metrics in response to wet/dry events and warm/cold events on vegetation greenness were assessed using an auto-regressive model of NDVI in the Mekong River basin (around 759,000 km2) where large ecological and climatic gradients exist. Grided temperature, and the Global Standard Precipitation Evaporation Index (SPEI) and antecedent NDVI were used as model predictors. The forest in north Laos was more resilient to the temperate and wet/dry anomalies events than other regions in the basin. Drought reduced green biomass in north Laos, northeast Thailand and Myanmar, but in these tropical climate regions’ the vegetation biomass was also more responsive by higher temperatures. Vegetation in northeast Thailand, Cambodia and the Mekong delta were less sensitive to the temperature anomalies effect compared to other part of Mekong River basin. The map of resistance and resilience metrics can help to determine the most vulnerable regions to extreme events for policy makers.

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, Chinese Academy of Sciences
Authors: Na-U-Dom, T. (Ekstern), Garcia, M. (Intern), Mo, X. (Ekstern)
Number of pages: 6
Publication date: 2017
Main Research Area: Technical/natural sciences
Ecotoxicity testing and environmental risk assessment of iron nanomaterials for sub-surface remediation – Recommendations from the FP7 project NanoRem

Nanoremediation with iron (Fe) nanomaterials opens new doors for treating contaminated soil and groundwater, but is also accompanied by new potential risks as large quantities of engineered nanomaterials are introduced into the environment. In this study, we have assessed the ecotoxicity of four engineered Fe nanomaterials, specifically, Nano-Goethite, Trap-Ox Fe-zeolites, Carbo-Iron® and FerMEG12, developed within the European FP7 project NanoRem for sub-surface remediation towards a test battery consisting of eight ecotoxicity tests on bacteria (V. fisheri, E. coli), algae (P. subcapitata, Chlamydomonas sp.), crustaceans (D. magna), worms (E. fetida, L. variegatus) and plants (R. sativus, L. multiflorum). The tested materials are commercially available and include Fe oxide and nanoscale zero valent iron (nZVI), but also hybrid products with Fe loaded into a matrix. All but one material, a ball milled nZVI (FerMEG12), showed no toxicity in the test battery when tested in concentrations up to 100 mg/L, which is the cutoff for hazard labeling in chemicals regulation in Europe. However it should be noted that Fe nanomaterials proved challenging to test adequately due to their turbidity, aggregation and sedimentation behavior in aqueous media. This paper provides a number of recommendations concerning future testing of Fe nanomaterials and discusses environmental risk assessment considerations related to these.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Technical University of Liberec, Norwegian University of Life Sciences, Norwegian Institute for Agricultural and Environmental Research
Authors: Hjorth, R. (Intern), Coutris, C. (Ekstern), Nguyen, N. (Ekstern), Sevcu, A. (Ekstern), Gallego-Urrea, J. A. (Ekstern), Baun, A. (Intern), Joner, E. (Ekstern)
Pages: 525-631
Publication date: 2017
Main Research Area: Technical/natural sciences
Effect of electrostatic interactions on pH fronts propagation in saturated in saturated porous media

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, University of Tubingen
Authors: Muniruzzaman, M. (Ekstern), Rolle, M. (Intern)
Number of pages: 1
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
Muniruzzaman_Rolle_Interpore_2017_531_MS1.16.pdf
Source: PublicationPreSubmission
Source-ID: 139657035
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Effect of medium-pressure UV-lamp treatment on disinfection by-products in chlorinated seawater swimming pool waters

Several brominated disinfection by-products (DBPs) are formed in chlorinated seawater pools, due to the high concentration of bromide in seawater. UV irradiation is increasingly employed in freshwater pools, because UV treatment photodegrades harmful chloramines. However, in freshwater pools it has been reported that post-UV chlorination promotes the formation of other DBPs. To date, UV-based processes have not been investigated for DBPs in seawater pools. In this study, the effects of UV, followed by chlorination, on the concentration of three groups of DBPs were investigated in laboratory batch experiments using a medium-pressure UV lamp. Chlorine consumption increased following post-UV chlorination, most likely because UV irradiation degraded organic matter in the pool samples to more chlorine-reactive organic matter. Haloacetic acid (HAA) concentrations decreased significantly, due to photo-degradation, but the concentrations of trihalomethanes (THMs) and haloacetanitrides (HANs) increased with post-UV chlorination. Bromine incorporation in HAAs was significantly higher in the control samples chlorinated without UV irradiation but decreased significantly with UV treatment. Bromine incorporation was promoted in THM and HAN after UV and chlorine treatment. Overall, the accumulated bromine incorporation level in DBPs remained essentially unchanged in comparison with the control samples. Toxicity estimates increased with single-dose UV and chlorination, mainly due to increased HAN.
concentrations. However, brominated HANs are known in the literature to degrade following further UV treatment.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Aix-Marseille University, Aix Marseille Université
Authors: Cheema, W. A. (Intern), Manasfi, T. (Ekstern), Kaarsholm, K. M. S. (Intern), Andersen, H. R. (Intern), Boudenne, J. (Ekstern)
Pages: 910-917
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Science of the Total Environment
Volume: 599-600
ISSN (Print): 0048-9697
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.546 SNIP 1.65 CiteScore 4.98
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.09 SJR 1.652 SNIP 1.856
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.653 SNIP 1.648 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.635 SNIP 1.843 CiteScore 4.2
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.527 SNIP 1.745 CiteScore 3.73
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.749 SNIP 1.82 CiteScore 3.7
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.802 SNIP 1.676 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.651 SNIP 1.506
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.576 SNIP 1.6
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.461 SNIP 1.489
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.393 SNIP 1.473
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.512 SNIP 1.586
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.439 SNIP 1.509
The effect of various micro-aeration strategies on the anaerobic digestion (AD) of wheat straw was thoroughly examined using a mixture of inocula, containing compost and well digested sludge from biogas plant. The aim was to determine the most efficient oxygen load, pulse repetition and treatment duration, resulting in the highest methane production. The oxygen load had the largest impact on the biodegradability of straw, among the examined variables. More specifically, a micro-aeration intensity of 10mLO2/gVS was identified as the critical threshold above which the AD performance was more susceptible to instability. The highest enhancement in biogas production was achieved by injecting 5mLO2/gVS for a consecutive 3-day treatment period, presenting a 7.2% increase compared to the untreated wheat straw. Nevertheless, the results from optimisation case study indicated a higher increase of 9% by injecting 7.3mLO2/gVS, distributed in 2 pulses during a slightly shorter treatment period (i.e. 47h).

**General information**

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark, National Technical University of Athens
Authors: Tsapekos, P. (Intern), Kougias, P. (Intern), Vasileiou, S. A. (Ekstern), Lyberatos, G. (Ekstern), Angelidaki, I. (Intern)
Number of pages: 8
Pages: 246-253
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Bioresource Technology
Volume: 225
ISSN (Print): 0960-8524
Ratings:
- BFI (2018): BFI-level 2
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Scopus rating (2017): SJR 2.029 SNIP 1.799 CiteScore 6.28
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
Effect of nitrogen source and acclimatization on specific growth rates of microalgae determined by a high throughput in vivo microplate autofluorescence method

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, National Food Institute, Research Group for Bioactives – Analysis and Application
Number of pages: 1
Publication date: 2017

Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.308 SNIP 2.507 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.089 SNIP 2.344
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.915 SNIP 2.236
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.736 SNIP 2.74
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.403 SNIP 2.396
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.314 SNIP 2.003
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.278 SNIP 1.98
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.19 SNIP 1.655
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.942 SNIP 1.665
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.908 SNIP 1.294
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.537 SNIP 1.2
Scopus rating (2000): SJR 0.653 SNIP 1.023
Scopus rating (1999): SJR 0.659 SNIP 1.033
Original language: English
Anaerobic digestion, Methane yield, Micro-aeration, Response surface methodology, Wheat straw
DOI:
10.1016/j.biortech.2016.11.081
Source: FindIt
Source-ID: 2349222804
Publication: Research - peer-review › Journal article – Annual report year: 2017

Effect of nitrogen source and acclimatization on specific growth rates of microalgae determined by a high throughput in vivo microplate autofluorescence method
Effect of UV treatment on DBPs formation in chlorinated seawater swimming pools - a laboratory study

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Aix-Marseille University, Aix Marseille Universite
Authors: Cheema, W. A. (Intern), Manasfi, T. (Ekstern), Kaarsholm, K. M. S. (Intern), Andersen, H. R. (Intern), Boudenne, J. L. (Ekstern)
Publication date: 2017
Event: Abstract from 7th International Conference, Kos, Greece.
Main Research Area: Technical/natural sciences
Electronic versions:
Sider_fra_UV_for_seawater_pools.pdf

Effect of UV treatment on formation of disinfection by-products in chlorinated seawater swimming pools

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Aix-Marseille University, Aix Marseille Universite
Authors: Cheema, W. A. (Intern), Manasfi, T. (Ekstern), Kaarsholm, K. M. S. (Intern), Andersen, H. R. (Intern), Boudenne, J. (Ekstern)
Pages: 103-104
Publication date: 2017
Event: 7th International Conference, Kos, Greece, 02/05/2017 - 02/05/2017
Main Research Area: Technical/natural sciences
Electronic versions:
UV_treatment_for_DBPs_in_seawater_pools.pdf

Effect of UV treatment on formation of disinfection by-products in chlorinated seawater swimming pools

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Aix-Marseille University, Aix Marseille Universite
Authors: Cheema, W. A. (Intern), Manasfi, T. (Ekstern), Kaarsholm, K. M. S. (Intern), Andersen, H. R. (Intern), Boudenne, J. (Ekstern)
Number of pages: 1
Publication date: 2017
Event: Abstract from 2017 IUVA Americas Conference, Austin, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
Effects of climate model interdependency on the uncertainty quantification of extreme rainfall projections
The inherent uncertainty in climate models is one of the most important uncertainties in climate change impact studies. In recent years, several uncertainty quantification methods based on multi-model ensembles have been suggested. Most of these methods assume that the climate models are independent. This study investigates the validity of this assumption and its effects on the estimated probabilistic projections of the changes in the 95% quantile of wet days. The methodology is divided in two main parts. First, the interdependency of the ENSEMBLES RCMs is estimated using the methodology developed by Pennell and Reichler (2011). The results show that the projections from the ENSEMBLES RCMs cannot be assumed independent. This result is then used to estimate the uncertainty in climate model projections. A Bayesian approach has been developed using the procedure suggested by Tebaldi et al. (2005) in order to quantify the uncertainty.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Urban Water Systems, DHI Denmark
Authors: Sunyer, M. A. (Intern), Rosbjerg, D. (Intern), Arnbjerg-Nielsen, K. (Intern), Madsen, H. (Ekstern)
Pages: 284-289
Publication date: 2017

Host publication information
Title of host publication: 9th International Workshop on Precipitation in Urban Areas: Urban Challenges in Rainfall Analysis, Urbanrain 2012
Publisher: ETH Zurich
ISBN (Electronic): 9783906031217
Main Research Area: Technical/natural sciences
Conference: UrbanRain12: 9th International Workshop on Precipitation in Urban Areas, St. Moritz, Switzerland, 06/12/2012 - 06/12/2012

Effects of copper oxide nanoparticles and copper ions to zebrafish (Danio rerio) cells, embryos and fry
The use of engineered metal nanoparticles (NPs) is continuously increasing and so is the need for information regarding their toxicity. This study compares the toxicity of CuO NPs with ionic Cu in three zebrafish model systems; zebrafish hepatoma cell line (ZFL), fish embryo toxicity test (FET) and fry locomotion. In the ZFL tests, no significant cytotoxicity (cell death, decreased metabolic or cell membrane integrity) was detected for either treatment, though both significantly affected reactive oxygen species (ROS) production. Embryo mortality was affected by both Cu ions and CuO NPs with similar concentration-response relationships, whereas only Cu ions affected fry mortality (24h LC50≈30μM, ≈2mgCuL⁻¹ for Cu ions and no significant mortality observed at up to 200μM, 12.7mgCuL⁻¹ for CuO NP). Both Cu forms increased fry swimming activity during light cycles and decreased activity during dark cycles: Cu ions had significant impact at lower concentrations than CuO NPs. The implications are that Cu ions generally are more toxic than CuO NPs to embryos and fry but there is a marked difference in toxicity among the different zebrafish model systems. Metal NPs release into the environment may have adverse effects on fish and other aquatic organisms.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Roskilde University, University of Gothenburg
Authors: Thit, A. (Ekstern), Skjolding, L. M. (Intern), Selck, H. (Ekstern), Sturve, J. (Ekstern)
Pages: 89-100
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Toxicology in Vitro
Volume: 45
Issue number: 1
ISSN (Print): 0887-2333
Effects of diffuse radiation on carbon and water fluxes of a high latitude temperate deciduous forest

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Atmospheric Environment
Authors: Wang, S. (Intern), Ibrom, A. (Intern), Pilegaard, K. (Intern), Bauer-Gottwein, P. (Intern), Garcia, M. (Intern)
Number of pages: 1
Publication date: 2017
Effects of thermal drying on phosphorus availability from iron-precipitated sewage sludge

Thermal drying of sewage sludge implies sanitation and improves practical handling options of the sludge prior to land application. However, it may also affect its value as a fertilizer. The objective of this study was to assess whether thermal drying of sewage sludge, as well as drying temperature, affects plant P availability after application to soil. The experiment included dewatered sewage sludge (20% DM) and thermally dried sewage sludge (95% DM) collected at a Danish wastewater treatment plant, as well as laboratory oven-dried (70, 130, 190, and 250°C; DM > 95%) subsamples of the dewatered sludge, and a triple superphosphate as a reference. Plant P availability was studied in a 197 d soil incubation experiment, with sampling for Diffusive Gradients in Thin films (DGT) and water extractable P (WEP) analyses over time, and in a pot experiment with spring barley (Hordeum vulgare L.). In both experiments, thermal drying reduced P availability, as shown by 37 and 23% lower DGT and WEP values, respectively, and a 16% lower P uptake by barley in the pot experiment. The specific drying temperature did not appear to have much effect. Overall, our results suggest that thermal drying of iron-precipitated sewage sludge is not an optimal treatment option if the aim is to optimize plant P availability.
Efficient pharmaceutical removal from (hospital) wastewater by staged-moving bed biofilm reactors (MBBRs) followed by ozonation

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Danish Technological Institute, Aarhus University
Authors: Kragelund, C. (Ekstern), Ooi, G. T. H. (Intern), Tang, K. (Intern), Christensen, A. T. (Ekstern), Bester, K. (Ekstern), Andersen, H. R. (Intern)
Pages: 21-21
Publication date: 2017

Host publication information
Title of host publication: Abstract proceedings - 11th annual meeting danish water forum
Place of publication: Frederiksberg
Publisher: University of Copenhagen
Editors: Flindt Jørgensen, L., Mosolff Larsen, T., Jensen, B. K.
Main Research Area: Technical/natural sciences
Conference: 11th Annual Meeting of Danish Water Forum, Copenhagen, Denmark, 30/01/2017
Electronic versions:
Abstract proceedings book

Relations
Activities:
11th annual Danish Water Forum (DWF) 2017
Efficient treatment of aniline containing wastewater in bipolar membrane microbial electrolysis cell-Fenton system

Aniline-containing wastewater can cause significant environmental problems and threaten the humans's life. However, rapid degradation of aniline with cost-efficient methods remains a challenge. In this work, a novel microbial electrolysis cell with bipolar membrane was integrated with Fenton reaction (MEC-Fenton) for efficient treatment of real wastewater containing a high concentration (4460 ± 52 mg L\(^{-1}\)) of aniline. In this system, H\(_2\)O\(_2\) was in situ electro-synthesized from O\(_2\) reduction on the graphite cathode and was simultaneously used as source of radical dotOH for the oxidation of aniline wastewater under an acidic condition maintained by the bipolar membrane. The aniline was effectively degraded following first-order kinetics at a rate constant of 0.0166 h\(^{-1}\) under an applied voltage of 0.5 V. Meanwhile, a total organic carbon (TOC) removal efficiency of 93.1 ± 1.2% was obtained, revealing efficient mineralization of aniline. The applicability of bipolar membrane MEC-Fenton system was successfully demonstrated with actual aniline wastewater. Moreover, energy balance showed that the system could be a promising technology for removal of biorefractory organic pollutants from wastewaters.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Li, X. (Intern), Jin, X. (Intern), Zhao, N. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
Pages: 67-72
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Water Research
Volume: 119
ISSN (Print): 0043-1354
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.601 SNIP 2.358 CiteScore 7.55
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.663 SNIP 2.563
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.592 SNIP 2.192
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Efficient water table evolution discretization using domain transformation

Domain transformation methods are useful techniques for solving problems on non-stationary domains. In this work, we consider the evolution of the water table in an unconfined aquifer. This nonlinear, time-dependent problem is greatly simplified by using a mapping from the physical domain to a reference domain and is then further reduced to a single, (nonlinear) partial differential equation. We show well-posedness of the approach and propose a stable and convergent discretization scheme. Numerical results are presented supporting the theory.
Electricity generation and microbial community in response to short-term changes in stack connection of self-stacked submersible microbial fuel cell powered by glycerol

Stack connection (i.e., in series or parallel) of microbial fuel cell (MFC) is an efficient way to boost the power output for practical application. However, there is little information available on short-term changes in stack connection and its effect on the electricity generation and microbial community. In this study, a self-stacked submersible microbial fuel cell (SSMFC) powered by glycerol was tested to elucidate this important issue. In series connection, the maximum voltage output reached to 1.15 V, while maximum current density was 5.73 mA in parallel. In both connections, the maximum power density increased with the initial glycerol concentration. However, the glycerol degradation was even faster in parallel connection. When the SSMFC was shifted from series to parallel connection, the reactor reached to a stable power output without any lag phase. Meanwhile, the anodic microbial community compositions were nearly stable. Comparatively, after changing parallel to series connection, there was a lag period for the system to get stable again and the microbial community compositions became greatly different. This study is the first attempt to elucidate the influence of short-term changes in connection on the performance of MFC stack, and could provide insight to the practical utilization of MFC.
Electrochemical monitoring of ammonia during anaerobic digestion

Ammonia is known as a key inhibitor to methanogens in anaerobic digestion (AD) processes. It's of importance to develop efficient tools for ammonia monitoring. In this study, an electrolysis cell (EC) coupled with a complete nitrification reactor was developed as a sensor for real-time and online monitoring of ammonia in AD. The AD effluent was pumped into the nitrification reactor first, in which ammonia was converted to nitrate. Afterwards, the nitrate-rich effluent was introduced into the cathode chamber of the EC. The correlation between currents and ammonia levels was first evaluated with synthetic ammonia-rich digesters. It was observed that the initial transient currents (0 min) were linearly corresponding to the ammonia levels (from 0 to 95.75 mg/L NH4+-N, R2 = 0.9673). Finally, this new sensor was tested with real AD effluent and the results showed no significant difference with that measured by conventional methods. The sensor developed here has great potential for online, cost-saving, fast, and accurate ammonia monitoring in AD processes.

Elemental composition of natural nanoparticles and fine colloids in European forest stream waters and their role as phosphorus carriers

Biogeochemical cycling of elements largely occurs in dissolved state, but many elements may also be bound to natural nanoparticles (NNP, 1–100 nm) and fine colloids (100–450 nm). We examined the hypothesis that the size and composition of stream water NNP and colloids vary systematically across Europe. To test this hypothesis, 96 stream water samples were simultaneously collected in 26 forested headwater catchments along two transects across Europe. Three size fractions (~1–20 nm, >20–60 nm, >60 nm) of NNP and fine colloids were identified with Field Flow Fractionation coupled to inductively coupled plasma mass-spectrometry and an organic carbon detector. The results showed that NNP and fine colloids constituted between 2±5% (Si) and 53±21% (Fe; mean ± SD) of total element concentrations, indicating a substantial contribution of particles to element transport in these European streams, especially for P and Fe. The particulate contents of Fe, Al, and organic C were correlated to their total element concentrations, but those of particulate Si, Mn, P, and Ca were not. The fine colloidal fractions >60 nm were dominated by clay minerals across all sites. The resulting element patterns of NNP <60 nm changed from North to South Europe from Fe- to Ca-dominated particles, along with associated changes in acidity, forest type, and dominant lithology.
Enhanced Accessibility of Polycyclic Aromatic Hydrocarbons (PAHs) and Heterocyclic PAHs in Industrially Contaminated Soil after Passive Dosing of a Competitive Sorbate

To assess the exposure to polycyclic aromatic hydrocarbons (PAHs) it is important to understand the binding mechanisms between specific soil constituents and the organic pollutant. In this study, sorptive bioaccessibility extraction (SBE) was applied to quantify the accessible PAH fraction in industrially contaminated soil with and without passive dosing of a competitive sorbate. SBE experiments revealed an accessible PAH fraction of 41 ± 1% (∑16 US EPA PAHs + 5 further PAHs). The passive dosing of toluene below its saturation level revealed competitive binding and resulted in an average increase of the accessible fraction to 49 ± 2%, whereby primarily the accessibility of higher molecular weight PAHs (log Kow > 6) was affected. Competitive binding was verified using the same soil with only desorption-resistant PAHs present. In this experiment, passive dosing of toluene resulted in desorption of 13 ± 0.4% PAH. We explain increased PAH desorption after addition of toluene by competitive adsorption to high-affinity sorption sites while acknowledging that toluene could additionally have increased PAH mobility within the soil matrix. Findings suggest that the presence of copollutants at contaminated sites deserves specific considerations as these may increase accessibility and thereby exposure and mobility of PAHs.

General information

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Enhancing biogas production from recalcitrant lignocellulosic residue

Lignocellulosic substrates are abundant in agricultural areas around the world and lately, are utilized for biogas production in full-scale anaerobic digesters. However, the anaerobic digestion (AD) of these substrates is associated with specific difficulties due to their recalcitrant nature which protects them from enzymatic attack. Hence, the main purpose of this work was to define diverse ways to improve the performance of AD systems using these unconventional biomasses. Thus, mechanical and thermal alkaline pretreatments, microaeration and bioaugmentation with hydrolytic microbes were examined. The studied substrates were fresh and ensiled meadow grass, regularly cultivated ensiled grass, digested manure fibers and wheat straw. AD of lignocellulosic substrates is time demanding and an extended incubation period is often needed. Initially, diverse analytical methods were used (i.e. electrical conductivity, soluble chemical oxygen demand and enzymatic hydrolysis) as a rapid way to predict the methane production. However, the precision of methane yield prediction was not high ($R^2 < 0.68$) and thus, the biochemical methane potential (BMP) test is concluded to be the most precise method to estimate the biomethanation process. Various mechanical pretreatments were examined on ensiled meadow grass biodegradability by applying shearing forces. Preliminary results showed that the methane production of ensiled meadow grass can be efficiently increased up to 25% compared to untreated samples. Hence, the most efficient method was further applied on the same substrate, focusing on different age of vegetation under mono- and co-digestion with livestock manures (i.e. poultry, mink and cattle manure). The differences on biomass’ chemical composition were also determined in order to demonstrate the effect of vegetation stage. Clear alterations were revealed due to late harvest time and specifically, the lignin content was markedly augmented (∼30% of dry matter) with advancing age, implying the need of pretreatment. Mechanically pretreated biomass of increased maturity was co-digested with diverse livestock manures in
order to define the optimum silage/manure ratio in the feedstock. Results showed that the ideal lignocellulose/manure contribution differs among the examined substrates and that the chemical characteristics of the feedstock mixture significantly influenced the biomethanation process. The application of shearing forces was also examined on the hardly degradable fraction of digested manure fibers. However, limited efficacy was observed on biomethanation and the remaining volatile solids (VS) were not highly utilized. Conversely, the well-studied thermal alkaline pretreatments using sodium hydroxide as a catalyst promoted the yield from approximately 42 mLCH₄/gVS to 170 mLCH₄/gVS. Furthermore, the positive results were validated in the co-digestion of biofibers with cattle manure under continuous mode operation. Mechanical and thermal alkaline pretreatment (6% NaOH at 55 °C for 24 h) had an effect of 7% and 26% respectively, without provoking process inhibition. Focusing on full-scale practices, the application of simple and efficient treatment methods is generally suggested. Accordingly, the reduction of supply chain steps prior to AD could eventually improve the energy budget and subsequently, process profitability. Hence, the integration of mechanical pretreatment at harvesting step was examined as a solution to scale-up the used mechanical method in real-life applications. On this topic, an innovative Disc-mower (named as Excoriator) was studied in order to simultaneously harvest and pretreat fresh meadow grass through the application of shearing forces. Kinetic studies showed that the lag phase was decreased, the methane production rate was increased and finally, the methane yield was significantly enhanced by up to 27% under optimal conditions. Further investigations on full-scale experiments mowing regularly cultivated grass confirmed the positive effect due to the selection of the most appropriate harvester. The modern harvester poses the ability improve the energy balance and subsequently, the sustainability of lignocellulose-based AD. The co-digestion of pig manure and lignocellulosic silage was assessed in continuous stirred tank reactors (CSTR). Addition of mechanically pretreated silage in the feedstock positively affected the methane yield (+16%) and in parallel, reduced the risk of ammonia inhibition compared to monodigestion of pig manure. Furthermore, metagenomic analysis was performed to determine differences among the microbial communities in CSTRs operating under mono- and co-digestion. Species similar to Clostridium thermocellum, with increased cellulolytic activity, were detected to be adherent to the solid fraction of digested feedstock and concluded to be key players for lignocellulose’s disintegration. Moreover, various microaeration strategies were applied in order to elucidate the effect of oxygen load (O₂), pulse repeatability and treatment period on the AD of wheat straw. The results obtained from this study demonstrated a 7.2% increase in methane yield after a 3 days microaeration period, using 5 mL O₂/gVS served by once. In addition, an optimisation study was conducted and the analysis indicated that the methane yield could have been increased by 9%, if 7.3 mL O₂/gVS were injected. It was indicated that microaeration can be an alternative solution for augmented biomass solubilization without causing inhibition to the mandatory anaerobic methanogenic community. Based on the initial microbial analysis, the bioaugmentation with the typically abundant in AD systems C. thermocellum was examined in biogas reactors fed with wheat straw. Bioaugmentation with the hydrolytic strain had immediately a remarkable result on methane production. Nevertheless, the long term monitoring showed that routine bioaugmentation is needed to retain a positive effect of approximately 7%. Moreover, it was indicated that the bioaugmentation with C. thermocellum can be periodically applied in biogas reactors in order to extract the residual methane from the amassing materials and avoid potential accumulation. Additionally, the facultative anaerobic Melioribacter roseus was inoculated in a replicate CSTR following different bioaugmentation strategies, either strictly anaerobic or micro-aerobic conditions. Nevertheless, the novel strain did not enhance the biomethanation process and the metagenomic analysis revealed that the inoculated strain did not adapt in the biogas reactor. The results obtained confirm that lignocellulose-based AD can lead to high biogas yield. At lab-scale experiments, the bioenergy production can be further improved using micro-aeration, bioaugmentation with C. thermocellum, thermal-alkaline or mechanical pretreatments. Further insights into AD microbiome can improve and optimize the used processes. Among the examined pretreatments, only mechanical methods were evaluated in full-scale operation due to their easiness in application. On this topic, modern harvesting technology simulating the process applied in lab-scale could generate similar enhancement under full-scale trials. Machineries orientated to pretreat biomass using simplified techniques can positively affect the industrial applications.

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Enquiring into the roots of bioenergy - epistemic uncertainties in life cycle assessments

The research for this Thesis was originally framed around the "sustainability assessment of full chain bioenergy". However, it is known for some years that the critical impacts of dedicated bioenergy relate to induced land use changes (LUC). Their criticality derives from their potential to dominate environmental impacts from a life-cycle perspective and from the uncertainty that accompanies them. On the other hand, continued land use may be a concern for soil's long-term sustainability (understood as fertility), which has recently received attention in environmental life-cycle assessments (LCA) under the respective life-cycle initiative of the UNEP-SETAC. The Thesis thus focused on these two aspects of sustainability of bioenergy. The overall aim was to disentangle the epistemic uncertainties related to land use impact assessments in order to provide science based decision-support for environmentally sustainable land use management and policy-making, especially relevant for land-demanding or dedicated bioenergy deployment.

Paper I took a Danish willow plantation for cogeneration of heat and power (CHP) through gasification and framed the research around the key land-use reference assumptions. For this, the LCA was structured around three basic land scenarios: marginal abandoned land, marginal extensive grassland and arable land. For each scenario, different LUC models were developed which represent the different impacts induced from the occupation of land for energy cropping. Despite being the most productive, occupying arable land proved to have the largest impacts due to indirect LUC. Gasification willow from marginal abandoned land had also significant impacts from preventing natural regeneration, but it showed a significantly better environmental performance (even under the considered uncertainties) than CHP from natural gas. The implementation of such bioenergy systems on abandoned lands would be thus justified as long as they substitute fossil-fuel based CHP.

In Paper II, the key assumptions related to time horizons in LCA of bioenergy systems were analysed and crucial definitions for them were proposed, as well as generic recommendations regarding them. Similarly, the effect of different modelling approaches in LUC emission accounting was studied by the application of several methods to four biofuel case studies. As a result, dynamic land-use baseline methods were rejected for LUC accounting while top-down LUC models showed to be a more solid alternative to economic iLUC models for regulation and footprinting purposes. After considering the studied epistemic uncertainties and based on the key conservative assumptions taken, it was concluded that land-demanding biofuels have larger global warming impacts than the respective fossil fuels they replace unless planted on abandoned lands.

With Papers I-II, the selection of the land-use references and time horizons involved in LCA of biofuels was demonstrated to be crucial for the characterization of the resulting environmental impacts. On top of that, different LCA modelling approaches exist with different virtues and applications, which logically articulate different sets of other key assumptions. Therefore, three land-use reference frameworks were proposed in Paper III to enable value-consistent land use impact assessments. Based on previous findings and recommendations, new methodological modifications to the existing UNEP-SETAC framework were suggested. The proposed modifications were articulated by discriminating among different long-term impacts from land use and by classifying different ecosystem services provided by land as environmental stocks or flows. These modifications reorient the land use impact assessments to impacts during occupation and suggest dealing with permanent impacts separately. In the proposed new methodology, dynamic land-use baseline methods are suggested for assessing occupation impacts on abandoned lands (relevant for consequential LCA) while static references are suggested for generic occupation impacts (in any LCA). Static references, understood as the precedent vegetation cover in equilibrium, are also suggested for every transformation impact assessed with any LCA modelling approach.

Last but not least, a hybrid LCA (HLCA) framework was also proposed as an alternative to existing attributional LCA which facilitates both absolute and relative sustainability assessments. Unknown or indirect LUC can be included with top-down LUC models (LUCglobal factor for world-average greenhouse gas (GHG) emissions or LUCGHGprotocol factors for country-average, crop-specific GHG emissions). In order to enable absolute land use impact assessments, the use of substitution is not allowed in the HLCA framework and an area based functional unit (FU) should be chosen. For this, land use impacts can be linked to planetary and regional ecosystem boundaries through normalization references (taken as carrying capacity thresholds). Environmental footprinting of products from land-use systems with co-products can be carried out by choosing product-based FU, but absolute land use impact assessments would involve then value-laden allocation choices. Value-free absolute impact assessments can still be carried out with area-based FU and by adding function-equivalent synthetic products to the other system(s), which allow system (rather than product) comparability.

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Enriched ammonia-tolerant methanogenic cultures as bioaugmentation inocula in continuous biomethanation processes

Many ammonia-rich biomass sources, such as manures and protein-rich substrates, are potential inhibitors of the anaerobic digestion (AD) process. It was previously demonstrated that bioaugmentation of Methanoculleus bourgensis MS2T in an ammonia inhibited process in a continuous stirred tank reactor (CSTR), resulted in up to 90% recovery of the methane production compared to the uninhibited production. However, cultivation of pure strains has practical difficulties due to the need of special growth media and sterile conditions. In contrast, acclimatized enriched cultures have minor sterility requirements. In the current study, an enriched ammonia-tolerant methanogenic culture was bioaugmented in a CSTR reactor operating under ammonia-induced, inhibited-steady-state. The results demonstrated that bioaugmentation, completely counteracted the ammonia toxicity effect. This indicates that a commercial application of bioaugmentation could improve up to 36% the methane production, the greenhouse gas reduction efficiency and the gross revenue of ammonia inhibited full scale biogas reactors. 16S rRNA gene sequencing showed that bioaugmentation changed the microbial composition of the reactors resulting in higher bacterial and lower archaeal community diversity. The bioaugmented reactor showed a fourfold increase of the abundance of the bioaugmented methanogens compared to the control reactor. This indicates that ammonia-tolerant methanogens established well in the ammonia-inhibited reactor and dominated over the domestic methanogenic population. Finally, this study showed that the enriched culture alleviated ammonia toxicity 25% more efficiently than the previously used pure culture.
Entropy-based critical reaction time for mixing-controlled reactive transport

Entropy-based metrics, such as the dilution index, have been proposed to quantify dilution and reactive mixing in solute transport problems. In this work, we derive the transient advection dispersion equation for the entropy density of a reactive plume. We restrict our analysis to the case where the concentration distribution of the transported species is Gaussian and we observe that, even in case of an instantaneous complete bimolecular reaction, dilution caused by dispersive processes dominates the entropy balance at early times and results in the net increase of the entropy density of a reactive species. Successively, the entropy of the reactant decreases until it vanishes. We show the existence of a unique critical value of dilution, which corresponds to the complete consumption of one of the reactants. This critical dilution index is independent of advective and dispersive processes, and depends only on the dimensionality of the problem, on the stoichiometry of the reaction and on the initial concentrations of the reactants. Furthermore, we provide simple analytical expressions to compute the critical reaction time, i.e., the time at which the critical dilution index is reached, for selected flow configurations. Our results show that, differently from the critical dilution index, the critical reaction time depends on solute transport processes such as advection and hydrodynamic dispersion.
Sewage sludge is generated from the treatment of domestic wastewaters at wastewater treatment plants. Since the implementation of stricter requirements for wastewater treatment in the European Union in 2005, the amount of sludge produced has increased, creating the demand for more effective treatment and recycling.

In Denmark, the application of sludge on agricultural land is an often-used recycling strategy, as it returns nutrients and microelements to the soil, which can substitute for commercial fertilisers. Conventionally, sludge produced in Denmark is dewatered with mechanical devices; however, in the late 1980s, sludge treatment reed bed (STRB) systems were introduced in Denmark and in 2016, more than 100 STRB systems were operating in the country. Sludge treatment in STRB systems is often considered more environmentally friendly compared to mechanical sludge treatment technologies, albeit only a few life cycle assessments (LCAs) comparing the environmental performances of sludge treatment technologies include STRB systems. Furthermore, as data on the STRB system technology suitable for LCA are scarce, the results of these LCAs are unreliable.

The project aimed at generating data on the STRB system technology that would be useable for LCA. Based on identified knowledge gaps, research focused on three areas; quantification of gas emissions directly related to treatment, establishment of substance flows through the technology and the fate of carbon and nitrogen-based compounds in treated sludge when applied to the land. The overall goal of the project was to perform an LCA comparing the environmental performance of the STRB system technology with a conventional technology based on mechanical dewatering of sludge on a decanter centrifuge and subsequent storage. Geographically, the project focused on Denmark, and was carried out as a collaborative effort between the Technical University of Denmark (DTU) and the Danish environmental consultancy Orbicon A/S. The outcome of the project was a dataset on the STRB system technology usable for LCA, and an LCA comparing the environmental profiles of the STRB system technology and a mechanical treatment technology, constituting a basis for decision-making in relation to choice of technology.

A major part of the project involved performance of fieldwork and laboratory work. Data were collected at three Danish, well-operated STRB systems; furthermore, data required to represent the mechanical treatment technology were collected alongside data on STRB systems. Most of the data collection was undertaken at a wastewater treatment plant housing both technologies, thereby making it possible to make the two datasets as comparable as possible.

Fourteen environmental impact categories were included in the LCA, and the environmental loadings and saving provided by the sludge treatment technologies normalised to represent the treatment of 1000 kg wet weight of sludge. The life cycle inventory and the choices underlying the life cycle impact assessment were based on international acknowledged standards and recommendations. An attributional LCA approach was chosen, and the loadings and savings for all impact categories were normalised to people equivalents (PE) (the annual loadings and savings provided by one average person). Three sludge treatment scenarios were defined: 1) mechanical treatment on centrifuge, followed by storage and finally land application, 2) treatment in an STRB system and finally land application (S-STRB), and 3) treatment in an STRB system, followed by post-treatment on a stockpile area (SPA) and finally application (S-SPA).

The project succeeded in generating data on STRB systems, which could form the basis for a LCA, and comparable data alongside data on STRB systems. Most of the data collection was undertaken at a wastewater treatment plant housing both technologies, thereby making it possible to make the two datasets as comparable as possible.

Environmental Assessment of Sewage Sludge Management – Focusing on Sludge Treatment Reed Bed Systems

Sewage sludge is generated from the treatment of domestic wastewaters at wastewater treatment plants. Since the implementation of stricter requirements for wastewater treatment in the European Union in 2005, the amount of sludge produced has increased, creating the demand for more effective treatment and recycling. In Denmark, the application of sludge on agricultural land is an often-used recycling strategy, as it returns nutrients and microelements to the soil, which can substitute for commercial fertilisers. Conventionally, sludge produced in Denmark is dewatered with mechanical devices; however, in the late 1980s, sludge treatment reed bed (STRB) systems were introduced in Denmark and in 2016, more than 100 STRB systems were operating in the country. Sludge treatment in STRB systems is often considered more environmentally friendly compared to mechanical sludge treatment technologies, albeit only a few life cycle assessments (LCAs) comparing the environmental performances of sludge treatment technologies include STRB systems. Furthermore, as data on the STRB system technology suitable for LCA are scarce, the results of these LCAs are unreliable.

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The project succeeded in generating data on STRB systems, which could form the basis for a LCA, and comparable data related to mechanical sludge treatment. The results of the LCA revealed that STRB systems performed comparable to or better than mechanical treatment. The two scenarios based on the STRB system technology (S-STRB and S-SPA) performed comparable which only minor differences.

According to toxic impact categories, which for both technologies were mainly impacted by metals contained by treated sludge applied on land, the three scenarios performed comparable. Indeed, the substance flow analyses revealed that the metals held by sludge subjected to treatment for all scenarios were accumulated in the final sludge product. For all scenarios, the net-loadings for the impact categories Human Toxicity – Non-Carcinogenic and Ecotoxicity corresponded to 2.010-2 PE, and for Human Toxicity – Carcinogenic to 5.0 10-4 PE.

Emission rates of CO2, CH4 and N2O related to biological processes in sludge subjected to treatment in STRB systems were measured during all four seasons of the year. The results revealed that seasonal variations were considerable, and should be taken into account when calculating annual, average emission rates. The emission rate of CO2 measured from
External storage of mechanically treated sludge was much lower compared to those measured for STRB systems, reflecting a lower microbial activity in the mechanical dewatered sludge. As the emission rates of the potent greenhouse gasses CH₄ and N₂O were larger for mechanical dewatered sludge, the net environmental loadings provided to the impact category Climate Change by this technology (S-CEN) and the STRB system technology (S-STRB and S-SPA) ended up being equally sized (9.010⁻⁴ PE), despite of higher biological activity in the STRB systems. As a consequence of the lower microbial activity in mechanically treated sludge, the concentration of carbon and nitrogen-based compounds in the final sludge product produced by this treatment technology was higher compared to the final sludge product produced by treatment in STRB systems. Hence, the loadings affecting impact categories related to eutrophication and acidification were higher for the mechanical treatment technology, especially in relation to the category Marine Eutrophication, the net-loadings to this category being 8.0 10⁻⁴ PE for mechanical treatment (S-CEN) and 3.0 10⁻⁴ PE for STRB systems (S-STRB and S-SPA).

The STRB system technology consumed fewer abiotic resources, due mainly to the fact that the mechanical treatment process requires an input of polymer coagulant, while a STRB system does not require this contribution. Furthermore, as mechanically treated sludge often have a stronger odour compared to sludge treated in STRB systems, the latter is often claimed by the local land application sites, while mechanically treated sludge often must be transported longer distances to land application sites willing to apply it. Hence, the STRB system technology required a lower input of fuel for transportation.

In the future, it would be relevant to use the obtained data on STRB systems to compare the technology with other sludge treatment technologies commonly used. Furthermore, it would be relevant to generate a comparable dataset on representing the performance of the technology in other climate zones, and to expand the data set with more data related to economics, making it possible to make more detailed economical assessments.

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Environmental impacts and resource losses of incinerating misplaced household special wastes (WEEE, batteries, ink cartridges and cables)
The contribution of misplaced special waste (sWEEE, lamps, CRT, batteries, ink cartridges and cables) to environmental impacts from incineration of residual household waste was quantified through life cycle assessment (LCA)-modelling. Misplaced special waste was quantified to constitute less than 1% of the net impact for most environmental impact categories, except for the toxic impact categories (4–28% of toxic impacts) and the impact on abiotic resource depletion. It was found that the main contributor (96%) to the toxic impact categories was related to the presence of mercury (Hg) from lamps and batteries. However as shown by sensitivity analysis, lack of good data on the transfer of rare and hazardous metals to the flue gas in the incineration process should receive further investigation before the environmental impacts from misplaced incinerated special waste can fully be concluded upon. Although the misplaced special waste is only 0.5% of residual household waste, it constitutes in the residual household waste the most significant fraction with respect to metal content when iron and aluminum are excluded. By extending the boundary of the LCA beyond the traditional “zero burden boundary”, we were able to quantify the impact of abiotic resources not recovered from incineration residues. This appeared to be a significant impact category, and the special waste contributed about 96% of this category although it by weight makes up only 0.5% of the waste. Furthermore, enhancing the recovery of iron (Fe) and aluminum (Al) from the ashes would not affect the loss of abiotic resources significantly. Only by recovering elements as platinum (Pt), copper (Cu), gold (Au), and silver (Ag) would it be possible to reduce the loss of abiotic resources from the system. These elements are primarily found in misplaced special waste (sWEEE, lamps, CRT, batteries, ink cartridges, and cables).

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Organisations: Department of Environmental Engineering, Residual Resource Engineering, Atmospheric Environment, Water Technologies
Environmental impacts of stormwater management and pollutant discharges

Stormwater management systems are necessary to protect people and assets from flooding and pollution, especially in densely built, sealed urban areas. The possible solutions range from underground pipes and basins, where rain water is often handled together with wastewater, to local and multi-functional solutions, e.g. rain beds or retention lakes. Ideally, these solutions are not only economically, but also environmentally sustainable. Risk assessments are sometimes carried out, e.g. to determine the effect of discharges during extreme events, but they lack a holistic perspective: While pollutants in runoff are one possible source of (local) environmental impacts, the stormwater management system itself is a source of emissions. Raw material extraction, construction, operation, renewal, and disposal all cause environmental impacts at a more regional or even global scale. These impacts can be quantified using life cycle assessment, which on the other hand usually neglects the impacts from local emissions, even though these may potentially be significant. By integrating local emissions into the assessment, we are able to quantify the total environmental impacts of stormwater management solutions.

We have tested the approach using a sub-catchment of Copenhagen. The existing stormwater management system has to be adapted to climatic changes to maintain existing flood safety levels. The environmental impacts from both local and global emissions over a period of 100 years have been quantified using life cycle assessment. The inventory for the assessment is based on an extensive literature research, planning documents and expert interviews. Here, we focus on the ecotoxicity impacts: The impact over the whole life cycle of the system, excluding local emissions, is 14 mio comparative toxic units (CTUe). This ecotoxicity impact is mainly caused by the emission of metals. Metals are, however, also important pollutants in stormwater runoff. In Copenhagen, the emission of stormwater pollutants from runoff are found to cause additional impacts of 19 mio CTUe when discharged directly to freshwater. If the water first infiltrates through soil, the impacts are significantly lower (10 mio CTUe). The stormwater system itself is passive, and mainly causes impacts during construction, while runoff goes through the system constantly over 100 years, which explains the large difference in impacts. The results are characterized by a high uncertainty, which is caused by large ranges in measured concentrations in literature (up to 5 orders of magnitude). Limiting these uncertainties is the subject of ongoing research.

Our results highlight the importance of including local emission of toxic compounds in stormwater management systems. Often, an increase in global emission, e.g. through the construction of treatment facilities, will lead to reduced local impacts, and vice versa. By taking into account both local and global impacts, stormwater management systems can be optimized holistically to minimize environmental impacts and create more sustainable stormwater management systems.
Environmental Multiobjective Optimization of the Use of Biomass Resources for Energy

Bioenergy is often considered an important component, alongside other renewables, to mitigate global warming and to reduce fossil fuel dependency. Determining sustainable strategies for utilizing biomass resources, however, requires a holistic perspective to reflect a wider range of potential environmental consequences. To circumvent the limitations of scenario-based life cycle assessment (LCA), we develop a multiobjective optimization model to systematically identify the environmentally optimal use of biomass for energy under given system constraints. Besides satisfying annual final energy demand, the model constraints comprise availability of biomass and arable land, technology- and system-specific capacities, and relevant policy targets. Efficiencies and environmental performances of bioenergy conversions are derived using biochemical process models combined with LCA data. The application of the optimization model is exemplified by a case aimed at determining the environmentally optimal use of biomass in the Danish energy system in 2025. A multiobjective formulation based on fuzzy intervals for six environmental impact categories resulted in impact reductions of 13-43% compared to the baseline. The robustness of the optimal solution was analyzed with respect to parameter uncertainty and choice of environmental objectives.
Environmental performance of gasified willow from different lands including land-use changes

A life-cycle assessment (LCA) of a low-input, short rotation coppice (SRC) willow grown on different Danish lands was performed. Woodchips are gasified, producer gas is used for co-generation of heat and power (CHP) and the ash-char output is applied as soil amendment in the field. A hybrid model was developed for the estimation of greenhouse gas (GHG) emissions from indirect land-use changes (iLUC) induced by willow cropping on arable land. For this, area expansion results from a general equilibrium economic model were combined with global LUC trends to differentiate between land transformation (as additional agricultural expansion, in areas with historical deforestation) and occupation (as delayed relaxation, DR, in areas with historical land abandonment) impacts. A biophysical approach was followed to determine the iLUCfeed emissions factor from marginal grassland. Land transformation impacts were derived from latest world deforestation statistics, while a commercial feed mix of equivalent nutritive value was assumed to substitute the displaced grass as fodder. Intensification effects were included in both iLUC factors as additional N-fertilizer consumption. Finally, DR impacts were considered for abandoned farmland, as a relative C stock loss compared to natural regeneration. ILUC results show that area related GHG emissions are dominant (93% of iLUCfood and 80% of iLUCfeed), transformation being more important (82% of iLUCfood) than occupation (11%) impacts. LCA results show that CHP from willow emits 4,047 kg CO2-eq haoccup−1 (or 0.8 gCO2-eq MJ−1) when grown on arable land, while sequestering 43,745 kg CO2-eq haoccup−1 (or -10.4 gCO2-eq MJ−1) when planted on marginal pastureland, and 134,296 kg CO2-eq haoccup−1 (or -31.8 gCO2-eq MJ−1) when marginal abandoned land is cultivated. Increasing the bioenergy potential without undesirable iLUC effects, especially relevant regarding biodiversity impacts, requires that part of the marginally used extensive grasslands are released from their current use or energy cropping on abandoned farmland incentivized.

General information

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Organisations: Department of Environmental Engineering, Atmospheric Environment, Department of Management Engineering, Quantitative Sustainability Assessment
Authors: Saez de Bikuna Salinas, K. (Intern), Hauschild, M. Z. (Intern), Pilegaard, K. (Intern), Ibrom, A. (Intern)
Environmental performance of household waste management in Europe - an example of 7 countries

An attributional life cycle assessment (LCA) of the management of 1 ton of household waste was conducted in accordance with ISO 14044:2006 and the ILCD Handbook for seven European countries, namely Germany, Denmark, France, UK, Italy, Poland and Greece, representing different household waste compositions, waste management practices, technologies, and energy systems. National data were collected from a range of sources regarding household waste composition, household sorting efficiency, collection, waste treatments, recycling, electricity and heat composition, and technological efficiencies. The objective was to quantify the environmental performance in the different countries, in order to analyze the sources of the main environmental impacts and national differences which affect the results. In most of the seven countries, household waste management provides environmental benefits when considering the benefits of recycling of materials and recovering and utilization of energy. Environmental benefits come from paper recycling and, to a lesser extent, the recycling of metals and glass. Waste-to-energy plants can lead to an environmental load (as in France) or a saving (Germany and Denmark), depending mainly on the composition of the energy being substituted. Sensitivity analysis and a data quality assessment identified a range of critical parameters, suggesting from where better data should be obtained. The study concluded that household waste management is environmentally the best in European countries with a minimum reliance on landfilling, also induced by the implementation of the Waste Hierarchy, though environmental performance does not correlate clearly with the rate of material recycling. From an environmental point of view, this calls for a change in the waste management paradigm, with less focus on where the waste is routed and more of a focus on the quality and utilization of recovered materials and energy.

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering, Atmospheric Environment, Water Technologies
Authors: Andreasi Bassi, S. (Intern), Christensen, T. H. (Intern), Damgaard, A. (Intern)
Pages: 545-557
Environmental risk assessment of poorly soluble substances: Improved tools for assessing biodegradation, (de)sorption, and modeling (project RABIT)

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, RWTH Aachen University, German Federal Environment Agency
Authors: Müller, M. E. (Ekstern), Stibany, F. (Ekstern), Polesel, F. (Intern), Smith, K. E. C. (Ekstern), Schulte, C. (Ekstern), Trapp, S. (Intern), Schäffer, A. (Ekstern)
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Erratum to: A global approach for sparse representation of uncertainty in Life Cycle Assessments of waste management systems
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Authors: Bisinella, V. (Intern), Conradsen, K. (Intern), Christensen, T. H. (Intern), Astrup, T. F. (Intern)
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Erratum to: NanoRiskCat: a conceptual tool for categorization and communication of exposure potentials and hazards of nanomaterials in consumer products
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Authors: Hansen, S. F. (Intern), Jensen, K. A. (Ekstern), Baun, A. (Intern)
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BFI (2017): BFI-level 1
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
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BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.568 SNIP 0.696 CiteScore 1.97
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.672 SNIP 0.861 CiteScore 2.17
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.753 SNIP 1.01 CiteScore 2.54
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.855 SNIP 1.024 CiteScore 2.56
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.092 SNIP 1.437 CiteScore 3.52
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Scopus rating (2010): SJR 0.974 SNIP 1.242
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.979 SNIP 1.055
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.991 SNIP 1.124
Scopus rating (2007): SJR 0.882 SNIP 1.089
Scopus rating (2006): SJR 0.869 SNIP 1.267
Scopus rating (2005): SJR 0.813 SNIP 1.161
Scopus rating (2004): SJR 0.811 SNIP 1.321
Scopus rating (2003): SJR 0.58 SNIP 0.877
Scopus rating (2002): SJR 0.993 SNIP 1.243
Scopus rating (2001): SJR 0.522 SNIP 0.665
Establishment and calibration of consensus process model for nitrous oxide dynamics in water quality engineering

Research on biological nitrogen removal (BNR) in wastewater treatment plants (WWTP) has historically focused on achieving good effluent quality, with more recent attention to energy savings and carbon dioxide (CO2) footprints. Novel processes and operating conditions are being implemented that enhance cost and energy efficiency in BNR, while maintaining effluent quality. Now, increasing attention is placed on direct emissions of nitrous oxide (N2O) as by-product of BNR; N2O is a greenhouse gas (GHG) with a high warming potential and also an ozone depleting chemical compound. Several N2O production pathways have been identified from pure culture studies, while mechanisms are still being unravelled. Heterotrophic bacteria (HB) and ammonium oxidizing bacteria (AOB) are well known to produce N2O. However, the effect of environmental factors on N2O production is not yet well understood. Current process modelling efforts aim to reproduce experimental data with mathematical equations, structuring our understanding of the system. Various mechanistic models with different structures describing N2O production have been proposed, but no consensus exists between researchers. Hence, the existing plant-wide GHG models still lack a complete biological process model that can be integrated in a methodology that assesses N2O emissions and their impact on overall plant performance. A mathematical model structure that describes N2O production during biological nitrogen removal is proposed. Two autotrophic and one heterotrophic biological pathways are coupled with abiotic processes. The model stoichiometry and process rates synthesize a comprehensive literature review on the metabolism of microbes involved in nitrogen removal. The proposed model can describe all relevant NO and N2O production pathways with fewer parameters than present in other proposed models. A novel experimental design based on the developed model and on extant respirometric techniques is introduced. Monitoring dissolved oxygen and N2O allowed the isolation of individual processes and the estimation of parameters associated to oxygen consumption (endogenous activity, nitrite and ammonium oxidation) and N2O production (NN, ND and HD pathway contributions). To estimate parameters of the N2O model a rigorous procedure is presented as a case study. The calibrated model predicts the NO and N2O dynamics at varying ammonium, nitrite and dissolved oxygen levels in two independent systems: (a) an AOB-enriched biomass and (b) activated sludge (AS) mixed liquor biomass. A total of ten (a) and seventeen (b) parameters are identified with high accuracy (coefficients of variation < 25%). The critical validation of the model response and the estimated parameter values represent a novel and rigorous tool for N2O modelling studies. For the first time, uncertainty associated with parameter estimation from N2O models is reported, this procedure is recommended to be included with best-fit simulations. Additionally, modelling electron competition in heterotrophic processes is explored via an analogy to current intensity through resistors in electric circuits. While further model validation is required, this approach captured the electron competition during denitrification for four different carbon sources. Overall, a combination of modelling and experimental efforts to study N2O dynamics was
To address the third main aim, an Aerodyne quantum cascade laser for CO2 isotopes was combined with a LI-CORsoil of the transect not being representative for the spatial heterogeneity of Rsoil at the site. We found that annual Rsoil estimated from a previously used transect at the site was underestimated by 20%, due to a diel pattern between the intact and trenched soil plots. Finally, we calculated the annual Rsoil for different transects at the site, with Rroot showing the highest respiration during nighttime with no clear difference in the diel pattern of Rstem and Rsoil across all seasons with highest rates during nighttime. However, further analysis showed a clear diel pattern of Rsoil during the daytime, and also led to a substantial decrease of 21%, depending on u* threshold value, in the estimated annual Rsoil.

By installing fans to produce continuous turbulent mixing of air around the soil chambers, we tested the hypothesis that negative relationship between measured flux rates and atmospheric turbulence measured as friction velocity (u*) above the canopy, suggesting that the measured Rsoil was overestimated at low atmospheric turbulence. Filtering out data at low u* values removed, or even inverted, the observed diel pattern, such that the highest fluxes were now observed during daytime, and also led to a substantial decrease of 21%, depending on u* threshold value, in the estimated annual Rsoil. By installing fans to produce continuous turbulent mixing of air around the soil chambers, we tested the hypothesis that overestimation of soil CO2 fluxes at low u* can be eliminated if proper mixing of air is ensured, and indeed the use of fans removed the overestimation of Rsoil during low u*.

To address the second main aim, total Reco was measured by the eddy covariance method and the components of tree stem respiration (Rstem), heterotrophic Rsoil from trenched soil, heterotrophic and autotrophic Rsoil from intact soil, and coarse root respiration (Rroot) were measured every two hours by automated closed-chambers for one year. We found that the contribution of Rstem to total Reco varied across the year, by only accounting for 6% of Reco during winter and 16% during summer. In contrast, Rsoil showed a fairly similar contribution to Reco during winter, spring and summer of 52, 45 and 49%, respectively, while the contribution increased to 79% during autumn. By using the trenching method, we found that autotrophic Rsoil accounted for 34% of Rsoil during summer, while the contribution increased to 79% during autumn. By using the trenching method, we found that autotrophic Rsoil accounted for 34% of Rsoil during summer, while the contribution increased to 79% during autumn.

To address the third main aim, an Aerodyne quantum cascade laser for CO2 isotopes was combined with a LI-CORsoil of the transect not being representative for the spatial heterogeneity of Rsoil at the site. We found that annual Rsoil estimated from a previously used transect at the site was underestimated by 20%, due to a diel pattern between the intact and trenched soil plots. Finally, we calculated the annual Rsoil for different transects at the site, and found that annual Rsoil estimated from a previously used transect at the site was underestimated by 20%, due to Rsoil of the transect not being representative for the spatial heterogeneity of Rsoil at the site.
8100A/8150 automatic closed-chamber system to yield the δ13C of CO2 during automated chamber measurements. The δ13C of the respired CO2 for each chamber measurement was determined by the Keeling plot methodology. We found that the δ13C measured by the laser was influenced by the water vapour and CO2 concentration of the sample air. However, we quantified these dependencies, and implemented a correction method to yield precise measurements of δ13C. The corrections increased the average δ13C determined from the Keeling plots by 2.1 and 3.4 ‰ for the water vapour and the CO2 concentration dependence corrections, respectively. The system was used during a two month campaign where we measured δ13C every two hours from intact soil, trenched soil, tree stems and coarse roots. The results revealed an average δ13C of -29.8, -29.7, -30.2 and -32.6 ‰ for the intact soil plots, the trenched soil plots, the stem plots and the coarse root plots, respectively.

Taken together, the work presented in this PhD thesis shows that periods with low atmospheric turbulence can provide a significant source of error in Rsoil rates estimated by the closed-chamber techniques and that erroneous data must be filtered out to obtain unbiased diel patterns, accurate relationships to biotic and abiotic factors, and before estimating Rsoil fluxes over longer time scales. The work also shows that artificial turbulent air mixing may provide a method to overcome the issue with overestimated fluxes, allowing for measurements even at low atmospheric turbulence. Furthermore, the results show that a quantum cascade laser can successfully be combined with an automated closed-chamber system to yield δ13C of ecosystem CO2 fluxes at a high temporal scale, but also that the measured δ13C is highly influenced by water vapour and CO2 concentration, why a calibration procedure, as developed in this study, is crucial to yield precise measurements of δ13C.

General information
State: Published
Organisations: Department of Environmental Engineering, Atmospheric Environment
Authors: Brændholt, A. (Intern), Pilegaard, K. (Intern), Larsen, K. S. (Intern), Ibrom, A. (Intern)
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Evaluating potentials for waste sorting in the Arctic: waste separation studies from Greenland

General information
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Authors: Kirkelund, G. M. (Intern), Diez, L. (Ekstern), Scheutz, C. (Intern), Eisted, R. (Ekstern)
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Evaluation of Externality Costs in Life-Cycle Optimization of Municipal Solid Waste Management Systems

The development of sustainable solid waste management (SWM) systems requires consideration of both economic and environmental impacts. Societal life-cycle costing (S-LCC) provides a quantitative framework to estimate both economic and environmental impacts, by including "budget costs" and "externality costs". Budget costs include market goods and services (economic impact), whereas externality costs include effects outside the economic system (e.g., environmental impact). This study demonstrates the applicability of S-LCC to SWM life-cycle optimization through a case study based on an average suburban U.S. county of 500000 people generating 320000 Mg of waste annually. Estimated externality costs
are based on emissions of CO2, CH4, N2O, PM2.5, PM10, NOx, SO2, VOC, CO, NH3, Hg, Pb, Cd, Cr (VI), Ni, As, and dioxins. The results indicate that incorporating S-LCC into optimized SWM strategy development encourages the use of a mixed waste material recovery facility with residues going to incineration, and separated organics to anaerobic digestion. Results are sensitive to waste composition, energy mix and recycling rates. Most of the externality costs stem from SO2, NOx, PM2.5, CH4, fossil CO2, and NH3 emissions. S-LCC proved to be a valuable tool for policy analysis, but additional data on key externality costs such as organic compounds emissions to water would improve future analyses.
Evaluation of high resolution spatio-temporal precipitation extremes from a stochastic weather generator

Spatio-temporal rainfall is modelled for the North-Eastern part of Zealand (Denmark) using the Spatio-Temporal Neyman-Scott Rectangular Pulses model as implemented in the RainSim software. Hourly precipitation series for fitting the model are obtained from a dense network of tipping bucket rain gauges in the model area. The spatiotemporal performance of the model with respect to precipitation extremes is evaluated in the points of a 2x2 km regular grid covering the full model area. The model satisfactorily reproduces the extreme behaviour of the observed precipitation with respect to event intensity levels and unconditional spatial correlation when evaluated using an event based ranking approach at point scale and an advanced spatiotemporal coupling of extreme events. Prospectively the model can be used as a tool to evaluate the impact of climate change without relying on precipitation output from climate model modelled precipitation directly, but merely on the climate change signal derived from climate models.

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Organisations: Department of Environmental Engineering, Urban Water Systems, Danish Meteorological Institute
Authors: Sarup, H. J. D. (Intern), Christensen, O. B. (Ekstern), Arnbjerg-Nielsen, K. (Intern), Mikkelsen, P. S. (Intern)
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Evaluering af effekten af tiltag rettet mod bedre sortering på genbrugspladser: Projektet støttet af kommunepuljen under Miljøstyrelsen

General information
State: Published
Evidence for temporal and spatial variations in groundwater contaminant plume discharge to a stream

The pollution and impairment of stream waters by chemical compounds is one of the threats currently targeted by the enforcement of the European Water Framework Directive in Denmark. The groundwater/surface water interaction is one of the pathways for the release of contaminant in streams. In this study, a 2D advection-dispersion model associated to field measurements was used to investigate the mixing and dilution of pollutants discharging from a groundwater plume to a stream at different times of the year. The model is a continuation of the work by Aisopou et al. (2015) which simulates the mixing of groundwater pollutant plumes seeping into a stream. Extra features such as drains or sewers can also be accounted for as additional point sources in the adapted model presented here, as well as the dilution effect of tributaries to better simulate the possible urbanization of streams. The model was used to characterize a plume of chlorinated compounds that discharges into a small stream at a former industrial site in Raadvad, Denmark (Average stream width: 10 m; average flow: 300 l/s; contaminant mass discharge: ca. 1 kg/y). The simulation was combined with streambed and surface water sampling, as well as monthly flow rate monitoring and groundwater fluxes. The use of the model facilitated the identification of a possible discharge area of the groundwater plume and successfully captured the evolution of the pollutant concentration and mixing. At the time of measurement, the groundwater plume seeped mostly through a narrow area of the streambed, which was confirmed by high concentration results from the streambed water sampling and identification of an upward groundwater flux into the stream. The measurements and simulations carried out at later times of the year revealed the existence of temporal and spatial variations: 1) in the overall quantity of chlorinated compound discharged, 2) in the discharge pathways with additional contribution from a drain, and 3) in the contaminant mixing itself. The results highlight the complexity and variability of the contaminant fluxes at the interface between a groundwater contaminated plume and stream water, and the need for a better understanding of the general dynamics of these fluxes.

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Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals
Authors: Lemaire, G. G. (Intern), Schulz, H. (Intern), McKnight, U. S. (Intern), Bjerg, P. L. (Intern)
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Experimental determination of isotope enrichment factors – bias from mass removal by repetitive sampling

Application of compound-specific stable isotope approaches often involves comparisons of isotope enrichment factors (ε). Experimental determination of ε-values is based on the Rayleigh equation, which relates the change in measured isotope ratios to the decreasing substrate fractions and is valid for closed systems. Even in well-controlled batch experiments, however, this requirement is not necessarily fulfilled, since repetitive sampling can remove a significant fraction of the analyte. For volatile compounds the need for appropriate corrections is most evident and various methods have been proposed to account for mass removal and for volatilization into the headspace. In this study we use both synthetic and experimental data to demonstrate that the determination of ε-values according to current correction methods is prone to considerable systematic errors even in well-designed experimental setups. Application of inappropriate methods may lead to incorrect and inconsistent ε-values entailing misinterpretations regarding the processes underlying isotope fractionation. In fact, our results suggest that artifacts arising from inappropriate data evaluation might contribute to the variability of published ε-values. In response, we present novel, adequate methods to eliminate systematic errors in data evaluation. A model-based sensitivity analysis serves to reveal the most crucial experimental parameters and can be used for future experimental design to obtain correct ε-values allowing mechanistic interpretations.
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Scopus rating (2010): SJR 2.979 SNIP 1.726
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BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.86 SNIP 1.809
Web of Science (2009): Indexed yes
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Scopus rating (2008): SJR 2.96 SNIP 1.935
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.774 SNIP 1.914
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.55 SNIP 1.893
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.608 SNIP 1.999
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.86 SNIP 2.046
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.54 SNIP 2.065
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 2.392 SNIP 1.949
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.387 SNIP 1.968
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 3.03 SNIP 2.315
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Experimental investigation of concentration and stable isotopes signals during organic contaminants back diffusion
Back diffusion of organic contaminants is often the cause of groundwater plumes’ persistence and can significantly hinder cleanup interventions [1, 2]. In this study we perform a high-resolution investigation of back diffusion in a well-controlled flow-through laboratory setup. We considered cis-dichloroethene (cis-DCE) as model contaminant and we investigated its back diffusion from an impermeable source into a permeable saturated layer, in which advection-dominated flow conditions were established. We used concentration and stable chlorine isotope measurements to investigate the plumes originated by cis-DCE back diffusion in a series of flow-through experiments, performed in porous media with different hydraulic conductivity and at different seepage velocities (i.e., 0.4, 0.8 and 1.2 m/day). A two-centimeter thick agarose gel layer was placed at the bottom of the setup to simulate the source of cis-DCE back diffusion from an impervious layer. Intensive sampling (>1000 measurements) was carried out, including the withdrawal of aqueous samples at closely spaced (1 cm) outlet ports, as well as the high-resolution sampling of the source zone (agarose gel) at the end of each experiment. The transient behavior of the plumes originated by back diffusion was investigated by sampling the outlet ports at regular intervals in the experiments, each run for a total time corresponding to 15 pore volumes. The high-resolution sampling allowed us to resolve the spatial and temporal evolution of concentration and stable isotope gradients in the flow-through setup. In particular, steep concentration and stable isotope gradients were observed at the outlet. Lateral isotope gradients corresponding to chlorine isotope fractionation up to 20‰ were induced by cis-DCE back
Experimental investigation of the impact of compound-specific dispersion and electrostatic interactions on transient transport and solute breakthrough

This study investigates the effects of compound-specific diffusion/dispersion and electrochemical migration on transient solute transport in saturated porous media. We conducted laboratory bench-scale experiments, under advection-dominated regimes (seepage velocity: 0.5, 5, 25 m/d), in a quasi two-dimensional flow-through setup using pulse injection of multiple tracers (both uncharged and ionic species). Extensive sampling and measurement of solutes' concentrations (~1500 samples; >3000 measurements) were performed at the outlet of the flow-through setup, at high spatial and temporal resolution. The experimental results show that compound-specific effects and charge-induced Coulombic interactions are important not only at low velocities and/or for steady state plumes but also for transient transport under high flow velocities. Such effects can lead to a remarkably different behavior of measured breakthrough curves also at very high Péclet numbers. To quantitatively interpret the experimental results, we used four modeling approaches: classical advection-dispersion equation (ADE), continuous time random walk (CTRW), dual-domain mass transfer model (DDMT), and a multicomponent ionic dispersion model. The latter is based on the multicomponent formulation of coupled diffusive/dispersive fluxes and was used to describe and explain the electrostatic effects of charged species. Furthermore, we determined experimentally the temporal profiles of the flux-related dilution index. This metric of mixing, used in connection with the traditional solute breakthrough curves, proved to be useful to correctly distinguish between plume spreading and mixing, particularly for the cases in which the sole analysis of integrated concentration breakthrough curves may lead to erroneous interpretation of plume dilution.

General information
State: Published
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Explorative analysis of long time series of very high resolution spatial rainfall

We examine rainfall characteristics of convective and front extreme events in high spatio-temporal resolution (5 minutes, 1x1 km) over an area of 1824 km² covering the catchment of the Wupperverband, North Rhine-Westphalia. The main focus of the analysis is a description of the complexity of hourly and daily extreme rainfall with the purpose of identifying suitable characteristics that can be used in a spatial weather generator of similar resolution. The spatial and temporal properties of the extreme events are explored by means of principal component analysis, cluster analysis, and linear models. For each method a set of 17 variables are used to describe the properties of each event, e.g. duration, maximum volumes, spatial coverage and heterogeneity, and movement of cells. A total of 5-9 dimensions can be found in the data, which can be interpreted as a rough indication of how many independent variables a weather generator should employ. Both principal component analysis and cluster analysis show patterns that are in accordance with our understanding of physical properties of rainfall. In particular it seems that the differences between hourly and daily extremes can be described by relatively simple scaling across the set of variables, i.e. the level of each variable varies significantly, but not the overall structure of the spatial precipitation. The analysis show that there is a good potential for making a spatial weather generator for high spatio-temporal precipitation for precipitation extremes. Before the method can be employed further work is necessary to describe non-linear correlation between the variables and also the tracking algorithm employed needs to be improved.

Ex-situ biogas upgrading and enhancement in different reactor systems

Biogas upgrading is envisioned as a key process for clean energy production. The current study evaluates the efficiency of different reactor configurations for ex-situ biogas upgrading and enhancement, in which externally provided hydrogen and carbon dioxide were biologically converted to methane by the action of hydrogenotrophic methanogens. The methane content in the output gas of the most efficient configuration was >98%, allowing its exploitation as substitute to natural gas. Additionally, use of digestate from biogas plants as a cost efficient method to provide all the necessary nutrients for microbial growth was successful. High-throughput 16S rRNA sequencing revealed that the microbial community was resided by novel phylotypes belonging to the uncultured order MBA08 and to Bacteroidales. Moreover, only hydrogenotrophic methanogens were identified belonging to Methanothermobacter and Methanoculleus genera. Methanothermobacter thermautotrophicus was the predominant methanogen in the biofilm formed on top of the diffuser surface in the bubble column reactor.
Factors affecting the hydraulic performance of infiltration based SUDS in clay

The influence of small scale soil heterogeneity on the hydraulic performance of infiltration based SUDS was studied using field data from a clayey glacial till and groundwater simulations with the integrated surface water and groundwater model HydroGeoSphere. Simulations of homogeneous soil blocks with hydraulic properties ranging from sand to clay showed that infiltration capacities vary greatly for the different soil types observed in glacial till. The inclusion of heterogeneities dramatically increased infiltration volume by a factor of 22 for a soil with structural changes above and below the CaC03 boundary. Infiltration increased further by 8% if tectonic fractures were included and by another 61% if earthworm burrows were added. Comparison of HydroGeoSphere infiltration hydrographs with a simple soakaway model (Roldin et al. 2012) showed similar results for homogenous soils but indicated that exclusion of small scale soil physical features may greatly underestimate hydraulic performance of infiltration based SUDS.

General information
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Fate prediction and mass balances verification of pharmaceuticals compounds in Roldán-Balsicas WWTP (Murcia, Spain)

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Feasibility of phytoremediation for common soil and groundwater pollutants

During the past two to three decades numerous studies reporting highly efficient remediation of contaminated soil and groundwater by plants have been published. The promises of phytoremediation have been great but till now the technology has not been widely applied and recognized, commercially and in a regulatory context, on par with other conventional soil and groundwater remediation technologies. This thesis elucidates the field of phytoremediation and addresses the lack of recognition of the technology. It aims to assess the overall feasibility of phytoremediation and identify obstacles within the field. Further, it provides examples and suggestions of how to overcome these obstacles. The first part of the thesis scrutinizes the literature for data and experiences regarding application of phytoremediation and uncovers potential barriers and where the existing knowledge is insufficient. Further, it considers phytoremediation from a more technical perspective, setting up a mass balance for a generic plant-soil system. On basis of the data review and the mass balance application, an initial assessment of the feasibility of phytoremediation for common soil and groundwater pollutants is conducted. Several knowledge gaps and limitations were identified. Phytoremediation is restricted by phytotoxicity, root depth and long remediation time. Further, there is an evident lack of information about fate of contaminants in plants and the plant processes affecting uptake, excretion and metabolism of contaminants. These data are needed for mass balance modelling purposes. The mass balance revealed that if contaminants are degraded (kdeg ~ 0.01/day or higher) the governing loss of contaminant mass in the soil matrix is by aerobic microbial degradation in the rhizosphere and not by plant uptake. If the total removal of contaminant mass by degradation, direct volatilization and other unknown processes (not including plant uptake and leaching) is negligible, the governing removal process is plant uptake. However, removal by plant uptake is slow compared to rhizo-degradation and it is controlled by the soil matrix volume and the soil/water distribution coefficient (Kd). For compounds with high Kd (e.g. lead) phytoremediation may take immensely long time (>80,000 years). Extraction efficiency of plants is proportional to the soil volume which explains why pot experiments tend to underestimate the remediation time. The feasibility of phytoremediation for organic compounds with limited aerobic degradation (e.g. many chlorinated solvents) and low Kd (~10 L/kg) is more difficult to assess due to lack of knowledge of their fate. The second part of the thesis proposes two flow charts for assessment of the applicability of phytoremediation and applicability of phytoremediation techniques, respectively. They can be seen as a check list of things to consider before implementation of phytoremediation and are meant to ease the decision-support process. Further, they emphasize the need for phytotoxicity data, fate, metabolism- and mass balance studies. It is shown that existing phytotoxicity tests with higher terrestrial plants, not including seed germination, lack standardization and reporting requirements for easy comparison and transparency. The willow tree acute toxicity test by Trapp et al. (2000) is suggested as a candidate for a standardized test as it allows combined uptake, metabolism and toxicity studies. An overview of phytotoxicity data generated by the willow tree acute toxicity test is provided and compared to results generated by the standardized phytotoxicity tests on freshwater green algae and duckweed. No species could be classified as the most sensitive. It is proposed to establish a phytotoxicity database for standardized tests on terrestrial plants, not including seed germination. The fate and metabolism of trichloroethylene (TCE) in plants were evaluated by the willow tree acute toxicity test with chloride as indicator of dehalogenation. Willows and willows inoculated with TCE co-metabolizing strains of the plant endophyte Burkholderia cepacia were continuously exposed to TCE during a tree week period. Approximately 96% of the added TCE evaporated from solution and only 4% was taken up by the plants. Less than 3% of the added TCE was mineralized. To assess the feasibility of phytoremediation at a sodium fluoride contaminated site, the uptake of fluoride in plants was determined by the willow tree acute toxicity test. The mass balance revealed that the willows were capable of enzymatic removal of fluoride from the roots at low external concentrations. At high external concentrations the enzyme system collapsed and fluoride was taken up leading to further toxic effects. Phytoremediation was not assessed to be feasible at the site. The work encompassed in this thesis underlines that phytoremediation may occasionally be feasible. However, there are several limitations which strongly inhibit the applicability. Phytoremediation is assessed to be feasible for nutrients and organic pollutants which can be degraded aerobically. Most trace elements are too strongly bound to the soil matrix to be available for plant extraction and are thus not feasible for phytoremediation. For phytoremediation to become an accepted and recognized technology it must be proven by providing examples of field-scale applications where the soil quality criteria are reached within acceptable timeframes.
Fertilizer driven forward osmosis as a low energy technology for sodium removal in greenhouse applications

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Flood damage assessment – Literature review and recommended procedure
The assessment of flood risk is an essential tool in evaluating the potential consequences of a flood. The analysis of the risk can be applied as part of the flood plain management, but can also be used in a cost-benefit analysis, when comparing different adaption strategies. This analysis is therefore important when assessing flood disaster mitigation options and economical optimizations of possible measures. A common definition is that the flood risk is found with the use of a flood hazard assessment and a flood vulnerability assessment (Apel, Merz and Thieken, 2008).

The flood hazard is the quantification of amount, extent, and location of flooding expected to occur with a given return period. This means that the spatial distribution of the calculated inundation depth as a function of the return period can be used to describe the flood hazard. The vulnerability is the susceptibility of the area subjected to the flooding. A way to express the vulnerability is through a damage cost assessment.

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Food waste prevention in Denmark: Identification of hotspots and potentials with Life Cycle Assessment

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Forced-gradient tracer tests in a fractured limestone aquifer designed and interpreted by modeling

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Formulating and testing a method for perturbing precipitation time series to reflect anticipated climatic changes
Urban water infrastructure has very long planning horizons, and planning is thus very dependent on reliable estimates of the impacts of climate change. Many urban water systems are designed using time series with a high temporal resolution. To assess the impact of climate change on these systems, similarly high-resolution precipitation time series for future climate are necessary. Climate models cannot at their current resolutions provide these time series at the relevant scales. Known methods for stochastic downscaling of climate change to urban hydrological scales have known shortcomings in constructing realistic climate-changed precipitation time series at the sub-hourly scale. In the present study we present a deterministic methodology to perturb historical precipitation time series at the minute scale to reflect non-linear expectations to climate change. The methodology shows good skill in meeting the expectations to climate change in extremes at the event scale when evaluated at different timescales from the minute to the daily scale. The methodology also shows good skill with respect to representing expected changes of seasonal precipitation. The methodology is very robust against the actual magnitude of the expected changes as well as the direction of the changes (increase or decrease), even for situations where the extremes are increasing for seasons that in general should have a decreasing trend in precipitation. The methodology can provide planners with valuable time series representing future climate that can be used as input to urban hydrological models and give better estimates of climate change impacts on these systems.

General information
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Forward Osmosis in Wastewater Treatment Processes

In recent years, membrane technology has been widely used in wastewater treatment and water purification. Membrane technology is simple to operate and produces very high quality water for human consumption and industrial purposes. One of the promising technologies for water and wastewater treatment is the application of forward osmosis. Essentially, forward osmosis is a process in which water is driven through a semipermeable membrane from a feed solution to a draw solution due to the osmotic pressure gradient across the membrane. The immediate advantage over existing pressure driven membrane technologies is that the forward osmosis process per se eliminates the need for operation with high hydraulic pressure and forward osmosis has low fouling tendency. Hence, it provides an opportunity for saving energy and membrane replacement cost. However, there are many limitations that still need to be addressed. Here we briefly review some of the applications within water purification and new developments in forward osmosis membrane fabrication.

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Biofilms are complex biostructures that appear on all surfaces that are regularly in contact with water. They are structurally complex, dynamic systems with attributes of primordial multicellular organisms and multifaceted ecosystems. The presence of biofilms may have a negative impact on the performance of various systems, but they can also be used beneficially for the treatment of water (defined herein as potable water, municipal and industrial wastewater, fresh/brackish/salt water bodies, groundwater) as well as in water stream-based biological resource recovery systems. This review addresses the following three topics: (1) biofilm ecology, (2) biofilm reactor technology and design, and (3) biofilm modeling. In so doing, it addresses the processes occurring in the biofilm, and how these affect and are affected by the broader biofilm system. The symphonic application of a suite of biological methods has led to significant advances in the understanding of biofilm ecology. New metabolic pathways, such as anaerobic ammonium oxidation (anammox) or complete ammonium oxidation (comammox) were first observed in biofilm reactors. The functions, properties, and constituents of the biofilm extracellular polymeric substance matrix are somewhat known, but their exact composition and role in the microbial conversion kinetics and biochemical transformations are still to be resolved. Biofilm grown
microorganisms may contribute to increased metabolism of micro-pollutants. Several types of biofilm reactors have been used for water treatment, with current focus on moving bed biofilm reactors, integrated fixed-film activated sludge, membrane-supported biofilm reactors, and granular sludge processes. The control and/or beneficial use of biofilms in membrane processes is advancing. Biofilm models have become essential tools for fundamental biofilm research and biofilm reactor engineering and design. At the same time, the divergence between biofilm modeling and biofilm reactor modeling approaches is recognized.
Plastic pollution and its environmental effects has received global attention the recent years. However, limited attention has so far been directed towards how plastics are regulated in a life cycle perspective and how regulatory gaps can be addressed in order to limit and prevent environmental exposure and hazards of macro- and microplastics. In this paper, we map European regulation taking outset in the life cycle perspective of plastic carrier bags: from plastic bag production to when it enters the environment. Relevant regulatory frameworks, directives and authorities along the life cycle are identified and their role in regulation of plastics is discussed. Most important regulations were identified as: the EU chemical Regulation, the Packaging and Packaging Waste Directive including the amending Directive regarding regulation of the consumption of lightweight plastic carrier bags, the Waste Framework Directive and the Directive on the Landfill of Waste. The main gaps identified relate to lack of clear definitions of categories of polymers, unambitious recycling rates and lack of consideration of macro- and microplastics in key pieces of legislation. We recommend that polymers are categorized according to whether they are polymers with the same monomer constituents (homopolymers) or with different monomer constituents (copolymers) and that polymers are no longer exempt from registration and evaluation under REACH. Plastics should furthermore have the same high level of monitoring and reporting requirements as hazardous waste involving stricter requirements to labelling, recordkeeping, monitoring and control over the whole lifecycle. Finally, we recommend that more ambitious recycle and recovery targets are set across the EU. Regulation of the consumption of lightweight plastic carrier bags should also apply to heavyweight plastic carrier bags. Last, the Marine and Water Framework Directives should specifically address plastic waste affecting water quality.
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Marine litter, Microplastics, Plastic bags, Regulation

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Functional nanostructured materials for stormwater runoff treatment

Numerous heavy metal removal practices for stormwater runoff have been studied and applied; however, there is still room for improvement. Among these practices, adsorption has proven to be the most efficient way of removing heavy metals. Commonly used adsorbents have an innate sorption capacity in relation to high concentrations of heavy metal ions, but if they are to be used for stormwater runoff, high affinity with rapid sorption kinetics for low concentrations of heavy metals is necessary. Therefore, in this study, new types of functional nanostructured polymer sorbents for effective heavy metal removal from stormwater are suggested.

First, comparison studies of several existing polymer sorbents were conducted, to find decisive functional groups for removing heavy metals from the solution. To enhance the sorption kinetics and affinity of polymer sorbents in the presence of competing ions, sulphur functional groups and polar functional groups in the polymer networks were found to be imperative. Based on this result, new types of covalently connected polymer sorbents were devised and characterised. One of the novel polymer sorbents, disulphide-linked polymer (COP-63), was selected for perusing heavy metal sorption behaviour. Although COP-63 has a moderate surface area, it demonstrated cadmium removal efficiency equivalent to highly porous activated carbon (AC), while it also exhibited 16 times faster sorption kinetics compared to AC, owing to high affinity towards disulphide and thiol functionality. The chemisorption mechanism of sorbents was confirmed by sorption kinetics, the effects of pH and metal complexation. The metal ions copper, cadmium and zinc showed high binding affinity towards the polymer sorbent, even in the presence of competing cations in the form of calcium.

To retrofit polymer sorbents for a real stormwater filter, controlling the size of sorbents by formulating composites was applied. The first composites were obtained by grafting polymer onto granular-AC through acyl chlorination (DiS-AC), and the formulation of composites was confirmed by various characterisation techniques. DiS-AC demonstrated 89 L/g sorption affinity for cadmium, which is notably higher than conventional sorbents’ sorption affinity. Furthermore, within an hour, half of the trace amounts of cadmium ions were removed by the DiS-AC, even in a batch test. Other composites were obtained by embedding the polymer particles on the surface of an alginate bead (DiS-algi). Moreover, the sorption capacity of DiS-algi was 22.3 mg/g, and within 6 minutes, half of the cadmium had been removed with 31 L/mg of Langmuir sorption affinity, outperforming an AC filter.

Moreover, DiS-algi was used to build the reactive filtration column for simulating a real stormwater treatment filter. A breakthrough test of the reactive column showed the complete uptake of cadmium from a contaminated flow, lasting two hours until reaching the breakthrough point. The maximum sorption capacity of the reactive column was 877 µg/g. Furthermore, regeneration tests of the column verified its reusability.

Based on the results of this PhD, novel polymer and composites sorbents are proposed for distinct uses. The devised functional nanostructured polymers confirmed their potential for efficient heavy metal removal, and the simulation of a real-life stormwater filter was successful. Therefore, the novel polymer sorbents herein proved to be viable materials for stormwater runoff filtration systems.
Future scenario development within life cycle assessment of waste management systems

Life Cycle Assessment (LCA) is an acknowledged tool for quantifying the sustainability of waste management solutions. However, the use of LCA for decision-making is hindered by the strong dependency of the LCA results on the assumptions regarding the future conditions in which the waste management solutions will operate. Future scenario methods from the management engineering field may provide valid approaches for formulating consistent assumptions on future conditions for the waste management system modelled with LCA. However, the standardized LCA procedure currently does not offer much guidance on how to model future scenarios in LCA. This thesis highlights critical findings aiming at strengthening the role of LCA in decision support and strategic planning for waste management. In particular, the thesis thoroughly investigated the future scenario methods, the existing guidance on modelling of future scenarios in LCA, all peer-reviewed articles in the literature combining future scenarios and LCA, across sectors, and the specific modelling mechanisms occurring in LCA when assessing future scenarios. For each of these aspects, the thesis investigated the specific needs of the waste management field. The quantitative modelling implications were tested within real-scale LCA models focusing on the management of residual waste in Denmark. In a wide range of scenarios, this thesis addressed the influence on the LCA model results of realistic technology and waste composition uncertainties, as well as the effects of implementing future energy scenarios and design-stage technologies. The thesis underlines that future scenarios can be used to formulate consistent assumptions for waste management systems. However, in order to obtain well-founded quantitative results with LCA, the implementation of future scenarios should comply with the following conditions:

- Future scenarios should include important aspects identified within the case-specific LCA model.
- Important aspects can be identified from a preliminary LCA, but should always be evaluated again after implementing the future scenarios in LCA.
- Identification of important aspects (such as parameters of the modelled technologies, waste composition, and framework conditions) ultimately governing the LCA results of the future scenarios should be regarded as a fundamental part of the future scenario process and be communicated to the final receivers of the LCA. The main outcome of this thesis is a systematic framework that can be used to assess future scenarios in LCA.
- The framework combines approaches developed during the PhD study in order to systematically address the modelling implications of combining future scenarios and LCAs of waste management systems.
- The study developed a systematic definition of importance of LCA model parameters based on their input uncertainty and their sensitivity on results with a Global Sensitivity Analysis (GSA) approach. Within LCAs of waste management systems, the GSA approach allowed quantifying the importance of the waste composition versus the more commonly tested technology parameters. Less than 10 waste composition parameters as well as 5-6 technology parameters, out of a total of 750 waste and technology parameters, were found important for the results across all tested impact categories. These findings were used to improve existing step-wise approaches for quantification of uncertainty in LCA. Moreover, this PhD study provided a novel method to quantitatively determine the most robust waste management solution across several future scenarios combining results of uncertainty analysis and scenario analysis into a simple and conveyable score.
- The systematic framework for future scenarios in LCA should start from a preliminary LCA carried out on the case-specific system and identifying the important aspects with the GSA approach. The future scenarios can be formulated with whichever future scenario technique in preference, including the important aspects identified in the preliminary LCA. Then, the future scenarios can be implemented in further LCAs. A subsequent determination of important parameters with GSA is fundamental for identifying the aspects of the model ultimately governing the future scenario results and any necessary revisions in the future scenarios or model data. Finally, sustainability on the long-term can be strengthened by the combined use of uncertainty and scenario analysis. This means that the LCA results can be communicated as probabilities of each individual waste solution being environmentally better compared to the others, together with a clear indication of which aspects and parameters critically affect the performance of the solution. The proposed systematic framework can be adapted to LCAs carried out in all fields and can also be used to quantitatively carry out systematic scenario analyses on the assumptions of present-day LCAs.
Gas chromatography vs. quantum cascade laser-based N₂O flux measurements using a novel chamber design

Recent advances in laser spectrometry offer new opportunities to investigate the soil-atmosphere exchange of nitrous oxide. During two field campaigns conducted at a grassland site and a willow field, we tested the performance of a quantum cascade laser (QCL) connected to a newly developed automated chamber system against a conventional gas chromatography (GC) approach using the same chambers plus an automated gas sampling unit with septum capped vials and subsequent laboratory GC analysis. Through its high precision and time resolution, data of the QCL system were used for quantifying the commonly observed nonlinearity in concentration changes during chamber deployment, making the calculation of exchange fluxes more accurate by the application of exponential models. As expected, the curvature values in the concentration increase was higher during long (60 min) chamber closure times and under high-flux conditions (F-N₂O > 150 μg Nm⁻²h⁻¹) than those values that were found when chambers were closed for only 10 min and/or when fluxes were in a typical range of 2 to 50 μg Nm⁻²h⁻¹. Extremely low standard errors of fluxes, i.e., from similar to 0.2 to 1.7% of the flux value, were observed regardless of linear or exponential flux calculation when using QCL data. Thus, we recommend reducing chamber closure times to a maximum of 10 min when a fast-response analyzer is available and this type of chamber system is used to keep soil disturbance low and conditions around the chamber plot as natural as possible. Further, applying linear regression to a 3 min data window with rejecting the first 2 min after closure and a sampling time of every 5 s proved to be sufficient for robust flux determination while ensuring that standard errors of N₂O fluxes were still on a relatively low level. Despite low signal-to-noise ratios, GC was still found to be a useful method to determine the mean soil-atmosphere exchange of N₂O on longer timescales during specific campaigns. Intriguingly, the consistency between GC and QCL-based campaign averages was better under low than under high N₂O efflux conditions, although single flux values were highly scattered during the low efflux campaign. Furthermore, the QCL technology provides a useful tool to accurately investigate the highly debated topic of diurnal courses of N₂O fluxes and its controlling factors. Our new chamber design protects the measurement spot from unintended shading and minimizes disturbance of throughfall, thereby complying with high quality requirements of long-term observation studies and research infrastructures.
Gas collection efficiency at two danish landfills

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Fathi Aghdam, E. (Intern), Fredenslund, A. M. (Intern), Kjeldsen, P. (Intern), Scheutz, C. (Intern)
Gas composition of sludge residue profiles in a sludge treatment reed bed between loadings

Treatment of sludge in sludge treatment reed bed systems includes dewatering and mineralization. The mineralization process, which is driven by microorganisms, produces different gas species as by-products. The pore space composition of the gas species provides useful information on the biological processes occurring in the sludge residue. In this study, we measured the change in composition of gas species in the pore space at different depth levels in vertical sludge residue profiles during a resting period of 32 days. The gas composition of the pore space in the sludge residue changed during the resting period. As the resting period proceeded, atmospheric air re-entered the pore space at all depth levels. The methane (CH4) concentration was at its highest during the first part of the resting period, and then declined as the sludge residue became more dewatered and thereby aerated. In the pore space, the concentration of CH4 often exceeded the concentration of carbon dioxide (CO2). However, the total emission of CO2 from the surface of the sludge residue exceeded the total emission of CH4, suggesting that CO2 was mainly produced in the layer of newly applied sludge and/or that CO2 was emitted from the sludge residue more readily compared to CH4.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Orbicon
Authors: Larsen, J. D. (Intern), Nielsen, S. M. (Ekstern), Scheutz, C. (Intern)
Number of pages: 9
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BFI (2017): BFI-level 1
Scopus rating (2017): SJR 0.429 SNIP 0.574 CiteScore 1.34
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.3 SJR 0.404 SNIP 0.637
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.464 SNIP 0.594 CiteScore 1.19
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.585 SNIP 0.683 CiteScore 1.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.571 SNIP 0.701 CiteScore 1.3
ISI indexed (2013): ISI indexed yes
Genome comparison and physiological characterization of eight Streptococcus thermophilus strains isolated from Italian dairy products

Eight Streptococcus thermophilus strains of dairy origin isolated in Italy were chosen to investigate autochthonous bacterial diversity in this important technological species. In the present study a comparative analysis of all the 17 S. thermophilus genomes publicly available was performed to identify the core and the variable genes, which vary among strains from 196 to 265. Additionally, correlation between the isolation site and the genetic distance was investigated at genomic level. Results highlight that the phylogenetic reconstruction differs from the geographical strain distribution. Moreover, strain M17PTZA496 has a genome of 2.15 Mbp, notably larger than that of the others, determined by lateral gene transfer (including phage-mediated incorporation) and duplication events. Important technological characters, such as growth kinetics, bacteriocin production, acidification kinetics and surface adhesion capability were studied in all the Italian strains. Results indicate a wide range of variability in adhesion properties that significantly clustered strains into four groups. Genomic differences among strains in relation to these characters were identified but a clear correlation between genotype and phenotype was not always found since most of the genomic modifications arise from single nucleotide polymorphisms. This research represents a step forward in the identification of strains-specific functions in Streptococcus thermophilus and it has also the potential to provide valuable information to predict strain specific behaviors in industrial
processes.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padova
Authors: Vendramin, V. (Ekstern), Treu, L. (Intern), Campanaro, S. (Ekstern), Lombardi, A. (Ekstern), Corich, V. (Ekstern), Giacomini, A. (Ekstern)
Number of pages: 11
Pages: 47-57
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BFI (2017): BFI-level 1
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.31 SJR 1.723 SNIP 1.675
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.705 SNIP 1.765 CiteScore 4.24
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.535 SNIP 1.738 CiteScore 3.74
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.772 SNIP 1.845 CiteScore 3.81
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.597 SNIP 1.627 CiteScore 3.54
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.587 SNIP 1.874 CiteScore 3.72
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.678 SNIP 1.754
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.591 SNIP 1.734
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.233 SNIP 1.593
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.043 SNIP 1.703
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.076 SNIP 1.614
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.907 SNIP 1.159
Scopus rating (2004): SJR 0.781 SNIP 1.054
GISMOWA: Geospatial Risk-Based Analysis Identifying Water Quality Monitoring Sites in Distribution Systems

Monitoring water quality in drinking water distribution systems is the basis for proactive approaches to prevent or manage emerging water quality issues, and such a monitoring requires a strategic selection of relevant and representative monitoring sites. GISMOWA is a new GIS and risk-based analysis tool to identify and prioritize pipe segments for water quality monitoring and to comply with existing monitoring and sampling guidelines. The tool was designed to integrate multiple parameters categorized as (1) hydraulic and structural weaknesses in the system, e.g., residence time; (2) external threats, e.g., contaminated sites; and (3) sensitive consumers, e.g., hospitals, in a GIS environment. The tool used a multicriteria decision analysis to evaluate multiple monitoring site parameters and map zones particularly suitable for water quality monitoring. GISMOWA was applied to Danish water distribution systems as a transparent and simple-to-use tool facilitating a complete overview of the distribution system, including sensitive consumers and consumers in general, thus fulfilling a precondition for a HACCP-based monitoring strategy of drinking water. (C) 2017 American Society of Civil Engineers.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Larsen, S. L. (Intern), Christensen, S. C. B. (Intern), Albrechtsen, H. (Intern), Rygaard, M. (Intern)
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.98 SJR 1.296 SNIP 1.594
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.153 SNIP 1.717 CiteScore 2.49
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.147 SNIP 2.765 CiteScore 2.59
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.299 SNIP 2.135 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Goodness of dustiness index for predicting human exposure to airborne nanomaterials

General information
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Organisations: Department of Environmental Engineering, Environmental Chemistry, National Research Center for Working Environment, Institute of Occupational Medicine (IOM)
Number of pages: 1
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Main Research Area: Technical/natural sciences
Conference: New tools and approaches for nanomaterial safety assessment 2017, Málaga, Spain, 07/02/2017 - 07/02/2017
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BOOK_OF_ABSTRACTS
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Greenhouse gas emission quantification from wastewater treatment plants, using a tracer gas dispersion method
Plant-integrated methane (CH4) and nitrous oxide (N2O) emission quantifications were performed at five Scandinavian wastewater treatment plants, using a ground-based remote sensing approach that combines a controlled release of tracer gas from the plant with downwind concentration measurements. CH4 emission factors were between 1 and 21% of CH4 production, and between 0.2 and 3.2% of COD influent. The main CH4 emitting sources at the five plants were sludge treatment and energy production units. The lowest CH4 emission factors were obtained at plants with enclosed sludge treatment and storage units. N2O emission factors ranged from < 0.1 to 5.2% of TN influent, and from < 0.1 to 5.9% of TN
removed. In general, measurement-based, site-specific CH4 and N2O emission factors for the five studied plants were in the upper range of the literature values and default emission factors applied in international guidelines. This study showed that measured CH4 and N2O emission rates from wastewater treatment plants were plant-specific and that emission rates estimated using models in current guidelines, mainly meant for reporting emissions on the country scale, were unsuitable for Scandinavian plant-specific emission reporting.

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Delre, A. (Intern), Mønster, J. (Intern), Scheutz, C. (Intern)
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Main Research Area: Technical/natural sciences

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BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.546 SNIP 1.65 CiteScore 4.98
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.09 SJR 1.652 SNIP 1.856
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.653 SNIP 1.648 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.635 SNIP 1.843 CiteScore 4.2
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.527 SNIP 1.745 CiteScore 3.73
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.749 SNIP 1.82 CiteScore 3.7
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.802 SNIP 1.676 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.651 SNIP 1.506
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.576 SNIP 1.6
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.461 SNIP 1.489
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.393 SNIP 1.473
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.512 SNIP 1.586
Web of Science (2006): Indexed yes
Greenhouse gas emissions from integrated urban drainage systems: where do we stand?

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, University of Exeter, Monash University, University of Innsbruck, University of Queensland, University of Leuven, University of Palermo
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Source: PublicationPreSubmission
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Greenhouse gas emissions from the mineralisation process in a Sludge Treatment Reed Bed system: Seasonal variation and environmental impact

Greenhouse gas emission data from the mineralisation process in Sludge Treatment Reed Bed systems (STRB) are scarce. The aim of this study was to quantify the emission rates of carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) and to investigate seasonal variations in order to estimate the annual greenhouse gas emission rate of the mineralisation process. The full-scale STRB at Helsinge wastewater treatment plant (WWTP) in Denmark was chosen as the study site. Gas emission rates were measured using static surface flux chambers. The measurements were carried out in October/November 2014, March/April 2015, June/July 2015 and January/February 2016. We found that the emission rates of all included gas species were significantly affected by season. For CO2 and CH4, the highest emission rates were recorded in summer, being 138 and 5.2 g m−2 d−1, respectively, while the lowest rates were recorded in winter, being 442 and 0.7 g m−2 d−1, respectively. For N2O, the highest and lowest rates were recorded in autumn and spring, being 0.47 and 0.31 g m−2 d−1, respectively. Emissions of CO2 and CH4 appeared to be affected not only by temperature, but also by the amount of precipitation. An annual greenhouse gas emission rate (given in CO2 equivalents) of the mineralisation process was calculated for two scenarios based on the assumptions: 1) gas emission rates are not affected by the amount of sludge accumulated in the STRB and 2) gas emission rates are affected by the amount of sludge accumulated in the STRB. The results revealed that the annual global warming potential is to be found in a range between 7 and 13.4 kg CO2-eq PE−1 y−1.

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GrundRisk - Coupling of vertical and horizontal transport models
This report presents the development of the GrundRisk model for contaminated site risk assessment.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering
Authors: Locatelli, L. (Intern), Rosenberg, L. (Intern), Bjerg, P. L. (Intern), Binning, P. J. (Intern)
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Publication: Commissioned › Report – Annual report year: 2017

Heat and water transport in soils and across the soil-atmosphere interface: 1. Theory and different model concepts
Evaporation is an important component of the soil water balance. It is composed of water flow and transport processes in a porous medium that are coupled with heat fluxes and free air flow. This work provides a comprehensive review of model concepts used in different research fields to describe evaporation. Concepts range from nonisothermal two-phase flow, two-component transport in the porous medium that is coupled with one-phase flow, two-component transport in the free air flow to isothermal liquid water flow in the porous medium with upper boundary conditions defined by a potential evaporation flux when available energy and transfer to the free airflow are limiting or by a critical threshold water pressure when soil water availability is limiting. The latter approach corresponds with the classical Richards equation with mixed boundary conditions. We compare the different approaches on a theoretical level by identifying the underlying simplifications that are made for the different compartments of the system: porous medium, free flow and their interface, and by discussing how processes not explicitly considered are parameterized. Simplifications can be grouped into three sets depending on whether lateral variations in vertical fluxes are considered, whether flow and transport in the air phase in the porous medium are considered, and depending on how the interaction at the interface between the free flow and the porous medium is represented. The consequences of the simplifications are illustrated by numerical simulations in an accompanying paper.

General information
State: Published
Authors: Vanderborght, J. (Ekstern), Fetzer, T. (Ekstern), Mosthaf, K. (Intern), Smits, K. M. (Ekstern), Helmig, R. (Ekstern)
Number of pages: 23
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Publication information
Heat and water transport in soils and across the soil-atmosphere interface: 2. Numerical analysis

In an accompanying paper, we presented an overview of a wide variety of modeling concepts, varying in complexity, used to describe evaporation from soil. Using theoretical analyses, we explained the simplifications and parameterizations in the different approaches. In this paper, we numerically evaluate the consequences of these simplifications and parameterizations. Two sets of simulations were performed. The first set investigates lateral variations in vertical fluxes, which emerge from both homogeneous and heterogeneous porous media, and their importance to capturing evaporation behavior. When evaporation decreases from parts of the heterogeneous soil surface, lateral flow and transport processes in the free flow and in the porous medium generate feedbacks that enhance evaporation from wet surface areas. In the second set of simulations, we assume that the vertical fluxes do not vary considerably in the simulation domain and represent the system using one-dimensional models which also consider dynamic forcing of the evaporation process, for example, due to diurnal variations in net radiation. Simulated evaporation fluxes subjected to dynamic forcing differed considerably between model concepts depending on how vapor transport in the air phase and the interaction at the interface between the free flow and porous medium were represented or parameterized. However, simulated cumulative evaporation losses from initially wet soil profiles were very similar between model concepts and mainly controlled by the desorptivity, $Se_{vap}$, of the porous medium, which depends mainly on the liquid flow properties of the porous medium.
Heterotrophs are key contributors to nitrous oxide production in mixed liquor under low C-to-N ratios during nitrification - batch experiments and modelling

Nitrous oxide (N2O), a by-product of biological nitrogen removal during wastewater treatment, is produced by ammonia-oxidizing bacteria (AOB) and heterotrophic denitrifying bacteria (HB). Mathematical models are used to predict N2O emissions, often including AOB as the main N2O producer. Several model structures have been proposed without consensus calibration procedures. Here, we present a new experimental design that was used to calibrate AOB-driven N2O dynamics of a mixed culture. Even though AOB activity was favoured with respect to HB, oxygen uptake rates indicated HB activity. Hence, rigorous experimental design for calibration of autotrophic N2O production from mixed cultures is essential. The proposed N2O production pathways were examined using five alternative process models confronted with experimental data inferred. Individually, the autotrophic and heterotrophic denitrification pathway could describe the observed data. In the best-fit model, which combined two denitrification pathways, the heterotrophic was stronger than the autotrophic contribution to N2O production. Importantly, the individual contribution of autotrophic and heterotrophic to the total N2O pool could not be unambiguously elucidated solely based on bulk N2O measurements. Data on NO would increase the practical identifiability of N2O production pathways.
High efficient ethanol and VFAs production from gas fermentation: effect of acetate, gas and inoculum microbial composition

In bioindustry, syngas fermentation is a promising technology for biofuel production without the use of plant biomass as sugar-based feedstock. The aim of this study was to identify optimal conditions for high efficient ethanol and volatile fatty acids (VFA) production from synthetic gas fermentation. Therefore, the effect of different gases (pure CO, H2, and a synthetic syngas mixture), media (acetate medium and acetate-free medium), and biocatalyst (pure and mixed culture) were studied. Acetate was the most dominant product independent on inoculum type. The maximum concentration of volatile fatty acids and ethanol was achieved by the pure culture (Clostridium ragsdalei). Depending on the headspace gas composition, VFA concentrations were up to 300% higher after fermentation with Clostridium ragsdalei compared to fermentation with mixed culture. The preferred gas composition with respect to highest VFA concentration was pure CO (100%) regardless of microbial composition of the inoculum and media composition. The addition of acetate had a negative impact on the VFA formation which was depending on the initial gas composition in head space.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Damietta University, City of Scientific Research and Technology Applications, Technical University of Denmark
Authors: El-Gammal, M. (Ekstern), Abou-Shanab, R. (Ekstern), Angelidaki, I. (Intern), Omar, B. (Ekstern), Sveding, P. V. (Ekstern), Karakashev, D. B. (Intern), Zhang, Y. (Intern)
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Main Research Area: Technical/natural sciences

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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.71 SJR 1.198 SNIP 1.385
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.51 SNIP 1.596 CiteScore 4.03
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
How much can we trust data from the real world? Assessing the performance of online sensors for CSO monitoring when operated in non-ideal conditions

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Water Technologies, Technical University of Denmark
Authors: Skov, L. S. (Ekstern), Chhetri, R. K. (Intern), Vezzaro, L. (Intern)
Pages: 2301-2307
Publication date: 2017
Human health no-effect levels of TiO2 nanoparticles as a function of their primary size

As engineered nanomaterials are increasingly introduced on the market into a broad range of commodities or nanoproducts, there is a need for operational, reliable tool, enabling to consistently assess the risks and impacts associated with the releases of nanoparticles. The lack of a developed metric that accurately represents their toxic effects while capturing the influence of the most relevant physicochemical properties is one of the major impediments. Here, we investigate the relationships between the toxic responses of nano-sized and micro-sized particles in in vivo toxicological studies and their physicochemical properties. Our results for TiO2 particles indicate statistically significant associations between the primary particle size and their toxicity responses for combined inhalation and ingestion exposure routes, although the numerical values should be considered with care due to the inability to encompass influences from other relevant physicochemical properties like surface coatings. These findings allow for expressing mass-based adverse effect levels as a continuous function of the primary size of particles. This meaningful, exploratory metric can thus be used for screening purposes and pave the way for reaching adaptive, robust risk assessments of nanomaterials, e.g. for setting up consistent threshold levels, as well as consistent life cycle assessments of nanoproducts. We provide examples of such applications.
Hybrid Moving Bed Biofilm Reactor for the biodegradation of benzotriazoles and hydroxy-benzothiazole in wastewater

A laboratory scale Hybrid Moving Bed Biofilm Reactor (HMBBR) was used to study the removal of five benzotriazoles and one benzothiazole from municipal wastewater. The HMBBR system consisted of two serially connected fully aerated bioreactors that contained activated sludge (AS) and K3-biocarriers and a settling tank. The average removal of target compounds ranged between 41% (4-methyl-1H-benzotriazole; 4TTR) and 88% (2-hydroxybenzothiazole; OHBTH). Except for 4TTR, degradation mainly occurred in the first bioreactor. Calculation of biodegradation constants in batch experiments and application of a model for describing micropollutants removal in the examined system showed that AS is mainly involved in biodegradation of OHBTH, 1H-benzotriazole (BTR) and xylytriazole (XTR), carriers contribute significantly on 4TTR biodegradation, while both types of biomass participate on elimination of 5-chlorobenzotriazole (CBTR) and 5-methyl-1H-benzotriazole (5TTR). Comparison of the HMBBR system with MBBR or AS systems from literature showed that the HMBBR system was more efficient for the biodegradation of the investigated chemicals. Biotransformation products of target compounds were identified using ultra high-performance liquid chromatography, coupled with a quadrupole-time-of-flight high-resolution mass spectrometer (UHPLC-QToF-MS). Twenty two biotransformation products were tentatively identified, while retention time denoted the formation of more polar transformation products than the parent compounds.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, National Kapodistrian University of Athens, University of the Aegean
Authors: Mazioti, A. A. (Ekstern), Stasinakis, A. S. (Ekstern), Psoma, A. K. (Ekstern), Thomaidis, N. S. (Ekstern), Andersen, H. R. (Intern)
Pages: 299-310
Hydraulics and drones: observations of water level, bathymetry and water surface velocity from Unmanned Aerial Vehicles

The planet faces several water-related threats, including water scarcity, floods, and pollution. Satellite and airborne sensing technology is rapidly improving to improve the observation and prediction of surface water and thus prevent natural disasters. While technological developments require extensive research and funding, they are far less expensive and therefore more important than disaster restoration and remediation. Thus, our research question was “Can we retrieve hydraulic observations of inland surface water bodies, whenever and wherever it is required, with (i) high accuracy, (ii) high spatial resolution and (iii) at a reasonable cost?”. Unmanned Aerial Vehicles (UAVs) and their miniaturized components solve this challenge. Indeed, they can monitor dangerous or difficult-to-reach areas delivering real-time data. Furthermore, they ensure high accuracy and spatial resolution in monitoring surface water bodies, at a limited cost and with high flexibility. This PhD project investigates and demonstrates how UAVs can enrich the set of available hydraulic observations in inland water bodies, including: 1. Orthometric water level. 2. Water depth (bathymetry). 3. Surface water speed. The novelty of this research is to retrieve water level and bathymetry measurements from UAVs. The objective is to retrieve these observations with an accuracy of few cm, without any need for GCPs (Ground Control Points), and without any dependency on river morphology, water turbidity, and maximum water depth. Although UAV-borne measurements of surface water speed have already been documented in the literature, a novel approach was developed to avoid GCPs. This research is the first demonstration that orthometric water level can be measured from UAVs with a radar system and a GNSS (Global Navigation Satellite System) receiver. As in satellite altimetry, the GNSS receiver measures the altitude above mean sea level, while the radar measures the range to the water surface. The orthometric water level is then computed by subtracting the range measured by the radar from the GNSS-derived altitude. However, compared to satellites, UAVs have several advantages: high spatial resolution, repetitiveness of the flight missions and good tracking of the water bodies. Nevertheless, UAVs face several constraints: vibrations, limited size, weight, and electric power available for the sensors. In this thesis, we present the first studies on UAV altimetry. Studies were conducted to measure orthometric water level (height of water surface above mean level) in rivers, lakes, and in the worldwide unique cenotes and lagoons of the Yucatan peninsula. An accuracy of ca. 5-7 cm is achievable with our technology. This accuracy is higher than any other spaceborne radar or spaceborne LIDAR altimeter. Water depths were measured by UAV with a tethered sonar controlled by the UAV. Bathymetry can be estimated by subtracting water depth from water level. Our technology aims to combine the large spatial and temporal coverage capabilities of remote sensing techniques, with the accuracy of in-situ measurements. An accuracy of ca. 2.1% of the actual depth was achieved with our system, with a maximum depth capability potentially up to 80 m. Since remote sensing techniques (e.g. LIDARs, through-water photogrammetry, spectral-depth signature of multispectral imagery) can survey water depths up to few meters only, our technology has a maximum depth capability and an applicability range superior to any other remote sensing technique. Compared to manned or unmanned vessels equipped with echo sounders, our UAV-borne technology can also survey non-navigable rivers and overpass obstacles (e.g. river structures). Computer vision, autopilot system and beyond visual line-of-sight (BVLOS) flights will ensure the possibility to retrieve hyper-spatial observations of water depth, without requiring the operator to access the area. Surface water speed can be measured with UAVs using image cross correlation techniques. UAV-borne water speed observations can overcome the practical difficulties of traditional methods. Indeed flow measurements are often intrusive (e.g. flow meters) or require deployment of vessels equipped with expensive acoustic Doppler current profilers (ADCPs). For these reasons, water speed observations have been traditionally challenging, especially in difficult-to-access environments. Conversely, UAV-borne observations open up the possibility of measuring water speed over extended regions at a low cost. The 2D water surface velocity field is computed by analysing the UAV-borne video frames using a technique called large scale PIV (Particle Image Velocimetry). PIV is well known in micro scale applications, but large scale PIV faces several challenges. For instance, it is not possible to use laser systems to better illuminate the water surface. Our preliminary studies show that UAVs can measure surface water speed of rivers. However, seeding of the water surface is required due to the lack of natural tracers (e.g. bubbles, debris, and foam) occurring in the Danish free-flowing rivers. Furthermore, video stabilization techniques are essential to remove the effects of drone vibrations. An innovative procedure was adopted to convert from image units (pixels) into metric units, by using the on-board radar observations. A study was conducted to evaluate the potential of UAV-borne water observations for calibrating a hydrological model. The hydrological model simulates Melléanne river (Denmark) and its catchment. The model-derived estimates of groundwater-surface water (GW-SW) interaction were significantly improved after calibration against synthetic UAV-borne observations. After calibration against UAV-borne water level observations, the sharpness (width of the confidence interval) of GW-SW time series is improved.
by ca. 50%, RMSE (Root Mean Square Error) decreases by ca. 75%, and the direction of the GW-SW flux is better simulated.

**Hydroeconomic analysis**

Hydroeconomic analysis and modeling provides a consistent and quantitative framework to assess the links between water resources systems and economic activities related to water use, simultaneously modeling water supply and water demand. It supports water managers and decision makers in assessing trade-offs between different water uses, different geographic regions, and various economic sectors and between the present and the future. Hydroeconomic analysis provides consistent economic performance criteria for infrastructure development and institutional reform in water policies and management organizations. This chapter presents an introduction to hydroeconomic analysis and modeling, and reviews the state of the art in the field. We review available economic water-valuation techniques and summarize the main types of decision problems encountered in hydroeconomic analysis. Popular solution strategies for hydroeconomic problems are introduced. Typical problems and issues in real-world applications of hydroeconomic analysis and modeling are discussed. The chapter ends with a discussion of challenges, limitations, and future research directions in this field.

**Hydrogen assisted biological biogas upgrading**

Wind and biomass are promoted worldwide as sustainable forms of energy. Anaerobic digestion of biomass produces biogas with ∼50−70% CH4 and 30−50% CO2. However, biogas with >90% CH4 content has higher heating value, can be injected into the natural gas grid or used as alternative to natural gas as vehicle fuel. Methods currently available for biogas upgrading mainly consists of physicochemical CO2 removal, requiring the use of chemical substances and energy input and, thus, increasing process costs. This PhD project proposes an alternative to existing biogas upgrading technologies, where H2, produced by water electrolysis, using excess of electricity from wind mills, is coupled with the CO2 contained in the biogas to convert them to CH4. This process is defined as biological biogas upgrading and is carried out by hydrogenotrophic methanogenic archaea that couples CO2 with H2 to produce biomethane, via hydrogenotrophic methanogenesis. This reaction results in an increment of the total volume of CH4 produced avoiding any loss of CH4.
Moreover, the CO2 is converted rather than being released to the atmosphere providing enhanced environmental benefits of biogas technologies. Moreover, hydrogenotrophic methanogenesis can operate in moderate operating conditions, without using chemical substances, and exploiting mixed culture, rather than pure culture, markedly reducing operation costs. The combination of these characteristics makes biogas an energy carrier with exceptional potential, which could become a key element in the future renewable-based energy system. Nevertheless, the direct injection of H2 in the reactor (in-situ biogas upgrading) can cause scientific challenges, such as pH increase due to the CO2 removal and process inhibition due to higher H2 partial pressure. Therefore, ex-situ biogas upgrading emerged as a solution aiming at the optimization of the upgrading process in dedicated external reactors. In this concept, biogas and H2 are introduced into an anaerobic reactor containing a mixed hydrogenotrophic culture where the biogas is upgraded to higher CH4 content. To overcome the issues related to in-situ biogas upgrading, a two-stage Continuous Stirred Tank Reactor (CSTR) was designed. In this configuration, the biogas and the digestate produced in the first reactor were transferred to the second one, where H2 was injected, decoupling biogas production (mainly occurring in the first reactor) and biogas upgrading (occurring in the second reactor) and providing higher process efficiency. Moreover, biogas production and upgrading performances at mesophilic and thermophilic conditions were compared. The results demonstrate the feasibility of the biogas upgrading process, at both temperature conditions with higher biomethanation and CO2 conversion efficiency at thermophilic. Moreover, upon H2 addition, the produced biogas was upgraded to average CH4 content of 89% in the mesophilic reactor and 85% in the thermophilic. Nevertheless, H2 is known to be poorly soluble in aqueous media and its transfer to the reactors’ liquid phase represents a strong limiting factor for H2 availability for methanogens. Therefore, the optimization of H2 dispersion is crucial to ensure efficient biogas upgrading process. Gas transfer to the liquid phase is specific for given reactor configuration and operating conditions and can be modulated by adjusting on parameters such as mixing speed, gas recirculation and H2 diffusion device. This aspect has been investigated in a thermophilic granular up-flow anaerobic sludge blanket (UASB) reactor connected to a separate H2-injection chamber, for in-situ biogas upgrading. The effect of liquid and gas recirculation on gas-liquid transfer was evaluated. Moreover, the application of different packing materials in the separate chamber, as a mean to minimize gas bubble size and thus increase the gas dissolution in the liquid was discussed. Finally, the effect of gas retention time was evaluated in different chamber configurations to elucidate its role for CO2 and H2 conversion to CH4. It was observed that by distributing H2 through a stainless steel diffuser followed by a ceramic sponge in a separate chamber (having a volume of 25% of the reactor) and by applying a moderate gas recirculation, CO2 content in the biogas dropped from 42 to 10% and the final biogas was upgraded from 58 to 82% CH4 content. Based on these finding, further enhancement of the H2 gas-liquid mass transfer rate was investigated in four up-flow reactors for ex-situ biogas upgrading. The effect of different H2 distribution devices and different pore sizes on H2 uptake by methanogens was elucidated. Moreover the role of input gas flow rate and gas recirculation on H2 and CO2 conversion to CH4 was investigated. The results showed that the configurations involving diffusion devices with larger pore size presented the best kinetics and output-gas quality and at the highest recirculation rate tested, they managed to convert all the input H2 and CO2 into CH4, up to a H2 loading rate of 3.6 L/L/REACTOR.d. Accordingly, the CH4 content in the reactor increased from 23 to 96% and the CH4 yield reached 0.25 LCH4/LH2. Finally, to provide higher process control and efficiency, a better understanding of the biogas community composition is crucial. Previous studies have showed that in each microbial community there is a fraction of microorganisms that is always present and constitutes the core of the community and a fraction depending on operating conditions. Therefore, we hypothesized that the H2 addition would selectively stimulate the hydrogenotrophic pathway enhancing the CO2 consumption and thus the biogas upgrading. Based on this knowledge, different bioinformatics approaches, comprising the commonly utilized, 16S rRNA amplicon sequencing, but also Assembled Full-Length 16S rRNA gene sequencing and total random sequencing followed by de novo assembly and by a binning strategy, were applied to the study of biogas production and upgrading communities. Specifically, biogas core community was composed of several recurrent microbial groups, including resilient methanogenic archaea such as Methanoculleus and Methanotermobacter and bacteria belonging to phylum Proteobacteria and genus Synthrophomonas. Moreover, upon H2 addition, the concomitant proliferation of hydrogenotrophic methanogens and syntrophic bacteria, such as Desulfovibrio, and some Thermoanaerobacteraceae and Syntrophomonadaceae, and the reduction of acetoclastic methanogens and fermentative bacteria state the role of the H2 moving biomethanation process toward the final steps stimulating CO2 consumption and therefore biogas upgrading.

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Hydrologic impact of urbanization with extensive stormwater infiltration

This paper presents a novel modeling analysis of a 40-year-long dataset to examine the impact of urbanization, with widespread stormwater infiltration, on groundwater levels and the water balance of a watershed. A dataset on the hydrologic impact of urbanization with extensive stormwater infiltration is not widely available, and is important because many municipalities are considering infiltration as an alternative to traditional stormwater systems. This study analyzes groundwater level observations from an urban catchment located in Perth, Western Australia. The groundwater observation data cover approximately a 40-year-long period where land use changes (particularly due to urbanization) occurred; moreover, the monitored area contains both undeveloped and urbanized areas where stormwater infiltration is common practice via soakwells (shallow vertical infiltration wells). The data is analyzed using a distributed and dynamic hydrological model to simulate the groundwater response. The model explicitly couples a soakwell model with a groundwater model so that the performance of the soakwells is reduced by the increase of groundwater levels. The groundwater observation data is used to setup, calibrate and validate a coupled MIKE SHE-MIKE URBAN groundwater model and the model is used to quantify the extent of groundwater rise as a result of the urbanization process. The modeled urbanization processes included the irrigation of new established private and public gardens, the reduction of evapotranspiration due to a decrease in green areas, and the development of artificial stormwater infiltration. The study demonstrates that urbanization with stormwater infiltration affects the whole catchment water balance, increasing recharge and decreasing evapotranspiration. These changes lead to a rise in the groundwater table and an increase in the probability of groundwater seepage above terrain.
Identifying criteria for environmental risk assessment models at different stagegates of nano-material/product innovation considering requirements of various stakeholders

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Impact of compound-specific mixing and electrostatic interactions on transient transport and solute breakthrough

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Impact of external carbon dose on the removal of micropollutants using methanol and ethanol in post-denitrifying Moving Bed Biofilm Reactors
Addition of external carbon sources to post-denitrification systems is frequently used in wastewater treatment plants to enhance nitrate removal. However, little is known about the fate of micropollutants in post-denitrification systems and the influence of external carbon dosing on their removal. In this study, we assessed the effects of two different types and availability of commonly used carbon sources - methanol and ethanol - on the removal of micropollutants in biofilm systems. Two laboratory-scale moving bed biofilm reactors (MBBRs), containing AnoxKaldnes K1 carriers with acclimated biofilm from full-scale systems, were operated in continuous-flow using wastewater dosed with methanol and ethanol, respectively. Batch experiments with 22 spiked pharmaceuticals were performed to assess removal kinetics. Acetyl-sulfadiazine, atenolol, citalopram, propranolol and trimethoprim were easily biotransformed in both MBBRs (biotransformations rate constants kbio between 1.2 and 12.9 L gbiomass(-1) d(-1)), 13 compounds were moderately biotransformed (rate constants between 0.2 and 2 L gbiomass(-1) d(-1)) and 4 compounds were recalcitrant. The methanol-dosed MBBR showed higher kbio (e.g., 1.5-2.5-fold) than in the ethanol-dosed MBBR for 9 out of the 22 studied compounds, equal kbio for 10 compounds, while 3 compounds (i.e., targeted sulfonamides) were biotransformed faster in the ethanol-dosed MBBR. While biotransformation of most of the targeted compounds followed first-order kinetics, removal of venlafaxine, carbamazepine, sulfamethoxazole and sulfamethizole could be described with a cometabolic model. Analyses of the microbial composition in the biofilms using 16S rRNA amplicon sequencing revealed that the methanol-dosed MBBR contained higher microbial richness than the one dosed with ethanol, suggesting that improved biotransformation of targeted compounds could be associated with higher microbial richness. During continuous-flow operation, at conditions representative of full-scale denitrification systems (hydraulic residence time = 2 h), the removal efficiencies of micropollutants were below 35% in both MBBRs, with the exception of atenolol and trimethoprim (>80%). Overall, this study demonstrated that MBBRs used for post-denitrification could be optimized to enhance the biotransformation of a number of micropollutants by accounting for optimal carbon sources and extended residence time.

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Importance of copper for nitrification in biological rapid sand filters for drinking water production

When anoxic groundwater is treated to produce drinking water, ammonium is commonly removed through nitrification in rapid sand filters. Nitrification is a biological process, and is mediated by chemoautotrophic microorganisms. Ammonia oxidizing bacteria (AOB) and archaea (AOA) oxidize ammonium to nitrite, which is further oxidized by nitrite oxidizing bacteria (NOB) to nitrate. Besides these canonical, strict ammonia and nitrite oxidizers, bacteria capable of complete oxidation of ammonia all the way to nitrate have recently been described (comammox). Although nitrification is commonly applied, the reaction rate is sometimes not high enough. This results in incomplete nitrification, with residual ammonium and nitrite concentrations in the finished water, which are problematic for the biological stability of the drinking water. In Denmark, 11 % of the larger water works (>350,000 m3/year) fail to remove ammonium to below the national drinking water quality standard of 0.05 mg NH4+/L. A better process understanding of nitrifying biofilters is needed to optimize treatment performance, remediate existing filters, and to prevent future nitrification problems. The frequent incidents of insufficient nitrification during drinking water production provided the motivation to investigate if a lack of copper could be responsible for the problems in nitrifying biofilters. Copper is believed to be an essential cofactor in the enzyme ammonia monoxygenase (AMO), which catalyzes the first essential step in the oxidation of ammonia to hydroxylamine. Thus, slow and incomplete nitrification could be caused by a lack of sufficient amounts of copper. The overall aim of this PhD project was therefore to determine whether copper supplementation could enhance nitrification in rapid sand filters with incomplete nitrification. Investigations were carried out in situ at full-scale drinking water treatment plants (DWTPs) in Denmark, thereby underlining the problem-solving approach, which focuses on process optimization of real systems. Initial investigations were carried out at Nærum DWTP. The plant has had a long history of incomplete nitrification, with ammonium effluent concentrations of approx. 0.23 mg NH4+/L. Copper concentrations in the raw and filter inlet water were <0.01 µg Cu/L. Subsequently, initiated controlled dosing at approx. 0.4 µg Cu/L doubled a filter's ammonium removal rate (ARR) within only 20 days, so that ammonium effluent concentrations dropped to <0.01 mg NH4+/NL soon after. Water sampling over filter depth with a specially constructed sampling probe revealed that nitrification activity had moved upwards in the filter, with an almost 14-fold increase in ARR in the top 10 cm. The stratified removal meant that less contact time was necessary for complete oxidation of ammonium. In another filter, the stimulation of nitrification lasted for at least 238 days after the dosing was stopped. This, taken together with the stimulatory effect of the dosing, is of great practical importance and shows that continuous dosing is not necessary. During initial experiments at Nærum DWTP, a novel method for trace metal dosing, employing active release of copper through electrolysis from solid metal electrodes, was developed (patents pending). The method has the benefits that low amounts of copper can be supplied in a controlled fashion, and that little maintenance and no chemicals are required. Copper dosing through the novel electrolysis method, as well as through passive dosing from solid copper and active dosing of copper solution, was studied at nine more DWTPs, which all shared a long history of incomplete nitrification. The plants represented a wide range of various parameters, with differences in water chemistry, ammonium concentrations and loading rates, filter design and operation, and treatment steps. Ammonium removal was stimulated at all plants and was complete after an average dosing time of only 19 days. This confirmed a generic, broad applicability of copper dosing to remediate nitrification problems in copper deficient biofilters. After ammonium removal was complete, ammonium loading rates (ALRs) twice as high as the normal ALR were imposed on a filter at one plant. Nevertheless, the filter successfully removed increased loads, with a 2.6-fold increase in ammonium removal capacity. The acquired extra capacity makes the filters more robust towards ALR upshifts during dynamic filter operation. To evaluate bioavailability of copper in rapid sand filters, filter sand extractions and chemical speciation modelling were carried out for Nærum DWTP. Results showed that substantial amounts of copper were bound to iron oxide-hydroxides in the filter and that bicarbonate heavily complexed copper in the water phase. Only <3 % were bioavailable free Cu2+, whereas 91 % of total copper was present as CuCO3. Furthermore, copper availability can be affected by desorption of copper from iron oxides or deposits, biofilm diffusion limitations, (re)cycling of copper within the biofilm, and competition for copper with other microorganisms. Since factors such as iron and bicarbonate concentrations can vary between plants, a site-specific evaluation of copper bioavailability is recommended to adjust dosing accordingly. State-of-the-art microbial methods (qPCR and Illumina sequencing) revealed that not only nitrification activity was affected by the dosing, but also nitrifier densities. At two investigated sites, genus Nitrosomonas (betaproteobacterial AOB) increased from 0.5 to 2.7 % and from 1.1 to 8.5 %, respectively, relative to the total community. With dosing, the ratio within ammonia oxidizing prokaryotes (AOP) was shifted towards Nitrosomonas and away from the comammox Nitrosipira, which were also abundant in the filters. Prior to dosing, cell specific ammonium removal rates of betaproteobacterial AOB were low, at 0.03 to 0.08 x 103 fg N/cell/day, possibly due to the copper deficiency. With dosing, rates increased to 0.15 to 0.79 x 103 fg N/cell/day, making it plausible that canonical AOB were the main active ammonium oxidizers during the dosing. This PhD project revealed that copper is of vital importance for efficient nitrification in biological rapid sand filters for drinking water production. The results of this study have important practical implications for biofilters currently in operation and for future filter designs. The developed dosing apparatus is at present successfully applied at a number of Danish DWTPs. Today, all investigated treatment plants have efficient and complete nitrification, and are able to deliver water of better quality to the consumers.

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Importance of waste composition for Life Cycle Assessment of waste management solutions

The composition of waste materials has fundamental influence on environmental emissions associated with waste treatment, recycling and disposal, and may play an important role also for the Life Cycle Assessment (LCA) of waste management solutions. However, very few assessments include effects of the waste composition and waste LCAs often rely on poorly justified data from secondary sources. This study systematically quantifies the influence and uncertainty on LCA results associated with selection of waste composition data. Three archetypal waste management scenarios were modelled with the waste LCA model EASYTECH based on detailed waste composition data from the literature. The influence from waste composition data on the LCA results was quantified with a step-wise Global Sensitivity Analysis (GSA) approach involving contribution, sensitivity, uncertainty and discernibility analyses. The waste composition data contributed significantly to the LCA results and the uncertainty associated with these results. The importance of 405 individual waste properties was evaluated in comparison with 345 technology parameters. Overall, less than 10 physico-chemical properties dominated the output uncertainty of the LCA results, although these properties had low sensitivity in the model. Moreover, the uncertainties associated with the physico-chemical properties were responsible for output uncertainties that spanned from impacts to benefits. The GSA approach applied in this study constitutes a valuable tool for systematically assessing the importance of waste composition and for consciously collecting and using waste composition data within LCAs of waste management systems.
Improving the energy balance of grass-based anaerobic digestion through combined harvesting and pretreatment

An important challenge that has to be addressed to achieve sustainable anaerobic digestion of lignocellulosic substrates is the development of energy and cost efficient pretreatment methods. Technologies orientated to simultaneously harvest and mechanically pretreat the biomass at the field could meet these criteria as they can potentially reduce the energy losses. The objective of this study was to elucidate the effect of two full-scale harvesting machines to enhance the biogas production and subsequently, improve energy balance. The performances of Disc-mower and Excoriator were assessed on meadow and cultivated grass silages. The results showed that relatively high methane production can be achieved from meadow and cultivated grass harvested in different seasons. The findings indicated that the bioenergy production can be improved based on the selection of the appropriate harvesting technology. More specifically, Excoriator, which cuts and subsequently applies shearing forces on harvested biomass, enhanced the methane production up to 10% and the overall energy budget was improved proportionally to the driving speed increase.

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Increasing nitrification in biological rapid sand filters: Diagnosing and supplementing micronutrients needed for proper filter performance

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Influence of humic acid addition on the degradation of pharmaceuticals by biofilms in effluent wastewater
The degradation of organic micropolutants in wastewater treatment is suspected to depend on co-degradation i.e. be dependent on concentrations of substrate. This complicates predicting and modelling their fate. The effect of humic acid, as a model for complex organic substrate, was investigated in relation to the biodegradation of pharmaceuticals by suspended biofilm carriers adapted to polishing effluent water from a tertiary sewage treatment plant. Twelve out of 22 investigated pharmaceuticals were significantly biodegradable. The biodegradation rate constants of ten of those compounds were increasing with increased humic acid concentrations. At the highest humic acid concentration (30 mgC/L), the biodegradation rate constants were four times higher than the biodegradation rate constants without added humic acid. This shows that the presence of complex substrate stimulates degradation via a co-metabolism-like mechanism and competitive inhibition does not occur. Increases of rate constant per mgC/L are tentatively calculated.

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Informing a hydrological model of the Ogooué with multi-mission remote sensing data

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Ingestion of micro- and nanoplastics in Daphnia magna – Quantification of body burdens and assessment of feeding rates and reproduction

Evidence is increasing that micro- and nanoplastic particles can have adverse effects on aquatic organisms. Exposure studies have so far mainly been qualitative since quantitative measurements of particle ingestion are analytically challenging. The aim of this study was therefore to use a quantitative approach for determining ingestion and egestion of micro- and nanoparticles in Daphnia magna and to analyze the influence of particle size, exposure duration and the presence of food. One week old animals were exposed to 2 µm and 100 nm fluorescent polystyrene beads (1 mg/l) for 24 h, followed by a 24 h egestion period in clean medium. During both phases body burdens of particles were determined by measuring the fluorescence intensity in dissolved tissues. Ingestion and egestion were investigated in the absence and presence of food (6.7·10^5 cells of Raphidocelis subcapitata per ml). Furthermore, feeding rates of daphnids in response to particle exposure were measured as well as effects on reproduction during a 21 days exposure (at 1 mg/l, 0.5 mg/l and 0.1 mg/l) to investigate potential impairments of physiology. Both particle sizes were readily ingested, but the ingested mass of particles was five times higher for the 2 µm particles than for the 100 nm particles. Complete egestion did not occur within 24 h but generally higher amounts of the 2 µm particles were egested. Animal body burdens of particles were strongly reduced in the presence of food. Daphnid feeding rates decreased by 21% in the presence of 100 nm particles, but no effect on reproduction was found despite high body burdens of particles at the end of 21 days exposure. The lower egestion and decreased feeding rates, caused by the 100 nm particles, could indicate that particles in the nanometer size range are potentially more hazardous to D. magna compared to larger particle sizes.

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Scopus rating (2015): SJR 2.003 SNIP 1.75 CiteScore 4.72
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.987 SNIP 2.005 CiteScore 4.57
Initial conditions of urban permeable surfaces in rainfall-runoff models using Horton’s infiltration

Infiltration is a key process controlling runoff, but varies depending on antecedent conditions. This study provides estimates on initial conditions for urban permeable surfaces via continuous simulation of the infiltration capacity using historical rain data. An analysis of historical rainfall records show that accumulated rainfall prior to large rain events does not depend on the return period of the event. Using an infiltration-runoff model we found that for a typical large rain storm, antecedent conditions in general lead to reduced infiltration capacity both for sandy and clayey soils and that there is substantial runoff for return periods above 1–10 years.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, LNH Water
Authors: Davidsen, S. (Intern), Löwe, R. (Intern), Høegh Ravn, N. (Ekstern), Jensen, L. N. (Ekstern), Ambjerg-Nielsen, K. (Intern)
Number of pages: 8
Insights on the activity of the anaerobic digestion microbiome by means of metatranscriptomic functional investigation

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padua, Technical University of Denmark
Authors: Treu, L. (Intern), Campanaro, S. (Ekstern), Fontana, A. (Ekstern), Zhu, X. (Intern), Kougiass, P. G. (Ekstern), Angelidaki, I. (Intern)
Number of pages: 1
Publication date: 2017

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Article number: R-18
Main Research Area: Technical/natural sciences
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Electronic versions:
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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

In-situ biogas upgrading process: modeling and simulations aspects
Biogas upgrading processes by in-situ hydrogen (H2) injection are still challenging and could benefit from a mathematical model to predict system performance. Therefore, a previous model on anaerobic digestion was updated and expanded to include the effect of H2 injection into the liquid phase of a fermenter with the aim of modeling and simulating these processes. This was done by including hydrogenotrophic methanogen kinetics for H2 consumption and inhibition effect on the acetogenic steps. Special attention was paid to gas to liquid transfer of H2. The final model was successfully validated considering a set of Case Studies. Biogas composition and H2 utilization were correctly predicted, with overall deviation below 10% compared to experimental measurements. Parameter sensitivity analysis revealed that the model is highly sensitive to the H2 injection rate and mass transfer coefficient. The model developed is an effective tool for predicting process performance in scenarios with biogas upgrading.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Instituto Maua de Tecnologia (IMT), Technical University of Denmark
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Journal: Bioresource Technology
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Biogas upgrading, Hydrogenotrophic methanogens, Mathematical modeling, Sensitivity analysis

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In-situ UV-Vis Probe to Monitor Algal Photobioreactors Treating Municipal Wastewater

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Technical University of Denmark, Swiss Federal Institute of Aquatic Science and Technology
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Number of pages: 1
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Integrated assessment of chemical stressors and ecological impact in mixed land use stream systems
The increasing human population and development pressure during the last century has motivated land use changes of importance on a global scale. Urban expansion and increasing agricultural production have thus created a wide range of pressures, which in particular affect the freshwater bodies such as streams, as they are highly connected to their catchment through their draining system. The pressures include hydromorphological alterations, as well as diffuse chemical sources (e.g. geogenic, agricultural activities) and point sources (e.g. wastewater outlets, contaminated sites). The degradation of these mixed land use stream systems causes critical changes and thus jeopardizes the health of the stream ecosystems. The various chemical sources result in a highly diverse group of chemical stressors leading to a decrease in the chemical quality of the different stream compartments (i.e. stream water, hyporheic zone and bed sediment). These compartment(s) will be impacted differently by the various chemicals present in the system, depending on e.g. the stressor's pathway to the stream, their physico-chemical properties, and controlling hydrological and biogeochemical processes. The resulting impairment of the different stream compartments thus comprises both temporal and spatial variation. Despite the growing understanding of the complexity, approaches for a holistic risk assessment of the potential impacts in the three stream compartments of a mixed land use stream system are still missing. To investigate and improve the understanding of the presence of multiple chemical stressors and any related ecological impacts in such a system, Grindsted stream was chosen as the study site for this PhD project. The groundwater-fed stream is situated in a mixed land use catchment hosting both urban and agricultural activities, including contaminated sites. To determine potential impacts, the chemical quality of both organic (i.e. pharmaceuticals, gasoline constituents, chlorinated solvents, and pesticides) and inorganic (i.e. metals, general water chemistry and macronions) compounds was assessed in all three stream compartments. To evaluate the magnitude of the sources, a combination of three established approaches was employed: contaminant mass discharge, toxic potential and threshold values. To subsequently account for potential ecological impacts, benthic invertebrate communities (both macro- and meiofauna) were characterized to enable a full coverage of the quality of all three stream compartments. Possible links between the chemical quality of the individual compartments and the ecological stream quality were then explored by using multivariate statistical analyses. The evaluation of the chemical quality in the three stream compartments revealed a substantial influence on both stream water and hyporheic zone from the diffuse metal sources (aluminum, barium, copper, lead, nickel, zinc) of both geogenic and anthropogenic origin in the catchment. The release of metals (particularly copper, nickel, zinc) was additionally enhanced by acidification of the noncalcereous aquifer. Moreover, the approach combining an evaluation of the contaminant mass discharge of the known anthropogenic point sources in the catchment together with the in-stream contaminant mass discharge showed to be an effective tool to both display their mutual importance and to reveal “new” sources. It further demonstrated the importance of contaminated sites as a potential noteworthy source to continuously impact the chemical stream quality (> ½ tonne per year of organic xenobiotics). An assessment of the chemical patterns (similarities) along the investigated stream corridor made it possible to link the chemical quality to a detected ecorespone in the invertebrate communities. This study thus demonstrated significant ecological impact resulting from the additional chemical stress of the inflow of a contaminated groundwater plume. The mechanism for this impact indicated that this was not caused solely by the presence of organic xenobiotics, but also by the strongly reduced redox conditions (e.g. high concentrations of dissolved iron and manganese) and secondary effects (e.g. high concentrations of dissolved arsenic), as a result of the organic degradation (e.g. benzene, toluene, ethylbenzene, and xylene) in the plume. The ecological impact was detected predominantly in the organisms living in the upper bed sediment. The sensitivity was especially pronounced in the meioinvertebrate community, which could be a promising tool to standardize the characterization of the ecological quality of streams considering their ubiquitous distribution throughout all ecoregions. The methodology developed here, applying
a holistic evaluation of both the chemical and ecological stream quality, thus demonstrates the importance for future risk assessments to include multiple compounds (i.e. organic and inorganic chemical stressors) and stream compartments to locate key sources and risk drivers. The approaches and findings in this thesis could truly be helpful for management and future remediation of mixed land use stream systems.

General information
State: Published
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Number of pages: 54
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Projects:
Integrated assessment of chemical stressors and ecological impact in mixed land use stream systems
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Integrated characterization of NA of PCE plume after thermal source zone remediation - microbial techniques and dual isotope analysis

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Universite de Neuchatel, Aarhus University, University of Neuchâtel, SiREM, Region Syddanmark
Authors: Broholm, M. M. (Intern), Badin, A. (Ekstern), Palau, J. (Ekstern), Hunkeler, D. (Ekstern), Jacobsen, C. S. (Ekstern), Dennis, P. (Ekstern), Just, N. (Ekstern)
Number of pages: 1
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Integrated characterization of perchloroethene plume natural attenuation after thermal source zone remediation - molecular biology tools and dual isotope analysis

General information
State: Published
Authors: Murray, A. M. (Intern), Drude, B. (Ekstern), Brabæk, L. (Ekstern), Kristensen, I. L. (Ekstern), Broholm, M. M. (Intern), Maillard, J. (Ekstern), Johansen, A. (Ekstern), Hunkeler, D. (Ekstern)
Number of pages: 1
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Main Research Area: Technical/natural sciences
Electronic versions:
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Relations
Activities:
Integrated electrochemical-biological process as an alternative mean for ammonia monitoring during anaerobic digestion of organic wastes

Ammonia monitoring is important to control anaerobic digestion (AD) process due to inhibition effect. Here, an electrolysis cell (EC) was integrated with a complete nitrification reactor as an alternative approach for online monitoring of ammonia during AD processes. The AD effluent was pumped into nitrification reactor to convert ammonia to nitrate, followed by the introduction of nitrate-rich effluent to EC cathode. It was first evaluated with synthetic ammonia-rich digesters and was observed that the current at 5min were linearly corresponding to the ammonia levels (from 0 to 7.5mM NH4+-N, R2=0.9673). The linear relationship was always observed regardless of different wastewater pH and external voltage. Pre-removal of other electron acceptors from digestate at cathode could eliminate their disturbances to sensor performance. Finally, the accuracy of biosensor was verified with real digestate test. The simple and reliable biosensor showed great promising for online ammonia monitoring of AD processes.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Zhao, N. (Intern), Li, X. (Intern), Jin, X. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
Number of pages: 7
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Scopus rating (2017): SJR 1.435 SNIP 1.448 CiteScore 4.62
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.39 SJR 1.447 SNIP 1.625
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.497 SNIP 1.567 CiteScore 4.04
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.59 SNIP 1.639 CiteScore 3.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.721 SNIP 1.751 CiteScore 3.92
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Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.794 SNIP 1.618 CiteScore 3.5
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.962 SNIP 1.508 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.879 SNIP 1.424
Integrated hydrological model-based assessment of stormwater management scenarios in Copenhagen's first climate resilient neighbourhood using the three point approach

The city of Copenhagen currently pursues a very ambitious plan to make the city 'cloudburst proof' within the next 30 years. The cloudburst management plan has the potential to support the city's aim to become more green, liveable, and sustainable. In this study, we assessed stormwater system designs using the Three Point Approach (3PA) as a framework, where an indicator value for each domain was calculated using state-of-the-art modelling techniques. We demonstrated the methodology on scenarios representing sequential enhancements of the cloudburst management plan for a district that has been appointed to become the first climate resilient neighbourhood in Copenhagen. The results show that if the cloudburst system is exploited to discharge runoff from selected areas that are disconnected from the combined sewer system, then the plan leads to multiple benefits. These include improved flood protection under a 100-years storm (i.e., compliance with the new demands in domain C of the 3PA), reduced surcharge to terrain under a 10-years storm (i.e., compliance with the service goal in domain B of the 3PA) and an improved yearly water balance (i.e., better performance in domain A of the 3PA).

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Technical University of Denmark
Authors: Lerer, S. M. (Intern), Righetti, F. (Intern), Rozario, T. (Ekstern), Mikkelsen, P. S. (Intern)
Number of pages: 12
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Main Research Area: Technical/natural sciences

Publication information
Journal: Water
Volume: 9
Issue number: 11
Article number: 883
Integration of geological, geophysical and contaminant monitoring technologies for contaminated site investigation

General information
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Organisations: Department of Environmental Engineering, Water Resources Engineering, Aarhus University, Geological Survey of Denmark and Greenland
Authors: Balbarini, N. (Intern), Rønde, V. K. (Intern), Maurya, P. K. (Ekstern), Klint, K. E. (Ekstern), Christiansen, A. V. (Ekstern), Binning, P. J. (Intern)
Number of pages: 2
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Main Research Area: Technical/natural sciences
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Conference Abstract ATV Vintermøde 2017
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Source-ID: 140729954
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Integrity of clay till aquitards to DNAPL migration: Assessment using current and emerging characterization tools

Field investigations were carried out to determine the occurrence of tetrachloroethene (PCE) dense non-aqueous phase liquid (DNAPL), the source zone architecture and the aquitard integrity at a 30-50 year old DNAPL release site. The DNAPL source zone is located in the clay till unit overlying a limestone aquifer. The DNAPL source zone architecture was investigated through a multiple-lines-of-evidence approach using various characterization tools; the most favorable combination of tools for the DNAPL characterization was geophysical investigations, Membrane Interface Probe (MIP), core subsampling with quantification of chlorinated solvents, hydrophobic dye test with Sudan IV and Flexible Liner Underground Technologies (FLUTE) NAPL liners with activated carbon felt (FACT). While the occurrence of DNAPL was best determined by quantification of chlorinated solvents in soil samples supported by the hydrophobic dye tests (Sudan IV and NAPL FLUTE), the conceptual understanding of source zone architecture was greatly assisted by the indirect continuous characterization tools. Although mobile or high residual DNAPL (St >1%) only occurred in 11% of the source zone samples (intact cores), they comprised 86% of the total PCE mass. The data set, and associated data analysis, supported vertical migration of DNAPL through fractures in the upper part of the clay till, horizontal migration along high permeability features around the redox boundary in the clay till, and to some extent vertical migration through the fractures in the reduced part of the clay till aquitard to the underlying limestone aquifer. The aquitard integrity to DNAPL migration was found to be compromised at a thickness of reduced clay till of less than 2 m.
Intermittent Aeration Suppresses Nitrite-Oxidizing Bacteria in Membrane-Aerated Biofilms: A Model-Based Explanation

Autotrophic ammonium oxidation in membrane-aerated biofilm reactors (MABRs) can make treatment of ammonium-rich wastewaters more energy-efficient, especially within the context of short-cut ammonium removal. The challenge is to exclusively enrich ammonium-oxidizing bacteria (AOB). To achieve nitritation, strategies to suppress nitrite-oxidizing bacteria (NOB) are needed, which are ideally grounded on an understanding of underlying mechanisms. In this study, a nitrifying MABR was operated under intermittent aeration. During eight months of operation, AOB dominated, while NOB were suppressed. On the basis of dissolved oxygen (DO), ammonium, nitrite, and nitrate profiles within the biofilm and in the bulk, a 1-dimensional nitrifying biofilm model was developed and calibrated. The model was utilized to explore the potential mechanisms of NOB suppression associated with intermittent aeration, considering DO limitation, direct pH effects on enzymatic activities, and indirect pH effects on activity via substrate speciation. The model predicted strong periodic shifts in the spatial gradients of DO, pH, free ammonia, and free nitrous acid, associated with aerated and nonaerated phases. NOB suppression during intermittent aeration was mostly explained by periodic inhibition caused by free ammonia due to periodic transient pH upshifts. Dissolved oxygen limitation did not govern NOB suppression. Different intermittent aeration strategies were then evaluated for nitritation success in intermittently aerated MABRs: both aeration intermittency and duration were effective control parameters.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Ma, Y. (Intern), Domingo Felez, C. (Intern), Plósz, B. G. (Intern), Smets, B. F. (Intern)
Number of pages: 10
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Main Research Area: Technical/natural sciences

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Journal: Environmental Science and Technology
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.26 SJR 2.559 SNIP 1.902
Intermittent provision of H₂ and CO₂ in up-flow reactors for ex-situ biogas upgrading
Invasion in microbial communities: Role of community composition and assembly processes

Microbes contribute to all biogeochemical cycles on earth and are responsible for key biological processes that support the survival of plants and animals. There is increased interest in controlling and managing microbial communities in different ecosystems in order to make targeted microbiological processes more effective. In order to manage microbial communities, it is essential to understand the factors that shape and influence microbial community composition. In addition to abiotic factors, such as environmental conditions and resource availability, biotic factors also shape the dynamics of microbial community assembly. Biotic factors include interactions between different microbial groups as well as the community response to alien species – invaders.

Microbial invasions can have significant effects on the composition and functioning of resident communities. There is, however, lack of agreement on the core determinants of invasion in microbial communities. Current models and concepts for invasion in microbial ecology are largely based on the macro-ecology literature. Although attempts have been made to examine the applicability of these concepts to microbial communities, a general conceptual framework for microbial invasion applicable across ecosystems is missing. The overall aim of this PhD project was therefore to propose a conceptual framework to study microbial community invasion and to test this framework against experimental observations.

Based on a synthesis of earlier frameworks on invasion and community ecology, I defined invasion in a microbial community as the establishment of an alien microbial type in a resident community and have proposed simple criteria to define aliens, residents, and alien establishment, applicable across a wide variety of communities. I suggested the adoption of the community ecology framework advanced by Vellend (2010) to identify determinants of invasion. This framework lists the four fundamental processes that govern community assembly as: dispersal, selection, drift and diversification. We have suggested that it is important to determine which processes dominate the assembly of a resident community in order to understand what governs invasion in that community.

To test invasion in microbial communities while controlling the processes driving community assembly, I developed a high-throughput flow-through experimental microcosm system that enabled me to manipulate the relative importance of selection versus drift during initial community assembly. I used this new system to establish resident microbial biofilm communities dominated by nitrite-oxidizing bacteria, where the direction of selection as well as contribution of drift was manipulated through differential nitrite loading rates.

Subsequently, I experimentally characterized the community assembly processes in the biofilm communities, using replicate communities assembled under same conditions. Both total community and guild-level analyses provided evidence for contribution of neutral processes (drift) combined with selection. More precisely, I observed the deterministic enrichment of certain types of nitrite-oxidizing bacteria in the biofilms: elevated nitrite loading selected for a single Nitrotoga representative, while lower nitrite conditions selected for a number of Nitrospira.

I then repeated the assembly experiment and subjected the assembled biofilms to invasion by a Nitrotoga HW29 culture. I found no significant (negative) correlation between community diversity and invasion success, in contrast with the often cited diversity/invasibility relationship. Instead, I observed that high phylogenetic similarity between invader and resident types, the effect of selection is surpassed by the effect of drift on invasion success. My results suggest that controlling invasion in communities that contain members that are phylogenetically similar to the invader is nearly impossible because stochastic processes determine the invasion outcome when selection towards invader and resident community is similar.

In conclusion, during this PhD project I proposed a simple conceptual framework to study and characterize microbial invasions. This conceptual framework allows comparison of experimental observations across ecosystems using a coherent ecological terminology and consideration of community assembly processes rather than indices to describe community composition. Furthermore, I experimentally identified the dominant processes in newly assembled biofilms enriched in nitrite-oxidizing guilds before subjecting the resident guilds to invasion by an alien nitrite-oxidizer. The results of my experiments indicate that neutral processes have significantly higher contribution to community assembly – including invasion – than previously suggested.
Managing invasion of microbial communities by new members can be a powerful tool in microbial resource management. Abundant studies have examined how resource availability and resident community diversity affect invasion success. Yet, a more rigorous approach towards studying invasion would consider a broader community ecology framework. For example, the effect of propagule pressure, often studied in macro-ecology, has rarely been examined for microbial communities. Also, the interactions between processes governing community assembly and propagule pressure on invasion success have never been reported.

The objective of this study was to determine the effect of propagule pressure on invasion success in microbial communities, shaped by varying degrees of stochasticity and determinism. The experimental system consisted of nitrite oxidizing bacterial enrichments, developed in replicate flow-through biofilm reactors using drinking water as inoculum and continuous feeding with nitrite as a sole energy source. Different nitrite loading rates were applied, as these were previously shown to influence nitrifying guild composition and stochasticity [1]. After 6 weeks, the reactors were invaded for 24 hours by nitrite oxidizer strain (Candidatus Nitrotoga sp. HW29) at 3 different propagule pressures. The reactors were then operated another 2 weeks before analyzing community composition by targeted qPCRs and 16S rRNA gene amplicon analysis. We successfully assembled resident communities with different ratios of Nitrotoga to Nitrospira as a result of determinism created by different nitrite concentrations: High nitrite loading selected for a diverse and abundant Nitrotoga population while low nitrite loading selected for an abundant Nitrospira population. We noted invasion success only at the highest propagule pressure, and the frequency of establishment was higher under low versus high nitrite loading conditions. Contrary to previous invasion studies, we found no significant correlation between resident community diversity and invasion success. Instead, our results suggest that deterministic processes combined with resident-invader phylogenetic relatedness influence invasion success.

Understanding and predicting the ammonia (NH3) exchange between the biosphere and the atmosphere is important due to the environmental consequences of the presence of reactive nitrogen (Nr) in the environment. The dynamics of the natural sources are, however, not well understood, especially not for forest ecosystems due to the complex nature of this soil-vegetation-atmosphere system. Furthermore, the high reactivity of NH3 makes it technically complex and expensive to measure and understand the forest-atmospheric NH3 exchange. The aim of this study is to investigate the NH3 flux partitioning between the ground layer, cuticle and stomata compartments for two temperate deciduous forest ecosystems located in Midwestern, USA (MMSF) and in Denmark (DK-Sor). This study is based on measurements and simulations of the surface energy balance, fluxes of CO2 and NH3 during two contrasted periods of the forest ecosystems, a period with
full developed canopy (MMSF) and a senescent period for the DK-Sor site, with leaf fall and leaf litter build-up. Both datasets indicate emissions of NH3 from the forest to the atmosphere. The two-layer NH3 compensation point model SURFATM-NH3 was used in combination with a coupled photosynthesis-stomatal conductance model to represent seasonal variation in canopy physiological activity for simulating both net ecosystem CO2 exchange rates (R2=0.77 for MMSF and R2=0.84 for DK-Sor) and atmospheric NH3 fluxes (R2=0.43 for MMSF and R2=0.60 for DK-Sor). A scaling of the ground layer NH3 emission potential (f_g) was successfully applied using the plant area index (PAI) to represent the build-up of a litter layer in the leaf fall period. For a closed green forest canopy (MMSF), unaffected by agricultural NH3 sources, NH3 was emitted with daytime fluxes up to 50ng NH3-N m−2s−1 and nighttime fluxes up to 30ng NH3-N m−2s−1. For a senescing forest (DK-Sor), located in an agricultural region, deposition rates of 250ng NH3-N m−2s−1 were measured prior to leaf fall, and emission rates up to 670ng NH3-N m−2s−1 were measured following leaf fall. For MMSF, simulated stomatal NH3 emissions explain the daytime flux observations well, and it is hypothesized that cuticular desorption is responsible for the observed NH3 emissions at night. During leaf fall in DK-Sor, ground fluxes dominate the NH3 flux with a mean emission rate of 150ng NH3-N m−2s−1. This study shows that forests potentially comprise a natural source of NH3 to the atmosphere, and that it is crucial to take into account the bi-directional exchange processes related to both the stomatal, cuticular and ground layer pathways in order to realistically simulate forest–atmosphere fluxes of NH3.
Investigating the state of a 6 years old full-scale biocover at a Danish landfill

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Olesen, A. O. U. (Intern), Fredenslund, A. M. (Intern), Scheutz, C. (Intern), Kjeldsen, P. (Intern)
Number of pages: 11
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Electronic versions: Olesen_et_al_2017_Sar.pdf
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Investigation of mixing enhancement in porous media under helical flow conditions: 3-D bench-scale experiments
Lateral mass exchange at the fringe of solute plumes is a fundamental process leading to plume dilution and reactive mixing. Mass transfer between the plume and ambient water can be considerably enhanced by helical flow occurring in three-dimensional heterogeneous anisotropic porous media [1-3]. We performed steady-state conservative tracer experiments in a fully three-dimensional flow-through chamber to investigate the effects of helical flow on plume spiraling and deformation, as well as on its dilution [4]. Helical flow was created by packing the porous medium in angled stripes of materials with different grain sizes to create blocks with macroscopically anisotropic hydraulic conductivity. The hydraulic conductivity of the blocks was varied in different experiments. Solute concentrations and flow rates were measured at high spatial resolution for samples collected at 49 outlet ports. This allowed us to quantify spreading and dilution of the solute plumes at the outlet cross section. Moreover, we collected direct evidence of plume spiraling and visual proof of helical flow by freezing and slicing the porous medium at different cross sections and observing the dye-tracer distribution. Model-based interpretation of the results allowed substantiating the effect of the helical flow field on plume dilution and on mixing-controlled reactive transport. The simulation results were evaluated using metrics of reactive mixing such as the critical
In vitro fermentation of key dietary compounds with rumen fluid: A genome-centric perspective

The anaerobic decomposition of organic substrates leads to the generation of gases, such as methane, which can either be a valuable energy carrier in industrial applications or can be considered as a main greenhouse gas when it is naturally emitted. In this study we investigated in vitro the effect of dietary compounds, such as starch and proteins, on the microbial community present in the rumen fluid. High throughput shotgun sequencing, followed by metagenomic assembly and binning allowed the extraction of 18 genome bins. A composite bioinformatic analysis led to the prediction of metabolic pathways involved in the degradation of dietary compounds and in the biosynthesis of crucial products like propionate, methane and ammonia. The identification of genomes belonging to poorly characterized phyla such as Thermoplasmata and Elusimicrobia shed light on their putative role. The high abundance of methylotrophic archaea in the inoculum suggests a relevant role in methane production.

DOIs:
iTRAQ quantitative proteomic analysis reveals the pathways for methanation of propionate facilitated by magnetite

Methanation of propionate requires syntrophic interaction of propionate-oxidizing bacteria and hydrogenotrophic methanogens, which is referred to as interspecies electron transfer. The present study showed that 10 mg/L conductive magnetite enhanced the methane production rate from propionate by around 44% in batch experiments, and both direct interspecies electron transfer and interspecies H2 transfer were thermodynamically feasible with the addition of magnetite. The methanation of propionate facilitated by magnetite was also demonstrated in a long-term operated continuous reactor. The methane production rate from acetate by the enriched mixed culture with magnetite was higher than that without magnetite, while similar methane production rates were found from H2/CO2 by the enriched mixed culture with and without magnetite. The ability to utilize molecular H2 indicated interspecies H2 transfer played a role in the enriched culture with magnetite, and propionate-oxidizing bacteria relating with interspecies H2 transfer were also detected by metagenomic sequencing. Metagenomic sequencing analysis also showed that Thauera, possibly relating with direct interspecies electron transfer, were enriched with the addition of magnetite. iTRAQ quantitative proteomic analysis, which was used in mixed culture for the first time, showed that magnetite induced the changes of protein expression levels involved in various pathways during the methanation of propionate. The up-regulation of proteins involved in propionate metabolism were found, and they were mainly originated from propionate-oxidizing bacteria which were not reported to be capable of direct interspecies electron transfer until now. Cytochrome c oxidase was also revealed as the possible protein relating with direct interspecies electron transfer considering its up-regulation with the addition of magnetite and origination from Thauera. Most of the up-regulated proteins in methane metabolism were originated from Methanosaeta, while most of the enzymes with down-regulated proteins were originated from Methanosarcina. However, the up-regulated proteins relating with hydrogenotrophic methanogenesis were originated from neither Methanosaeta nor Methanosarcina, indicating they were not involved in direct interspecies electron transfer. The hydrogenotrophic methanogens, e.g. Methanospirillum, Methanospirillum et al., might be involved in direct interspecies electron transfer. Overall, the present study showed that both direct interspecies electron transfer and interspecies H2 transfer were present during methanation of propionate facilitated by magnetite.

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Kinetic considerations of two Sulfurospirillum spp. competing for tetrachloroethene

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Laminaria digitata as potential carbon source in heterotrophic microalgae cultivation for the production of fish feed supplement
A novel concept using the macroalgae Laminaria digitata as substrate to grow heterotrophically microalgae species to be used as fish feed supplement is investigated in the present study. Enzymatic hydrolysis of the macroalgae was performed to release the sugars present in the biomass. The hydrolysate was then used as culture medium and nutrient source to grow heterotrophically three different microalgae species, namely Chlorella protothecoides, Chlorella vulgaris and Chlorella sorokiniana, identified as valuable sources of proteins. Due to its faster growth rates, C. protothecoides was selected for further cultivation in batch reactors and its protein content and amino acid composition were measured. At the end of the process the biomass production reached 10.68 ± 1.33 g L−1 with a total protein accumulation of 41.77 ± 1.82% (dry weight basis) and a protein yield of 0.17 ± 0.06. Moreover, the essential amino acids score at the end of the experiment was 6 times greater than for the original content of the macroalgae hydrolysate which was used as substrate for the microalgae cultivation. Therefore, this study reveals the potential of macroalgae hydrolysate as culture medium for microalgae cultivation and it opens possibilities for the development of future strategies to optimize the microalgae production processes.

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Let's Be Clear(er) about Substitution: A Reporting Framework to Account for Product Displacement in Life Cycle Assessment

The multifunctional character of resource recovery in waste management systems is commonly addressed through system expansion/substitution in life cycle assessment (LCA). Avoided burdens credited based on expected displacement of other product systems can dominate the overall results, making the underlying assumptions particularly important for the interpretation and recommendations. Substitution modeling, however, is often poorly motivated or inadequately described, which limits the utility and comparability of such LCA studies. The aim of this study is therefore to provide a structure for the systematic reporting of information and assumptions expected to contribute to the substitution potential in order to make substitution modeling and the results thereof more transparent and interpretable. We propose a reporting framework that can also support the systematic estimation of substitution potentials related to resource recovery. Key components of the framework include waste-specific (physical) resource potential, recovery efficiency, and displacement rate. End-use-specific displacement rates can be derived as the product of the relative functionality (substitutability) of the recovered resources compared to potentially displaced products and the expected change in consumption of competing products. Substitutability can be determined based on technical functionality and can include additional constraints. The case of anaerobic digestion of organic household waste illustrates its application. The proposed framework enables well-motivated substitution potentials to be accounted for, regardless of the chosen approach, and improves the reproducibility of comparative LCA studies of resource recovery.
Life cycle assessment of castor-based biorefinery: a well to wheel LCA

Purpose: Diminishing fossil resources and environmental concerns associated with their vast utilization have been in focus by energy policy makers and researchers. Among the different scenarios put forth to commercialize biofuels, various biorefinery concepts have aroused global interests because of their ability in converting biomass into a spectrum of marketable products and bioenergies. This study was aimed at developing different novel castor-based biorefinery scenarios for generating biodiesel and other co-products, i.e., ethanol and biogas. In these scenarios, glycerin, heat, and electricity were also considered as byproducts. Developed scenarios were also compared with a fossil reference system delivering the same amount of energy through the combustion of neat diesel. Materials and methods: Life cycle assessment (LCA) was used to investigate the environmental consequences of castor biodiesel production and consumption with a biorefinery approach. All the input and output flows from the cultivation stage to the combustion in diesel engines as well as changes in soil organic carbon (SOC) were taken into account. Impact 2002+ method was used to quantify the environmental consequences. Results and discussion: The LCA results demonstrated that in comparison with the fossil reference system, only one scenario (i.e., Sc-3 with co-production of significant amounts of biodiesel and biomethane) had 16% lower GHG emissions without even considering the improving effect of SOC. Moreover, resource damage category of this scenario was 50% lower than that of neat diesel combustion. The results proved that from a life cycle perspective, energy should be given priority in biorefineries because it is essential for a biorefinery to have a positive energy balance in order to be considered as a sustainable source of energy. Despite a positive effect on energy and GHG balances, these biorefineries had negative environmental impacts on the other damage categories like Human Health and Ecosystem Quality. Conclusions: Although biorefineries offer unique features as promising solutions for mitigating climate change and reducing dependence on fossil fuels, the selection of biomass processing options and management decisions can affect the final results in terms of environmental evaluations and energy balance. Moreover, if biorefineries are focused on transportation fuel production, a great deal of effort should still be made to have better environmental performance in Human Health and Ecosystem Quality damage categories. This study highly recommends that future studies focus towards biomass processing options and process optimization to guarantee the future of the most sustainable biofuels.
Life cycle assessment of orange peel waste management

The management of orange peel waste constitutes an economic and environmental problem in regions in which there are important citrus processing industries, as is the case of southern Italy. Traditional handling techniques are either not economically attractive (e.g. composting and animal feeding) or discouraged by European policy (landfilling). As an alternative to these technologies, others aimed at recovering energy and resources are currently receiving increasing attention. The consequential life cycle assessment adopted in this work compares the environmental performance of ten orange peel waste management scenarios. These include mono-treatment scenarios (pyrolysis, incineration,
anaerobic mono-digestion) and co-treatment (four anaerobic co-digestion strategies with animal manure and seaweed)
oones aimed at energy/resource recovery, which were compared with three “traditional non-energy focused handling
techniques (landfilling, composting and animal feeding). Overall, the co-digestion scenarios appear to be the best, in terms
of global warming and resource depletion mitigation. However, they also suffer from a drawback, that is, a potential
eutrophication impact, due to nitrate leaching following on-land digestate use. Orange peel waste use for animal feeding,
while appearing interesting from an environmental perspective (for example to reduce meal imports), presents practical
challenges as far as the nutritional aspects and costs are concerned, and these eventually hinder its market potential. A
preliminary cost flow analysis has concluded that anaerobic digestion strategies are economically preferable to the other
alternatives.

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Life cycle inventory modeling of phosphorus substitution, losses and crop uptake after land application of organic waste products

Purpose: Life cycle assessments (LCAs) that attempt to provide advice on treatment options for phosphorus (P) containing organic waste products encounter problems related to the quantification of mineral P fertilizer substitution, P loss and crop P uptake after land application. The purpose of this study was to develop a relatively easy to use life cycle inventory model, known as PLCI, that could be used to estimate these values.

Methods: A life cycle inventory model for P was developed, which estimates the effect of an application of organic waste followed by ordinary fertilizer management in the modeling period. This was compared with a simulation without the initial waste application. The difference in mineral P fertilizer application (substitution), P loss and crop P uptake was then calculated and expressed as a proportion of the amount of waste applied. As an example, the effect of an initial application of mineral fertilizer, sewage sludge and ash on two farm types was simulated. These results were applied in an LCA case study of different sewage sludge treatment options. Results and discussion: Farm type influenced the P fertilizer substitution, loss and crop uptake factors. The application on an arable farm showed a substitution of 28 to 31%, relatively low P loss and a large spread in crop P uptake for the different P sources, compared with the pig farm. Application on a pig farm showed no mineral P substitution. For substitution, mineral fertilizer outperformed waste product fertilizer with a short modeling period, due to higher immediate P availability, which was not the case with a long period. The LCA case study showed that the P substitution factor had an influence on the environmental impact categories climate change and depletion of reserve-based abiotic resources while the P loss factor influenced freshwater eutrophication. Application of the P loss and substitution factors generated from the PLCI model resulted in higher environmental burdens and lower savings than using conventional factors. Conclusions: The soil P status mainly affected P substitution and loss, with the fertilizer type only having a small influence when soils had a low P status. The PLCI model can facilitate more coherent and rigorous estimates of P substitution and loss to be used in LCA studies involving application of waste products on agricultural land. This is important since P substitution and loss can have an important influence on impact categories, such as freshwater eutrophication and resource depletion.
To generate meaningful results, life cycle assessments (LCAs) require accurate technology data that are consistent with the goal and scope of the analysis. While literature data are available for many products and processes, finding representative data for highly site-specific technologies, such as waste treatment processes, remains a challenge. This...
study investigated representative life cycle inventory (LCI) modeling of waste treatment technologies in consideration of variations in technological level and climate. The objectives were to demonstrate the importance of representative LCI modeling as a function of the specificity of the study, and to illustrate the necessity of iteratively refining the goal and scope of the study as data are developed. A landfill case study was performed where 52 discrete landfill data sets were built and grouped to represent different technology options and geographical sites, potential impacts were calculated, and minimum/maximum (min-max) intervals were generated for each group. The results showed decreasing min-max intervals with increasing specificity of the scope of study, which indicates that compatibility between the scope of study and LCI model is critical. Hereby, this study quantitatively demonstrates the influence of representative modeling on LCA results. The results indicate that technology variations and site-specific conditions (e.g., the influence of precipitation and cover permeability on landfill gas generation and collection) should be carefully addressed by a systematic analysis of the key process parameters. Therefore, a thorough understanding of the targeted waste treatment technologies is necessary to ensure that appropriate data choices are made within the boundaries of the defined scope of the study.

**General information**

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Liquid chromatography-tandem mass spectrometry determination of synthetic cathinones and phenethylamines in influent wastewater of eight European cities

The popularity of new psychoactive substances (NPS) has grown in recent years, with certain NPS commonly and preferentially consumed even following the introduction of preventative legislation. With the objective to improve the knowledge on the use of NPS, a rapid and very sensitive method was developed for the determination of ten priority NPS (N-ethylcathinone, methylenedioxyprovalerone (MDPV), methyline, butylone, methedrone, mephedrone, naphyrone, 25-C-NBOMe, 25-I-NBOMe and 25-B-NBOMe) in influent wastewater. Sample clean-up and pre-concentration was made by off-line solid phase extraction (SPE) with Oasis MCX cartridges. Isotopically labelled internal standards were used to correct for matrix effects and potential SPE losses. Following chromatographic separation on a C18 column within 6 min, the compounds were measured by tandem mass spectrometry in positive ionization mode. The method was optimised and validated for all compounds. Limits of quantification were evaluated by spiking influent wastewater samples at 1 or 5 ng/L.

An investigation into the stability of these compounds in influent wastewater was also performed, showing that, following acidification at pH 2, all compounds were relatively stable for up to 7 days. The method was then applied to influent wastewater samples from eight European countries, in which mephedrone, methylene and MDPV were detected. This work reveals that although NPS use is not as extensive as for classic illicit drugs, the application of a highly sensitive analytical procedure makes their detection in wastewater possible. The developed analytical methodology forms the basis of a subsequent model-based back-calculation of abuse rate in urban areas (i.e. wastewater-based epidemiology).
New psychoactive substances, Ultra high-performance liquid chromatography, Triple quadrupole, Wastewater, Stability, Matrix effects

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Long-term and realistic global change manipulations had low impact on diversity of soil biota in temperate heathland

In a dry heathland ecosystem we manipulated temperature (warming), precipitation (drought) and atmospheric concentration of CO2 in a full-factorial experiment in order to investigate changes in below-ground biodiversity as a result of future climate change. We investigated the responses in community diversity of nematodes, enchytraeids, collembolans and oribatid mites at two and eight years of manipulations. We used a structural equation modelling (SEM) approach analyzing the three manipulations, soil moisture and temperature, and seven soil biological and chemical variables. The analysis revealed a persistent and positive effect of elevated CO2 on litter C:N ratio. After two years of treatment, the fungi to bacteria ratio was increased by warming, and the diversities within oribatid mites, collembolans and nematode groups were all affected by elevated CO2 mediated through increased litter C:N ratio. After eight years of treatment, however, the CO2-increased litter C:N ratio did not influence the diversity in any of the four fauna groups. The number of significant correlations between treatments, food source quality, and soil biota diversities was reduced from six to three after two and eight years, respectively. These results suggest a remarkable resilience within the soil biota against global climate change treatments in the long term.

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Low nitrous oxide production in intermittent-feed high performance nitritating reactors

Nitrous oxide (N₂O) production from autotrophic nitrogen removal processes, especially nitritating systems, is of growing concern. N₂O dynamics were characterized and N₂O production factors were quantified in two lab-scale intermittent-feed nitritating SBRs. 93 ± 14% of the oxidized ammonium was converted to nitrite, with the average total net N₂O production of 2.1 ± 0.7% of the ammonium oxidized. Operation with intermittent feeding appears an effective optimization approach to mitigate N₂O emissions from nitritating systems. Net N₂O production rates transiently increased with a rise in pH after each feeding, indicating a potential role of pH in N₂O production.

Low nitrous oxide production through nitrifier-denitrification in intermittent-feed high-rate nitritation reactors

Nitrous oxide (N₂O) production from autotrophic nitrogen conversion processes, especially nitritation systems, can be significant, requires understanding and calls for mitigation. In this study, the rates and pathways of N₂O production were quantified in two lab-scale sequencing batch reactors operated with intermittent feeding and demonstrating long-term and high-rate nitritation. The resulting reactor biomass was highly enriched in ammonia-oxidizing bacteria, and converted ∼93 ± 14% of the oxidized ammonium to nitrite. The low DO set-point combined with intermittent feeding was sufficient to maintain high nitritation efficiency and high nitritation rates at 20-26 °C over a period of ~300 days. Even at the high nitritation efficiencies, net N₂O production was low (~2% of the oxidized ammonium). Net N₂O production rates transiently increased with a rise in pH after each feeding, suggesting a potential effect of pH on N₂O production. In situ application of 15N labeled substrates revealed nitrifier denitrification as the dominant pathway of N₂O production. Our study highlights operational conditions that minimize N₂O emission from two-stage autotrophic nitrogen removal systems.
Ammonia-oxidizing bacteria, Intermittent feeding, Nitrifier denitrification, Nitritation, Nitrous oxide, pH

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Macroalgae Laminaria digitata and Saccharina latissima as Potential Biomasses for Biogas and Total Phenolics Production: Focusing on Seasonal and Spatial Variations of the Algae

Laminaria digitata (L. digitata) and Saccharina latissima (S. latissima) are the most common species of macroalgae in the north Atlantic and north Pacific. Because of their interesting composition, they have recently attracted attention as useful biomass for various purposes such as for biochemicals and bioenergy production. Nevertheless their composition varies according to the season and to the local environmental conditions. Therefore, in this study different samples harvested throughout a year and in different locations in Denmark were analyzed. The aim of the study was identifying the best period of the year and location to cultivate macroalgae for biofuels and biochemical production. Therefore, the biogas potential and the total phenolics profile for L. digitata and S. latissima were determined. The total phenolics were determined as they may represent an interesting bioactive compound, due to their significant health benefits. The highest methane yield (358.9 ± 5.1 and 285.0 ± 19.1 N mL of CH4 g -1 of volatile solids for L. digitata and S. latissima, respectively) and total phenolic content (TPC) content (47.4 ± 0.0 mg of TPC g-1 of dry matter for L. digitata) were recorded in summer when the sugar level and the light intensity reached their maximum.
Gas Fuels, Biomass, Bioactive compounds, Bioenergy productions, Biofuels and biochemicals, Environmental conditions, Laminaria digitata, Saccharina latissima, Spatial variations, Total phenolic content, Biogas

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Måling af vandkvalitet i overløbsbygværker

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Mapping of water consumption and associated energy use to estimate water savings potentials

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Measuring biomarkers in wastewater as a new source of epidemiological information: Current state and future perspectives

The information obtained from the chemical analysis of specific human excretion products (biomarkers) in urban wastewater can be used to estimate the exposure or consumption of the population under investigation to a defined substance. A proper biomarker can provide relevant information about lifestyle habits, health and wellbeing, but its selection is not an easy task as it should fulfill several specific requirements in order to be successfully employed. This paper aims to summarize the current knowledge related to the most relevant biomarkers used so far. In addition, some potential wastewater biomarkers that could be used for future applications were evaluated. For this purpose, representative chemical classes have been chosen and grouped in four main categories: (i) those that provide estimates of lifestyle factors and substance use, (ii) those used to estimate the exposure to toxicants present in the environment and food, (iii) those that have the potential to provide information about public health and illness and (iv) those used to estimate the population size. To facilitate the evaluation of the eligibility of a compound as a biomarker, information, when available, on stability in urine and wastewater and pharmacokinetic data (i.e. metabolism and urinary excretion profile) has been reviewed. Finally, several needs and recommendations for future research are proposed.
Measuring water heights in rivers and lakes from lightweight unmanned aerial vehicles (UAVs)

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Organisations: Department of Environmental Engineering, Water Resources Engineering, Technical University of Denmark, DHI Denmark
Authors: Bandini, F. (Intern), Butts, M. (Ekstern), Olesen, D. (Ekstern), Jakobsen, J. (Ekstern), Bauer-Gottwein, P. (Intern)
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Measuring water level in rivers and lakes from lightweight Unmanned Aerial Vehicles

The assessment of hydrologic dynamics in rivers, lakes, reservoirs and wetlands requires measurements of water level, its temporal and spatial derivatives, and the extent and dynamics of open water surfaces. Motivated by the declining number of ground-based measurement stations, research efforts have been devoted to the retrieval of these hydraulic properties from spaceborne platforms in the past few decades. However, due to coarse spatial and temporal resolutions, spaceborne missions have several limitations when assessing the water level of terrestrial surface water bodies and determining complex water dynamics. Unmanned Aerial Vehicles (UAVs) can fill the gap between spaceborne and ground-based observations, and provide high spatial resolution and dense temporal coverage data, in quick turn-around time, using flexible payload design. This study focused on categorizing and testing sensors, which comply with the weight constraint of small UAVs (around 1.5 kg), capable of measuring the range to water surface. Subtracting the measured range from the vertical position retrieved by the onboard Global Navigation Satellite System (GNSS) receiver, we can determine the water level (orthometric height). Three different ranging payloads, which consisted of a radar, a sonar and an in-house developed camera-based laser distance sensor (CLDS), have been evaluated in terms of accuracy, precision, maximum ranging distance and beam divergence. After numerous flights, the relative accuracy of the overall system was estimated. A ranging accuracy better than 0.5 % of the range and a maximum ranging distance of 60 m were achieved with the radar. The CLDS showed the lowest beam divergence, which is required to avoid contamination of the signal from interfering surroundings for narrow fields of view. With the GNSS system delivering a relative vertical accuracy better than 3-5 cm, water level can be retrieved with an overall accuracy better than 5-7 cm.
Mechanical pretreatment at harvesting increases the bioenergy output from marginal land grasses

Meadow grass has recently gained increased attention as a substrate for full-scale biogas reactors. However, to increase its biodegradability, pretreatment is needed. In the present work, different harvesting machines were compared in order to assess their effect on biogas production. Specifically, a Disc-mower, an Excoriator and a Chopper were used to define the most appropriate machinery in order to improve the energy output per hectare for full-scale biogas plants. Among the harvesters, Excoriator, a novel simultaneous harvest and mechanical treatment, was found to significantly increase the methane yield of meadow grass by 20% compared to a classical Disc-mower. The positive effect was also validated by three kinetic model equations. The modified Gompertz model was the most capable of determining the kinetics of anaerobic digestion process, pointing out also the superiority of Excoriator. The usage of the novel harvester was associated with increased energy output, either for electrical/thermal energy generation or for transport fuel production, compared to the alternative machineries. Moreover, it was shown that the co-digestion of harvested biomass with different types of manure can enhance the bioenergy output of a full-scale biogas plant in a range of 12%-23%. (C) 2017 Elsevier Ltd. All rights reserved.

General information
Membrane-aerated Nitrifying Biofilms: Continuous versus Intermittent Aeration

This study evaluated the process performance of a lab-scale membrane-aerated nitrifying biofilm under continuous versus intermittent aeration regimes. Effects of intermittent aeration on the competition between individual microbial communities and the emission of nitrous oxide (N2O) were specifically studied. The principle observation under continuous aeration was more efficient ammonium removal (4.3 gNH4+_N/m2/day) but also higher N2O emission (2.9% of the N loading) and minor anaerobic ammonium oxidizer (AMX) activity compared to intermittent aeration (3.1 gNH4+_N/m2/day, 0.3% of the N loading). AMX activity increased at the expense of decreasing nitrite oxidizer (NOB) activity with intermittent aeration. Dissolved oxygen and pH microprofiles under each aeration regimes revealed that the dynamic variation of pH relevant effects could be the potential causes to these different performances. A high intermittency in aeration favors the suppression of NOB with positive effects on N2O emission reduction.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Technical University of Denmark
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Number of pages: 3
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Event: Abstract from 10th International Conference on Biofilm Reactors, Dublin, Ireland.
Main Research Area: Technical/natural sciences
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Metal stressors consistently modulate bacterial conjugal plasmid uptake potential in a phylogenetically conserved manner

The environmental stimulants and inhibitors of conjugal plasmid transfer in microbial communities are poorly understood. Specifically, it is not known whether exposure to stressors may cause a community to alter its plasmid uptake ability. We assessed whether metals (Cu, Cd, Ni, Zn) and one metalloid (As), at concentrations causing partial growth inhibition, modulate community permisiveness (that is, uptake ability) against a broad-host-range IncP-type plasmid (pKJK5). Cells were extracted from an agricultural soil as recipient community and a cultivation-minimal filter mating assay was conducted with an exogenous E. coli donor strain. The donor hosted a gfp-tagged pKJK5 derivative from which conjugation events could be microscopically quantified and transconjugants isolated and phylogenetically described at high resolution via FACS and 16S rRNA amplicon sequencing. Metal stress consistently decreased plasmid transfer frequencies to the community, while the transconjugal pool richness remained unaffected with OTUs belonging to 12 bacterial phyla. The taxonomic composition of the transconjugal pools was distinct from their respective recipient communities and clustered dependent on the stress type and dose. However, for certain OTUs, stress increased or decreased permissiveness by more than 1000-fold and this response was typically correlated across different metals and doses. The response to some stresses was, in addition, phylogenetically conserved. This is the first demonstration that community permisiveness is sensitive to metal(loid) stress in a manner that is both partially consistent across stressors and phylogenetically conserved. The ISME Journal advance online publication, 2 August 2016; doi:10.1038/ismej.2016.98.
"Metharmo" is setting the standards - joint european research project develops standards for determining methane emissions from anaerobic digestion plants

Microalgae biorefinery symbiosis: screening, production, and process analytical technology

Microalgae treatment of municipal wastewater (WW) has been the focal point of microalgal biotechnology research for several decades. However, this technology did not have a competitive advantage over other WW treatment technologies, which could be implemented in smaller areal footprints. In the past few decades, microalgal WW treatment has made a resurgence with the idea of using biomass from microalgal WW treatment, as a source of lipids for conversion into biodiesel. However, the savings from the treatment of nutrients and organic matter, as well as biodiesel production, are still not competitive with the price of crude oil. In recent years, microalgal research continued with the prospect of a microalgae biorefinery, where microalgal byproducts and coproducts are extracted to valorize the entire microalgal production, in which the sum of the parts of the microalgae is greater than the whole microalgae. However, in large part, the microalgae biorefinery does not comply with the treatment of nutrient-rich municipal WWs, due to regulatory concerns. Only recently, it was realized that biindustrial WWs are viable and conceivably regulatory compliant nutrient rich waste streams, capable of sustaining microalgal growth, as much as municipal WWs. The concept of an “industrial symbiosis” has also emerged in the past several decades, in which networks of industries cooperate to use waste sources from neighboring industries, in industrial parks, to create added value. The intersection of the microalgae biorefinery and industrial symbiosis, in a microalgae biorefinery symbiosis (MBS), may be the next generation scheme to valorize the microalgal production and promote industrial and global sustainability. Moreover, technological advances in screening,
outdoor photobioreactor (PBR) design, macromolecular monitoring and process automation must all be addressed to execute the complex bioprocesses needed to valorize an MBS successfully. In order to properly identify viable MBS partnerships with industry, microalgal species capable of producing an array of valuable products must first be screened on these potential bioindustrial WW streams for their growth potential. During screening, microalgae may have a preference or aversion for a given bioindustrial WW media, based on the types and ratios of nitrogen (ammonium, nitrate, or urea) in the WW. Furthermore, identifying algae capable of withstanding fluctuations between these nitrogen forms in dynamic WWs, is an important criterion for productivity. However, when screening microalgae on WWs containing different nitrogen sources and concentrations, assimilation of different nitrogen sources can result in starkly different physiochemical changes, specifically pH changes. In many microalgae, ammonium is the preferred nitrogen source, because it can passively transport into the cell and is directly assimilated into amino acids, without relying on light-mediated enzymatic processes to be reduced. However, when microalgae assimilating ammonium, the pH of the system can drop sharply, inhibiting growth after that; however, these pH changes do not directly reflect the microalgal’s affinity to grow on ammonium. By growing batch cultivations of microalgae in 24-well microplates, a microplate reader can be used to measure relative fluorescence of chlorophyll in vivo, during balanced growth, before these pH changes occur. This technique can be used to preempt the effects of pH changes on growth and reflects the true preference or aversion of microalgae to a particular nitrogen source or a WW media. Additionally, along with being spatially high-throughput in a 24-well microplate—where 24 batch reactions can be conducted simultaneously in a small footprint—the early and low detection of growth rates is also more temporally high-throughput than any other screening method. This method can also be used to quickly screen for robust and adaptable microalgae, capable of acclimatizing to different nitrogen sources and fluctuating media as well as to screen for the upper and lower tolerances of the microalgae to various concentrations of the WW. The latter must also be addressed when screening dynamic WW capable of large fluctuations.

Over the years, there have been very few demonstrations of outdoor microalgal growth in enclosed PBRs; demonstrations, which are essential for understanding the feasibility of an MBS as a whole. From microplate scales to large-scales—six orders of magnitude larger—the industrially important screened microalgae Chlorella sorokniana was grown on bioindustrial WW, inside a novel, solar tracking, 4000 L, airlift PBR. Despite cold temperatures and low irradiance, the microalgae reached a growth rate of 0.48 day⁻¹ in the four-day period immediately following inoculation of bioindustrial WW containing ammonium, as a primary nitrogen source. After that, after ammonium was depleted and the media was augmented with nitrate, a long lag phase persisted, before undergoing the predominant production phase with a specific growth rate (SGR) of 0.15 day⁻¹ over an 18-day period. It was evident that the transition from ammonium to nitrate metabolism can severely stunt microalgal growth in the outdoor PBR under low temperature and irradiance. More importantly, the delay in growth did not appear to be due to deleterious effects of the contents of bioindustrial WW media, since rapid growth was observed early in the experiment on the unaugmented WW. Moreover, it was demonstrated that microalgae could continue to grow in adverse environmental conditions at large-scales.

The success of the in vivo fluorescence microplate assay and the complexity of these outdoor reactions demonstrate the value of pursuing real-time data of microalgae in vivo at large-scales. The complex and dynamic nature of large-scale outdoor microalgal reactions, when grown on dynamic WW media, encourages the need for on-line, real-time monitoring to improve automation models of PBRs. In outdoor conditions with fluctuating light and temperature, there are several factors that can change the growth of microalgae, at time-scales less than a minute and as low as microseconds, which may not be accounted for in microalgal productivity models. Similarly, fluctuations of WW media are not accounted for in these models, especially in outdoor conditions. However, recent advances in hardware and software can significantly improve microalgal bioprocess models and automation, by manipulating large, time-resolution data sets, so-called “big data,” which can be acquired through high-selectivity vibrational spectroscopy, such as mid-infrared (MIR), near-infrared (NIR), or Raman vibrational spectroscopies. These large, real-time data sets can now be used to create adaptive models from artificial intelligence/machine learning tools or “black-box” models, to automate large-scale, outdoor PBRs treating WW.

With microalgae, now entering into a new paradigm of food, feed, pharmaceuticals and functional products, on top of biofuels in a biorefinery, there will be a growing need to maintain product quality, regulate, and mitigate contamination, especially in a symbiosis with WW. Vibrational spectroscopies can be used to monitor several microalgal components simultaneously, which can be used to aid fractionation of microalgal compounds in a biorefinery, while improving model building for automation and control of product quality and contamination, where quality can be built into the system. The results and research summarized in this thesis demonstrate that the modernization of microalgal research is becoming increasingly necessary and beneficial to microalgae production in an MBS. The focus of this thesis is to bring together lab-scale demonstrations, scaled up knowledge, and a critical outlook of modern technologies capable of making the MBS a reality.

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering, National Food Institute, Research Group for Bioactives – Analysis and Application
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Microbial biotechnologies for potable water production
Sustainable Development Goal 6 requires the provision of safe drinking water to the world. We propose that increased exploitation of biological processes is fundamental to achieving this goal due to their low economic and energetic costs. Biological processes exist for the removal of most common contaminants, and biofiltration processes can establish a biologically stable product that retains high quality in distribution networks, minimizing opportunities for pathogen invasion.

Microbial community changes in methanogenic granules during the transition from mesophilic to thermophilic conditions
Upflow anaerobic sludge blanket (UASB) reactor is one of the most applied technologies for various high-strength wastewater treatments. The present study analysed the microbial community changes in UASB granules during the transition from mesophilic to thermophilic conditions. Dynamicity of microbial community in granules was analysed using high-throughput sequencing of 16S ribosomal RNA gene amplicons, and the results showed that the temperature strictly determines the diversity of the microbial consortium. It was demonstrated that most of the microbes which were present in the initial mesophilic community were not found in the granules after the transition to thermophilic conditions. More specifically, only members from family Anaerolinaceae managed to tolerate the temperature change and contributed in maintaining the physical integrity of granular structure. On the contrary, new hydrolytic and fermentative bacteria were
quickly replacing the old members in the community. A direct result from this abrupt change in the microbial diversity was the accumulation of volatile fatty acids and the concomitant pH drop in the reactor inhibiting the overall anaerobic digestion process. Nevertheless, by maintaining deliberately the pH levels at values higher than 6.5, a methanogen belonging to Methanoculleus genus emerged in the community enhancing the methane production.

General information
State: Published
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Web of Science (2016): Indexed yes
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Microbial community dynamics during a successful acclimation process to extremely high ammonia levels in continuous anaerobic digester

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Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Tian, H. (Intern), Fotidis, I. (Intern), Mancini, E. (Intern), Angelidaki, I. (Intern)
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Microbial electrochemical sensor for online ammonia monitoring of waste streams

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Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Zhao, N. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
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Main Research Area: Technical/natural sciences
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Microbial electrolytic capture, separation and regeneration of CO₂ for biogas upgrading

Biogas upgrading to natural gas quality is essential for the efficient use of biogas in various applications. Carbon dioxide (CO₂) which constitutes a major part of the biogas is generally removed by physicochemical methods. However, most of the methods are expensive and often present environmental challenges. In this study, an innovative microbial electrolytic system was developed to capture, separate and regenerate CO₂ for biogas upgrading without external supply of chemicals, and potentially to treat wastewater. The new system was operated at varied biogas flow rates and external applied voltages. CO₂ was effectively separated from the raw biogas and the CH₄ content in the outlet reached as high as 97.0±0.2% at the external voltage of 1.2 V and gas flow rate of 19.6 mL/h. Regeneration of CO₂ was also achieved in the regeneration chamber with low pH (1.34±0.04). The relatively low electric energy consumption (≤0.15 kWh/m³) along with the H₂ production which can contribute to the energy input makes the overall energy need of the system low, and thereby makes the technology promising. This work provides the first attempt for development of a sustainable biogas upgrading technology and potentially expands the application of microbial electrochemical technologies.

General information
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BFI (2011): BFI-level 2
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Microbial growth yield estimates from thermodynamics and its importance for degradation of pesticides and formation of biogenic non-extractable residues

In biodegradation studies with isotope-labelled pesticides, fractions of non-extractable residues (NER) remain, but their nature and composition is rarely known, leading to uncertainty about their risk. Microbial growth leads to incorporation of carbon into the microbial mass, resulting in biogenic NER. Formation of microbial mass can be estimated from the microbial growth yield, but experimental data is rare. Instead, we suggest using prediction methods for the theoretical yield based on thermodynamics. Recently, we presented the Microbial Turnover to Biomass (MTB) method that needs a minimum of input data. We have estimated the growth yield of 40 organic chemicals (31 pesticides) using the MTB and two existing methods. The results were compared to experimental values, and the sensitivity of the methods was assessed. The MTB method performed best for pesticides. Having the theoretical yield and using the released CO2 as a measure for microbial activity, we predicted a range for the formation of biogenic NER. For the majority of the pesticides, a
A considerable fraction of the NER was estimated to be biogenic. This novel approach provides a theoretical foundation applicable to the evaluation and prediction of biogenic NER formation during pesticide degradation experiments, and may also be employed for the interpretation of NER data from regulatory studies.
Microbial population dynamics in urban organic waste anaerobic co-digestion with mixed sludge during a change in feedstock composition and different hydraulic retention times

Microbial communities play an essential role in the biochemical pathways of anaerobic digestion processes. The correlations between microorganisms' relative abundance and anaerobic digestion process parameters were investigated, by considering the effect of different feedstock compositions and hydraulic retention times (HRTs). Shifts in microbial diversity and changes in microbial community richness were observed by changing feedstock composition from mono-digestion of mixed sludge to co-digestion of food waste, grass clippings and garden waste with mixed sludge at HRT of 30, 20, 15 and 10 days. Syntrophic acetate oxidation along with hydrogenotrophic methanogenesis, mediated by Methanothermobacter, was found to be the most prevalent methane formation pathway, with the only exception of 10 days' HRT, in which Methanosarcina was the most dominant archaea. Significantly, the degradation of complex organic polymers was found to be the most active process, performed by members of S1 (Thermotogales), Thermonema and Lactobacillus in a reactor fed with a high share of food waste. Conversely, Thermacetogenium, Anaerobaculum, Ruminococcaceae, Porphyromonadaceae and the lignocellulosic-degrading Clostridium were the significantly more abundant bacteria in the reactor fed with an increased share of lignocellulosic biomass in the form of grass clippings and garden waste. Finally, microbes belonging to Coprothermobacter, Syntrophomonas and Clostridium were correlated significantly with the specific methane yield obtained in both reactors.
Microplastics as Vectors for Environmental Contaminants: Exploring Sorption, Desorption, and Transfer to Biota

The occurrence and effects of microplastics (MPs) in the aquatic environment are receiving increasing attention. In addition to their possible direct adverse effects on biota, the potential role of MPs as vectors for hydrophobic organic chemicals (HOCs), compared to natural pathways, is a topic of much debate. It is evident, however, that temporal and spatial variations of MP occurrence do (and will) occur. To further improve the estimations of the role of MPs as vectors for HOC transfer into biota under varying MP concentrations and environmental conditions, it is important to identify and understand the governing processes. Here, we explore HOC sorption to and desorption from MPs and the underlying principles for their interactions. We discuss intrinsic and extrinsic parameters influencing these processes and focus on the importance of the exposure route for diffusive mass transfer. Also, we outline research needed to fill knowledge gaps and improve model-based calculations of MP-facilitated HOC transfer in the environment. Integr Environ Assess Manag 2017;13:488–493. © 2017 SETAC
Miljøprofessor: Vi skal gøre op med dysfunktionelle vandafgifter
Der er for lidt vægt på almindelig økonomisk rationalitet i forhold til vand, og det har medført dysfunktionelle vandafgifter, som bør ændres ved at reformere spildevandsafgiften og indføre en klima- og miljøafgift, skriver Erik Arvin, professor
Mitigation of methane emissions in a pilot-scale biocover system at the AV Miljø Landfill, Denmark: 1. System design and gas distribution

Greenhouse gas mitigation at landfills by methane oxidation in engineered biocover systems is believed to be a cost-effective technology, but so far a full quantitative evaluation of the efficiency of the technology in full scale has only been carried out in a few cases. A third generation semi-passive biocover system was constructed at the AV Miljø Landfill, Denmark. The biocover system was fed by landfill gas pumped out of three leachate collection wells. An innovative gas distribution system was used to overcome the commonly observed surface emission hot spot areas resulting from an uneven gas distribution to the active methane oxidation layer, leading to areas with methane overloading. Performed screening of methane and carbon dioxide surface concentrations, as well as flux measurement using a flux chamber at the surface of the biocover, showed homogenous distributions indicating an even gas distribution. This was supported by results from a tracer gas test where the compound HFC-134a was added to the gas inlet over an adequately long time period to obtain tracer gas stationarity in the whole biocover system. Studies of the tracer gas movement within the biocover system showed a very even gas distribution in gas probes installed in the gas distribution layer. Also the flux of tracer gas out of the biocover surface, as measured by flux chamber technique, showed a spatially even distribution.

Installed probes logging the temperature and moisture content of the methane oxidation layer at different depths showed elevated temperatures in the layer with temperature differences to the ambient temperature in the range of 25-50 °C at the deepest measuring point due to the microbial processes occurring in the layer. The moisture measurements showed that infiltrating precipitation was efficiently drained away from the methane oxidation layer even gas distribution to the active methane oxidation layer, leading to areas with methane overloading. Performed screening of methane and carbon dioxide surface concentrations, as well as flux measurement using a flux chamber at the surface of the biocover, showed homogenous distributions indicating an even gas distribution. This was supported by results from a tracer gas test where the compound HFC-134a was added to the gas inlet over an adequately long time period to obtain tracer gas stationarity in the whole biocover system. Studies of the tracer gas movement within the biocover system showed a very even gas distribution in gas probes installed in the gas distribution layer. Also the flux of tracer gas out of the biocover surface, as measured by flux chamber technique, showed a spatially even distribution.

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Organisations: Department of Environmental Engineering
Authors: Arvin, E. (Intern)
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Mitigation of methane emissions in a pilot-scale biocover system at the AV Miljø Landfill, Denmark: 2. Methane oxidation

Greenhouse gas mitigation at landfills by methane (CH₄) oxidation in engineered biocover systems is believed to be a cost effective technology but so far a full quantitative evaluation of the efficiency of the technology in full scale has only been carried out in a few cases. A third generation semi-passive biocover system was constructed at the AV Miljø Landfill, Denmark. The biocover was fed by landfill gas pumped out of three leachate collection wells. An innovative gas distribution system was used to overcome the often observed uneven gas distribution to the active CH₄ oxidation layer resulting in overloaded areas causing CH₄ emission hot spot areas in the biocover surface. The whole biocover CH₄ oxidation efficiency was determined by measuring the CH₄ inlet load and CH₄ surface fluxes. In addition, CH₄ oxidation was determined for single points in the biocover using two different methods; the carbon mass balance method (based on CH₄ and carbon dioxide (CO₂) concentrations in the deeper part of the cover and CH₄ and CO₂ surface flux measurements) and a new-developed tracer gas mass balance method (based on CH₄ and tracer inlet fluxes and CH₄ and tracer surface flux measurements). Overall, the CH₄ oxidation efficiency of the whole biocover varied between 81 and 100% and showed that the pilot plant biocover system installed at AV Miljø landfill was very efficient in oxidizing the landfill CH₄. The average CH₄ oxidation rate measured at nine campaigns was approximately 13gm⁻²d⁻¹. Extrapolating laboratory measured CH₄ oxidation rates to the field showed that the biocover system had a much larger CH₄ oxidation potential in comparison to the tested CH₄ load. The carbon mass balance approach compared reasonably well with the tracer gas mass balance approach when applied for quantification of CH₄ oxidation in single points at the biofilter giving CH₄ oxidation efficiencies in the range of 84 to a 100%. CH₄ oxidation rates where however much higher using the tracer gas balance method giving CH₄ oxidation rates between 7 and 124gm²d⁻¹ compared to the carbon mass balance, which gave CH₄ oxidation rates -0.06 and 40gm²d⁻¹. The study also revealed that the compost respiration contributed significantly to the measured CO₂ surface emission, and that the contribution of the compost respiration decreased significantly with time probably due to further maturation of the compost material.
Model-based identification of chemicals transformation pathways combined with reaction kinetics models-- the case of heroin biomarkers in wastewater

General information
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Organisations: Department of Environmental Engineering, Water Technologies, Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, Environmental Chemistry
Authors: Ramin, P. (Intern), Valverde Pérez, B. (Intern), Polesel, F. (Intern), Gernaey, K. (Intern), Plósz, B. G. (Intern)
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Modelling multicomponent ionic dispersion, electrochemical migration, and chemical reactions in porous media with IPhreeqc coupling

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Organisations: Department of Environmental Engineering, Water Resources Engineering, University of Tubingen
Authors: Muniruzzaman, M. (Ekstern), Rolle, M. (Intern)
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Modelling of flow and transport processes in a fractured limestone aquifer

General information
State: Published
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Modelling biotransformation of drug biomarkers by sewer biofilms

General information
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Organisations: Water Technologies, Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, Department of Environmental Engineering, Environmental Chemistry, University of Bath
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Modelling of green microalgal growth and algal storage processes using wastewater resources
Recent research focuses on the recovery of nutrients, water and energy from wastewater. Microalgal cultivation on wastewater resources is considered as a more sustainable means to produce fertilizers or biofuels. Innovative systems that incorporate microalgal cultivation into conventional wastewater processes have been developed. The effective design, optimisation and control of these systems require modelling tools that can readily extend existing benchmark models with
new sub-models. Several process models have been developed to simulate algal growth. Some models include only one variable, e.g., light, whereas others include multiple variables, such as pH, nitrogen, phosphorus and organic carbon. This chapter aims to collect and describe green microalgal process models that can be used in wastewater resource recovery systems together with their limitations. Some of the listed models have been developed according to the activated sludge modelling (ASM) framework to facilitate the integration with existing modelling frameworks in water treatment. This chapter presents in detail the recently developed ASM-A biokinetic green microalgal process model. The model includes photoautotrophic and heterotrophic algal growth and uptake and storage of nutrients, including both nitrogen and phosphorus.

**General information**
State: Published
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**Modelling tools for integrating geological, geophysical and contamination data for characterization of groundwater plumes**
Contaminated sites are a major issue threatening the environment and the human health. The large number of contaminated sites require cost effective investigations to perform risk assessment and prioritize the sites that need remediation. Contaminated soil and groundwater investigations rely on borehole investigations to collect the geological, hydrological, and contaminant data. These data are integrated in conceptual and mathematical models describing the lithology, the groundwater flow, and the distribution of contaminant concentrations. Models are needed to analyze the potential risks to all receptors, including streams. Key risk assessment parameters, such as contaminant mass discharge estimates, and tools are then used to evaluate the risk.

The cost of drilling often makes investigations of large and/or deep contaminant plumes unfeasible. For this reason, it is important to develop cost effective tools that reduce the number of drillings required for proper characterization of contaminant plumes. Among these tools, non-invasive surface direct current resistivity and induced polarization (DCIP) geophysical methods for contaminant plume investigations are promising.

DCIP surveys provide data on the electrical properties of soil and groundwater. Thus, interpretation of DCIP surveys can supply indirect information on the geological and hydrological properties of soils. In addition, DCIP methods can be used to describe the distribution of concentration of ions in groundwater. However, the effects on the electrical signal of soil properties and of ionic compounds in groundwater can be similar. This means that the interpretation of DCIP surveys is challenging when contaminant plumes are present. Furthermore, these new types of data need to be integrated with the geological, hydrological, and contaminant data in modelling tools used for investigations of contaminated sites. This thesis presents the development of modelling tools to integrate DCIP methods with geological, hydrological and contaminant concentration data. The developed tools describe groundwater flow to meandering streams, map the distribution of contaminant concentrations in contaminant plumes, and estimate the contaminant mass discharge. The tools are tested at the Grindsted landfill site and at the Grindsted stream site where a contaminant plume from a former factory site is discharging to the stream.

Groundwater flow to streams is affected by many factors, including stream channel geometry. In this study, numerical models simulating groundwater flow to synthetic sinuous streams and to a real meandering stream were developed. Comparison of the models showed that groundwater discharge to streams is greatly affected by the geometry of meanders. Groundwater flow paths near streams are also affected by the combination of meander bends and aquifer properties, such as the groundwater flow direction in the aquifer. The three-dimensional (3D) characteristics of the flow paths require 3D modelling tools to properly describe these sites.

This is confirmed by the migration of the contaminant plume originating from the old factory site and discharging to Grindsted stream. Groundwater flow simulations, developed using on a 3D hydrogeological model of the site, were combined with chemical fingerprinting. This indicated that a low permeability layer separates the contaminant plume in a shallow and a deep plume. These plumes have different chemical characteristics and different migration paths to the stream. This has implications for the risk assessment of the stream and groundwater in the area.

The difficulty of determining groundwater flow paths means that it is also difficult to predict the distribution of contaminants in the subsurface. Anomalies in DCIP surveys near contaminated sites have been used to indicate the presence of plumes with high concentrations of ionic compounds, such as landfill leachate plumes. In some field studies, DCIP anomalies have also been used to detect the presence of microbial degradation of dissolved organic contaminants. This study presents a conceptual model describing the possible links between inorganic and organic contaminants often found at contaminated sites and plumes. The model was used to establish correlations between DCIP derived bulk electrical

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conductivity and the distribution of concentration of selected inorganic compounds (e.g. chloride and dissolved iron) in the contaminant plumes originated from the landfill site and the factory site. DCIP derived data could also describe the distribution of selected xenobiotic organic compounds, including pharmaceutical compounds and chlorinated ethenes. The correlation between DCIP and organic compounds is indirect and depends on the chemical composition of the contaminant plume and the transport processes. Thus, the correlations are site specific and may change between different parts of a contaminated site.

DCIP data are also useful in risk assessments based on contaminant mass discharge, which is a measure of the contaminant load on an aquifer. Contaminant mass discharge estimations often rely on multilevel wells to collect information on contaminant concentrations and groundwater flux. Thus, the error of the contaminant mass discharge depends on the density of the samples, on the site heterogeneity, and on the accuracy of the interpolation between data points. A novel contaminant mass discharge method was developed which integrates contaminant concentration data and DCIP data. The method enabled the determination of mass discharge with a lower error compared to only using contaminant concentrations. However, the method can only be applied when a correlation between DCIP and contaminant concentrations can be established. The geophysics based method performed better at low sample densities; thus, the geophysics based contaminant mass discharge method is in particular valuable at large sites and deep plumes, where the drilling costs often do not allow the installation of a sufficient number of sampling points.

In conclusion, this PhD project has developed new ways to improve contaminated site investigations by employing integrated surface DCIP geophysical data with modelling tools for contaminant plume characterization. These combined technologies may improve our ability to map groundwater flow and contaminant plumes more efficiently in the future.
Monitoring recent lake level variations on the Tibetan Plateau using CryoSat-2 SARIn mode data

Lakes on the Tibetan Plateau (TP) are of great interest due to their value as water resources but also as an important indicator of climate change. However, in situ data in this region are extremely scarce and only a few lakes have gauge measurements. Satellite altimetry has been used successfully to monitor lake levels. In this study, Cryosat-2 SARIn mode data over the period 2010–2015 are used to investigate recent lake level variations. The estimated water levels of the 70 largest lakes (> 100 km²) on the TP show that 48 lakes reveal a rising trend (avg. 0.28 ± 0.06 m/yr) while the other 22 show a slightly decreasing trend (avg. −0.10 ± 0.04 m/yr). To compare with the change rates during 2003–2009, ICESat data which cover 42 of the 70 lakes are also used. When combining the data, the results show that during the period of 2003–2015, 28 lakes maintained a rising trend and the change rates are comparable. Lakes in the northern part of the TP experienced pronounced rising (avg. 0.37 ± 0.10 m/yr), while lakes in southern part were steady or decreasing even in glaciated basins with high precipitation. Factor analysis indicates that driving factors for lake change are variable due to high spatial heterogeneity. However, autumn/winter temperature plays an important role in lake level change. These results demonstrate that lakes on the TP are still rapidly changing under climate change, especially in northern part of the TP, but the driving factors are variable and more research is needed to understand the mechanisms behind observed changes.

General information
State: Published
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BFI (2013): BFI-level 2
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Scopus rating (2011): SJR 1.742 SNIP 1.833 CiteScore 3.16
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Web of Science (2011): Indexed yes
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Moving bed biofilm reactors (MBBRs) for removal of pharmaceuticals in biological wastewater treatment

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Environmental Chemistry, AnoxKaldnes AB
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Number of pages: 1
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Main Research Area: Technical/natural sciences
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Publication: Research - peer-review › Poster – Annual report year: 2017

Multi-Objective Optimization for Analysis of Changing Trade-Offs in the Nepalese Water-Energy-Food Nexus with Hydropower Development

While the water-energy-food nexus approach is becoming increasingly important for more efficient resource utilization and economic development, limited quantitative tools are available to incorporate the approach in decision-making. We propose a spatially explicit framework that couples two well-established water and power system models to develop a decision support tool combining multiple nexus objectives in a linear objective function. To demonstrate our framework, we compare eight Nepalese power development scenarios based on five nexus objectives: minimization of power deficit, maintenance of water availability for irrigation to support food self-sufficiency, reduction in flood risk, maintenance of environmental flows, and maximization of power export. The deterministic multi-objective optimization model is spatially resolved to enable realistic representation of the nexus linkages and accounts for power transmission constraints using an optimal power flow approach. Basin inflows, hydropower plant specifications, reservoir characteristics, reservoir rules,
irrigation water demand, environmental flow requirements, power demand, and transmission line properties are provided as model inputs. The trade-offs and synergies among these objectives were visualized for each scenario under multiple environmental flow and power demand requirements. Spatially disaggregated model outputs allowed for the comparison of scenarios not only based on fulfillment of nexus objectives but also scenario compatibility with existing infrastructure, supporting the identification of projects that enhance overall system efficiency. Though the model is applied to the Nepalese nexus from a power development perspective here, it can be extended and adapted for other problems.
N2O and NO dynamics in AOB-enriched and mixed-culture biomass: Experimental Observations and Model Calibration

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Department of Chemical and Biochemical Engineering
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N2O emission from plant surfaces – light stimulated and a global phenomenon
Nitrous oxide (N2O) is a major long-lived greenhouse gas and precursor of stratospheric ozone-depleting mononitrogen oxides. The atmospheric concentration of N2O is persistently increasing; however, large uncertainties are associated with its distinct source strengths. Here we investigate for the first time N2O emission from terrestrial vegetation in response to natural solar ultra violet radiation. We conducted field site measurements to investigate N2O atmosphere exchange from grass vegetation exposed to solar irradiance with and without UV-screening. Further laboratory tests were conducted with a range of species to study the controls and possible loci of UV-induced N2O emission from plants. Plants released N2O in response to natural sunlight at rates of c.20-50 nmol m-2 h-1, mostly due to the UV component. The emission rate is temperature dependent with a rather high activation energy indicative for an abiotic process. The prevailing zone for the N2O formation appears to be at the very surface of leaves. However, only c. 26% of the UV-induced N2O appears to originate from plant-N. Further, the process is dependent on atmospheric oxygen concentration. Our work demonstrates that ecosystem emission of the important greenhouse gas, N2O, may be up to c. 30% higher than hitherto assumed.

General information
State: Published
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NanoCRED: A transparent framework to assess the regulatory adequacy of ecotoxicity data for nanomaterials – relevance and reliability revisited

Environmental hazard and risk assessment serve as the basis for regulatory decisions to protect the environment from unintentional adverse effects of chemical substances including nanomaterials. This process requires reliable and relevant environmental hazard data upon which classification and labelling can be based and Predicted No-Effect Concentration (PNEC) values can be estimated. In a regulatory context ecotoxicological data is often recommended to be generated according to accepted and validated test guidelines, preferably also following Good Laboratory Practice. However, engineered nanomaterials are known to behave very differently in ecotoxicity tests compared to the conventional soluble chemicals, for which most guidelines were developed. Therefore non-guideline tests, or tests following modified test guidelines, can provide valuable information and should not per se be considered less adequate for regulatory use. Here we propose a framework for reliability and relevance evaluation of ecotoxicity data for nanomaterials that take into account the challenges and characterisation requirements associated with testing of these substances. The nanoCRED evaluation criteria, and accompanying guidance, were developed to be used in combination with those developed through the ‘Criteria for Reporting and Evaluating Ecotoxicity Data (CRED)’ project. This approach can accommodate all types of nanomaterials, all types of aquatic ecotoxicity studies, and qualitative as well as quantitative data evaluation requirements. Furthermore, it is practically feasible to implement and directly applicable in European as well as international regulatory frameworks.

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Nanoscale Coloristic Pigments: Upper Limits on Releases from Pigmented Plastic during Environmental Aging, In Food Contact, and by Leaching

The life cycle of nanoscale pigments in plastics may cause environmental or human exposure by various release scenarios. We investigated spontaneous and induced release with mechanical stress during/after simulated sunlight and rain degradation of polyethylene (PE) with organic and inorganic pigments. Additionally, primary leaching in food contact and secondary leaching from nanocomposite fragments with an increased surface into environmental media was examined. Standardized protocols/methods for release sampling, detection, and characterization of release rate and form were applied: Transformation of the bulk material was analyzed by Scanning Electron Microscopy (SEM), X-ray-tomography and Fourier-Transform Infrared spectroscopy (FTIR); releases were quantified by Inductively Coupled Plasma Mass Spectrometry (ICP-MS), single-particle-ICP-MS (sp-ICP-MS), Transmission Electron Microscopy (TEM), Analytical Ultracentrifugation (AUC), and UV/Vis spectroscopy. In all scenarios, the detectable particulate releases were attributed primarily to contaminations from handling and machining of the plastics, and were not identified with the pigments,
although the contamination of 4 mg/kg (Fe) was dwarfed by the intentional content of 5800 mg/kg (Fe as Fe2O3 pigment). We observed modulations (which were at least partially preventable by UV stabilizers) when comparing as-produced and aged nanocomposites, but no significant increase of releases. Release of pigments was negligible within the experimental error for all investigated scenarios, with upper limits of 10 mg/m² or 1600 particles/mL. This is the first holistic confirmation that pigment nanomaterials remain strongly contained in a plastic that has low diffusion and high persistence such as the polyolefin High Density Polyethylene (HDPE).
Nitrification, the biological oxidation of ammonium to nitrate, is a fundamental process in the nitrogen cycle and plays an important role in natural and engineered systems. Throughout the last century, nitrification was assumed to be a two-step process executed by two different functional groups, ammonia oxidizing prokaryotes (AOP) and nitrite oxidizing bacteria (NOB). Recently, several articles have shown the capability of a single microorganism, belonging to the genus Nitrospira, to carry out the complete oxidation of ammonia to nitrate (comammox). Nitrospira spp. are widespread in both natural and engineered ecosystems associated with nitrogen cycling and different species are frequently observed to coexist in the same environment. Besides recent discoveries pointing towards versatile metabolism in some Nitrospira species, little is known about the functional potential of the two comammox Nitrospira clades, and the factors involved in niche-partitioning between comammox and canonical Nitrospira.

A comparative genomics analysis was conducted with five genomes recovered from a groundwater-fed rapid sand filter (including both comammox clades and a nitrite-oxidizing Nitrospira population genome) and high quality published Nitrospira genomes, to reveal distinct genomic features within Nitrospira. In addition, we investigated the evolution of the ammonia oxidation pathway in comammox Nitrospira. This analysis revealed distinct genetic capabilities of the different comammox clades and canonical Nitrospira which can help to explain the coexistence and niche partitioning of Nitrospira spp. These divergences range from the nitrogen source utilization capacity to the ability for electron donor versatility, and other characteristics such as stress response. With respect to the evolutionary history of comammox Nitrospira, our analysis indicates transfer events with betaproteobacterial ammonia oxidizers. In addition, transfer events between comammox clade A and clade B were also detected for genes belonging to the ammonium oxidation pathway.

Together, these results expand the actual knowledge of the ecology and evolution of the recently discovered comammox Nitrospira.
Niche partitioning within genus *Nitrospira* is affected by environmental copper concentration

Nitrification is a dominant process in groundwater-fed rapid sand filters (RSFs) used for drinking water purification. Near complete removal of ammonium and nitrite is required in the EU and Denmark due to strict regulatory limits that enable high water stability in the distribution system. Previous work has revealed that in poorly functioning filters, the addition of trace copper can increase the rate of nitrification, leading to increased removal of ammonium and nitrite to below regulatory limits. RSFs are a unique environment harboring diverse microbial communities including a range of nitrifying bacteria: Betaproteobacterial ammonia oxidizers (*Nitrosomonas, Nitrosospira; AOB*), ammonia oxidizing archaea (*AOA*), diverse heterotrophs potentially capable of ammonia and/or nitrite oxidation and a large fraction of *Nitrospira* spp., recently shown to comprise both nitrite oxidizers and comammox *Nitrospira* spp. This diversity points towards extensive niche partitioning within the nitrifying guild, and particularly within *Nitrospira* which generally comprises between 10 and 65% of the total filter community. Copper is a co-factor in the ammonia monooxygenase enzyme and is thus an essential and at times limiting nutrient in nitrifying environments. We sought to examine the effects of copper on niche partitioning within the genus *Nitrospira* in full-scale filters. Sand samples from the top of an after-filter that displayed incomplete ammonium oxidation at Nærum waterworks were taken prior to Cu dosing treatment and 4 months following the commencement of low-level Cu dosing (~μg Cu L⁻¹). Copper treatment had an immediate effect on nitrification, resulting in removal of ammonium and nitrite to below regulatory levels. DNA was extracted from sand samples and was subject to qPCR and amplicon based Illumina sequencing of *Nitrospira nxrB* (nitrite reductase B-subunit) and amoA genes using newly designed primers targeting clades A and B comammox. Quantitative PCR revealed that Cu addition resulted in a 4-fold increase of total *Nitrospira*, but a 5-fold decrease in the abundance of comammox *Nitrospira*. However, further examination of the qPCR melt curves and amoA sequence data revealed that the reduction in comammox *Nitrospira* resulted from the near complete loss of Clade B comammox, while Clade A comammox were present at similar absolute abundances as in the community prior to copper dosing. The reasons for the loss of Clade B comammox are currently unclear. Higher sensitivity to copper toxicity in Clade B relative to Clade A and nitrite-oxidizing *Nitrospira* seems unlikely due to the extremely low copper concentrations applied. An overall stimulation of the growth of nitrifying bacteria occurred once copper limitation was removed, likely resulting in the out-competition of Clade B *Nitrospira* ammonium oxidizers. These results suggest that copper availability plays a role in determining the diversity and distribution of *Nitrospira* spp. in nitrifying environments.

**General information**

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Organisations: Department of Environmental Engineering, Water Technologies, Urban Water Systems  
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Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Nitrogen mineralisation and greenhouse gas emission from the soil application of sludge from reed bed mineralisation systems

A sludge treatment reed bed system (STRB) is a technology used for dewatering and stabilising sewage sludge via assisted biological mineralisation, which creates a sludge residue suitable for use as fertiliser on agricultural land. We evaluated the effect of sludge residue storage time (stabilisation time) for three STRBs on soil N mineralisation and CO₂ and N₂O emissions in soil. The experiment revealed that the N mineralisation rate and emissions of CO₂ and N₂O decreased as a function of treatment time in the STRBs. Mixed sludge residue (sludge residue subjected to different treatment times) for the three STRBs resulted in N mineralisation rates similar to the sludge residue subjected to a shorter treatment time but lower N₂O emissions similar to the values of the older sludge residue. This finding reveals that combining fresh and more stabilised sludge residue ensures high N availability and reduces N₂O emissions when applied to land.

**General information**

State: Published  
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Office for Finance and Accounting, University of Copenhagen
Nitrogen recovery from wastewater to produce microbial protein using methane oxidizing bacteria

Community assembly is a central topic in microbial ecology: how do assembly processes interact and what is the relative contribution of stochasticity and determinism? Here, we exposed replicate flow-through biofilm systems, fed with nitrite-supplemented tap water, to continuous immigration from a source community, present in the tap water, to determine the extent of selection and neutral processes in newly assembled biofilm communities at both the community and the functional guild (of nitrite-oxidizing bacteria, NOB) levels. The community composition of biofilms assembled under low and high nitrite loading was described after 40 days of complete nitrite removal. The total community assembly, as well as the NOB guild assembly were largely governed by a combination of deterministic and stochastic processes. Furthermore, we observed deterministic enrichment of certain types of NOB in the biofilms. Specifically, elevated nitrite loading selected for a single Nitrotoga representative, while lower nitrite conditions selected for a number of Nitrospira. Therefore, even when focusing on ecologically coherent ensembles, assembly is the result of complex stochastic and deterministic processes that can only be interrogated by observing multiple assemblies under controlled conditions. This article is protected by copyright. All rights reserved.

Nitrota is selected over Nitrospira in newly assembled biofilm communities from a tap water source community at increased nitrite loading

Community assembly is a central topic in microbial ecology: how do assembly processes interact and what is the relative contribution of stochasticity and determinism? Here, we exposed replicate flow-through biofilm systems, fed with nitrite-supplemented tap water, to continuous immigration from a source community, present in the tap water, to determine the extent of selection and neutral processes in newly assembled biofilm communities at both the community and the functional guild (of nitrite-oxidizing bacteria, NOB) levels. The community composition of biofilms assembled under low and high nitrite loading was described after 40 days of complete nitrite removal. The total community assembly, as well as the NOB guild assembly were largely governed by a combination of deterministic and stochastic processes. Furthermore, we observed deterministic enrichment of certain types of NOB in the biofilms. Specifically, elevated nitrite loading selected for a single Nitrotoga representative, while lower nitrite conditions selected for a number of Nitrospira. Therefore, even when focusing on ecologically coherent ensembles, assembly is the result of complex stochastic and deterministic processes that can only be interrogated by observing multiple assemblies under controlled conditions. This article is protected by copyright. All rights reserved.
Nitrous oxide Production in Membrane-aerated Nitrifying Biofilms: Experimentation and Modelling

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Organisations: Department of Environmental Engineering, Water Technologies
Authors: Ma, Y. (Intern), Domingo-Felez, C. (Intern), Smets, B. F. (Intern)
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Normal and Inverse Diffusive Isotope Fractionation of Deuterated Toluene and Benzene in Aqueous Systems
Diffusive isotope fractionation of organic contaminants in aqueous solution is difficult to quantify, and only a few experimental data sets are available for compounds of environmental interest. In this study, we investigate diffusive fractionation of perdeuterated and nondeuterated benzene and toluene. Multitracer experiments were carried out in 1-D gel dissection tubes and in a quasi-2-D flow-through porous medium. The experiments allowed us to simultaneously and directly compare the diffusive and dispersive behavior of benzene and toluene. We observed an unexpected, opposite behavior of the two monoaromatic hydrocarbons. Toluene showed a normal diffusive isotope effect (DC7D8/DC7H8 = 0.96) with enrichment of the nondeuterated isotopologue in the direction of the diffusive and transverse dispersive fluxes. Conversely, the measured trends for benzene indicate inverse diffusive fractionation (DC6D6/DC6H6 = 1.02), with a remarkably faster diffusion rate of the perdeuterated isotopologue that was enriched in the downgradient portion of the diffusion tubes and at the fringes of the contaminant plumes in the flow-through setup. These outcomes can neither be interpreted as mass-dependent fractionation nor be described as purely hydrodynamic (i.e., mass independent) effects. The results of this study are relevant for the use of labeled/nonlabeled mixtures of organic compounds as conservative and (bio)reactive tracers in environmental applications.

Not all that glitters is gold - Electron microscopy study on uptake of gold nanoparticles in Daphnia magna and related artefacts
Increasing use of engineered nanoparticles has led to extensive research into their potential hazards to the environment and human health. Cellular uptake from the gut is sparsely investigated and microscopy techniques applied for uptake studies can result in misinterpretations. Various microscopy techniques are used to investigate internalization of 10 nm gold nanoparticles in Daphnia magna gut lumen and gut epithelial cells upon 24h exposure and outline potential artefacts, i.e. high contract precipitates from sample preparation related to these techniques. Light sheet microscopy confirmed accumulation of gold nanoparticles in the gut lumen. Scanning transmission electron microscopy and elemental analysis revealed gold nanoparticles attached to the microvilli of gut cells. Interestingly, the peritrophic membrane appeared to act as a semipermeable barrier between the lumen and the gut epithelium, permitting only single particles through. Structures resembling nanoparticles were also observed inside gut cells. As elemental analysis could not verify these to be gold they were likely artifacts from the preparation, such as osmium and iron. Importantly, gold nanoparticles were in fact found inside holocrine cells with disrupted membranes. Thus, false positive observations of nanoparticle internalization may result from either preparation artefacts or by mistaking disrupted cells for intact. These findings emphasize the importance of cell integrity and combining elemental analysis with the localization of internalized nanoparticles using transmission electron microscopy.

General information
State: Published
Organisations: Center for Electron Nanoscopy, Department of Environmental Engineering, Environmental Chemistry, Department of Micro- and Nanotechnology, Molecular Windows, Roskilde University
Authors: Jensen, L. H. S. (Intern), Skjolding, L. M. (Intern), Thit, A. (Ekstern), Sørensen, S. N. (Intern), Købler, C. (Intern), Mølhave, K. (Intern), Baun, A. (Intern)
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Scopus rating (2017): SNIP 1.018 SJR 1.178 CiteScore 2.87
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.74 SJR 1.231 SNIP 1.021
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.433 SNIP 1.056 CiteScore 3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.501 SNIP 1.12 CiteScore 2.89
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.656 SNIP 1.086 CiteScore 2.88
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.639 SNIP 1.108 CiteScore 2.81
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.947 SNIP 1.168 CiteScore 3.05
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.715 SNIP 0.992
Novel bio-electro-Fenton technology for azo dye wastewater treatment using microbial reverse-electrodialysis electrolysis cell

Development of sustainable technologies for treatment of azo dyes containing wastewaters has long been of great interest. In this study, we proposed an innovative concept of using microbial reverse-electrodialysis electrolysis cell (MREC) based Fenton process to treat azo dye wastewater. In such MREC-Fenton integrated process, the production of H₂O₂ which is the key reactant of fenton-reaction was driven by the electrons harvested from the exoelectrogens and salinity-gradient between sea water and fresh water in MREC. Complete decolorization and mineralization of 400 mg L⁻¹ Orange G was achieved with apparent first order rate constants of 1.15 ± 0.06 and 0.26 ± 0.03 h⁻¹, respectively. Furthermore, the initial concentration of orange G, initial solution pH, catholyte concentration, high and low concentration salt water flow rate and air flow rate were all found to significantly affect the dye degradation. This study provides an efficient and cost-effective system for the degradation of non-biodegradable pollutants.
Original language: English
Microbial Reverse-electrodialysis Electrolysis cell (MREC), Fenton reaction, Salinity gradient, Azo dye, Wastewater, Biological process

DOIs:
Novel Commercial Aquaporin Flat-Sheet Membrane for Forward Osmosis

Aquaporin proteins are of great interest to the membrane science community because of their unique characteristics of high water permeability and perfect molecular selectivity. Although these characteristics make aquaporins particularly valuable for desalination applications, none of these aquaporin-based membrane designs has been produced at a large scale. In this work, we report on the recently designed and commercially available Aquaporin Inside flat-sheet membrane designed for forward osmosis (FO) by Aquaporin A/S, Lyngby, Denmark. The Aquaporin Inside flat-sheet membrane is the first commercially available thin-film composite (TFC) FO membrane to incorporate aquaporin proteins into its polyamide-based selective layer. The membrane tested, which is a first-generation membrane, achieved water fluxes of 14.0 and 8.8 L m⁻² h⁻¹ with low reverse salt fluxes of 4.6 and 4.0 g m⁻² h⁻¹ in pressure-retarded osmosis (PRO) and FO modes, respectively, using 1.0 M sodium chloride as the draw solution and deionized water as the feed solution. The membrane structural parameter was calculated to be 630 μm, which is similar to those of existing commercial membrane options for FO. The Aquaporin Inside membrane was found to exhibit water and reverse solute flux performances similar to those of other commercially available varieties, although this membrane represents one of the few TFC membranes that is available to the academic community for FO testing at the time of this writing.

General information

State: Published
Organisations: Department of Environmental Engineering, Water Technologies, University of Connecticut, Aquaporin A/S
Authors: Xia, L. (Ekstern), Andersen, M. F. (Ekstern), Hélix-Nielsen, C. (Intern), McCutcheon, J. R. (Ekstern)
Number of pages: 7
Pages: 11919-11925
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BFI (2017): BFI-level 2
Scopus rating (2017): SJR 0.978 SNIP 1.203 CiteScore 3.4
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.1 SJR 0.95 SNIP 1.155
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 0.938 SNIP 1.145 CiteScore 2.87
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.009 SNIP 1.287 CiteScore 2.85
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 0.975 SNIP 1.232 CiteScore 2.6
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.054 SNIP 1.32 CiteScore 2.56
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.076 SNIP 1.236 CiteScore 2.58
Novel insights linking ecological health to biogeochemical hotspots across the groundwater-surface water interface in mixed land use stream systems

General information
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Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Aarhus University, Bielefeld University
Number of pages: 1
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Main Research Area: Technical/natural sciences
Electronic versions: McKnight_AGU2017_abstract.pdf
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Novel pre-treatments to control bromate formation during ozonation
Worldwide water shortage increase and water quality depletion from microbial and chemical compounds, pose significant challenges for today's water treatment industry. Both the development of new advanced oxidation technologies, but also the enhancement of existing conventional technologies is of high interest. This study tested improvements to conventional ozonation that reduce the formation of the oxidation-by-product bromate, while maintaining the effectiveness for removal emerging contaminants (atrazine). MnO4−, ClO2−, ClO2, ClO−, CH3COOO−, HSO5− or S2O8−2 with NH4+ were tested
as pre-treatments to ozonation of ground water. Each oxidant and NH4+ were added in a single stage or separately prior to ozonation. To the best of our knowledge, this is the first study that has tested all the above-mentioned oxidants for the same water matrix. Based on our results, the most promising pre-treatments were MnO4−-NH4+, ClO2−-NH4+ and ClO2-NH4+. MnO4−-NH4+ was the only pre-treatment that didn’t inhibit atrazine removal. When compared with the previously proposed Cl2/NH4+ pre-treatment, MnO4− + NH4+ was found as effective for preventing BrO3− formation, while atrazine removal was higher. In addition, MnO4− + NH4+ can be added in a single stage (compared to the 2 stage addition of Cl2/NH4+) without causing the formation of potentially harmful chlorination-by-products.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Siemens
Authors: Antoniou, M. (Intern), Sichel, C. (Ekstern), Andre, K. (Ekstern), Andersen, H. R. (Intern)
Pages: 452-459
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Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Hazardous Materials
Volume: 323
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Web of Science (2018): Indexed yes
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Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 6.31 SJR 1.742 SNIP 2.061
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BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.633 SNIP 1.931 CiteScore 5.54
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.814 SNIP 2.258 CiteScore 5.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.822 SNIP 2.43 CiteScore 5.09
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.953 SNIP 2.443 CiteScore 4.73
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.916 SNIP 2.098 CiteScore 4.81
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.677 SNIP 1.706
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.648 SNIP 2.032
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.25 SNIP 1.528
Web of Science (2008): Indexed yes
Novel protocol for lutein extraction from microalga Chlorella vulgaris

Lutein is a pigment generally extracted from marigold flowers. However, lutein is also found in considerable amounts in microalgae. In this study a novel method was developed to improve the extraction efficiency of lutein from microalga C. vulgaris. Differently from conventional methods, ethanol was used instead of water in the saponification step, which was conducted simultaneously to the solvent extraction, performed using dichloromethane. The amount of lutein extracted from C. vulgaris dried biomass increased more than threefold, from 0.20 ± 0.00 mg Lutein/gDM to 0.69 ± 0.08 mg Lutein/gDM. Lutein purity was increased from 73.6% to 93.7% by decreasing the ethanol-water ratio from 85% to 50% in the resolubilization step. The novel method was also tested with tetrahydrofuran. The extraction proved to be again more effective than the conventional one; however dichloromethane outperformed tetrahydrofuran in terms of quantity and purity of the recovered lutein.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: D'Este, M. (Intern), De Francisci, D. (Intern), Angelidaki, I. (Intern)
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Scopus rating (2017): CiteScore 3.18
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.16
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.75
**Numerical Weather Prediction and Relative Economic Value framework to improve Integrated Urban Drainage-Wastewater management**

Integrated urban drainage-wastewater systems (IUDWS) are challenged by the need for higher environmental and health standards and the increased frequency of heavy rain storms caused by climatic change. Real-time control (RTC) offers an alternative to the construction of costly facilities in cities where space is scarce and large-scale construction work a nuisance. This thesis focuses on flow domain predictions of IUDWS from numerical weather prediction (NWP) to select relevant control objectives for the IUDWS and develops a framework based on the relative economic value (REV) approach to evaluate when acting on the forecast is beneficial or not.

Rainfall forecasts are extremely valuable for estimating near future storm-water-related impacts on the IUDWS. Therefore, weather radar extrapolation "nowcasts" provide valuable predictions for RTC. However, radar nowcasts are limited by their prediction horizon of 1 to 2 hours and RTC of IUDWS could benefit from longer forecast horizons. The development of...
NWP models in parallel to the increase in computational power has led to limited area models (LAM) with increasingly finer spatial-temporal resolution, opening the possibility to use such weather forecast products in urban water management. NWP models are complementary to radar forecasts, providing predictions on a longer time scale (days). However, atmospheric motions are chaotic and highly nonlinear. Applying NWP to urban catchments, which often have a similar size to a single NWP grid cell, is limited by scientific gaps on how to deal with this poor spatial and temporal resolution for urban hydrology application, its predictive skills and uncertainty, etc. Forecast uncertainty is commonly described by meteorologist using ensemble prediction systems (EPS). This thesis used the outcome of the DMI-HIRLAM-S05 model which generates an EPS of 25 members. Each forecast ensemble provides hourly time step predictions over a forecast horizon of 54 hours with a horizontal resolution of 0.05° (approx. 5.6 km).

In order to evaluate the predictions based on the end-user perspective, namely the flow in the IUWDS, a case study was established for the urban catchment of Damhuså in Copenhagen, Denmark, and a rainfall-runoff model associated to it was developed. Hence, the predictions were therefore not assessed against observed rainfall but against observed flow at the end of the coupled hydro-meteorological model chain. The predictions were assessed based on flow domain prediction, distinguishing between high and low flow events. The combination of the different possibilities between observations and forecasts can be summarised in the 2x2 contingency table containing the four possible pairs of forecast-observation: hits (correct positives), false alarms (false positives), misses (false negatives) and correct negatives. The outcome of the contingency table were used to calculate skill scores like the probability of detection (PoD) and the probability of false detection (PoFD), and to plot the relative operating characteristic (ROC) diagram illustrating the discrimination skill of the NWP EPS prediction.

Using verification methods from meteorology on flow predictions showed that NWP have poor precision at such fine resolution. Therefore, NWP post-processing methods are necessary to cope with this limitation, getting the most out of the NWP to enhance its EPS, especially towards reducing the occurrence of missed events. This thesis investigates two NWP post-processing approaches: The neighbourhood method which includes predicted rainfall from nearby grid cells, and the time lagged ensemble (TLE) which utilises the overlap between consecutive NWP generations to expand the EPS. Both approaches have shown to be beneficial to enhance the NWP EPS, reducing the occurrence of missed events. However these approaches can lead to a large increase of the EPS size. The maximal threat neighbourhood method developed in this thesis improved the EPS discrimination skill with a limited increase of the EPS size. Despite these improvements, the high uncertainty embedded in NWP prevents the use of quantitative rainfall values directly for an urban catchment. NWP should be used, instead, in connection with a domain-based decision framework, predicting for which domain the IUWDS should be optimized. The following domain-based framework was suggested, distinguishing between 4 operational domains: (i) dry weather conditions with storage basins empty, (ii) dry weather conditions with stored water, (iii) wet weather conditions within the system capacity and (iv) wet weather conditions that exceed the system capacity.

Handling uncertainty is challenging for decision makers. Tools are necessary to provide insight on when acting based on uncertain forecast data is beneficial or not. The REV framework developed in this thesis provides a tool to evaluate the added benefit of using control strategies based on uncertain forecast information, to select the most relevant control parameters and to compare different control strategies.

This REV framework was applied on two case studies. The first one used NWP EPS to predict low flow domains during which the IUWDS can be coupled with the electrical smart grid to optimise its energy consumption. The REV framework was used to determine which decision threshold of the EPS (i.e. number of ensemble members predicting an event) provides the highest benefit for a given situation. In the second case study, the REV framework was used to evaluate the current control strategy switching the WWTP to wet weather operation and to assess other control parameters and strategies. The analysis of the current control showed a significant number of false alarms, and the REV framework was used to calibrate the threshold on radar flow prognosis and to test new control strategies to solve this problem. Uncertainty communication to end-users is a critical and challenging part of forecast usage. It can be achieved through the REV framework, which includes the possibility of considering management mistakes due to erroneous forecast. The REV framework assesses the overall benefit including these potential mismanagements, hence, maintaining the operator trust in the control.
Numerical Weather Prediction and Relative Economic Value framework to improve Integrated Urban Drainage-Wastewater management
Publication: Research › Ph.D. thesis – Annual report year: 2017

Occurrence, characterisation and fate of (nano)particulate Ti and Ag in two Norwegian wastewater treatment plants

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, SINTEF
Authors: Polesel, F. (Intern), Farkas, J. (Ekstern), Kjos, M. (Ekstern), Hansen, S. F. (Intern), Plósz, B. G. (Intern), Booth, A. M. (Ekstern)
Number of pages: 2
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On the way to on-line monitoring of microbial drinking water quality

General information
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Organisations: Department of Environmental Engineering, Urban Water Systems, Aigües de Barcelona, microLAN, Cetiqueta, Nordvand A/S
Authors: Albrechtsen, H. (Intern), Arnedo, M. J. (Ekstern), Appels, J. (Ekstern), Baquero, D. (Ekstern), Galofre, B. (Ekstern), Lindhardt, B. (Ekstern), Puigdomenech, C. (Ekstern), Wagner, F. B. (Intern)
Number of pages: 3
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Event: Abstract from Water Quality Technology Conference (WQTC) 2017, Portland, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
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Source: PublicationPreSubmission
Source-ID: 132146256
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Operational strategies for mitigation of nitrous oxide emissions from a phase isolated fullscale WWTP

General information
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Organisations: Department of Environmental Engineering, Water Technologies, VEOLIA, Biofos A/S
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Conference: 11th Annual Meeting of Danish Water Forum, Copenhagen, Denmark, 30/01/2017
Electronic versions:
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Source-ID: 132146256
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Optical remote sensing for soil mapping and monitoring

General information
Optimal adaptation to extreme rainfalls in current and future climate

More intense and frequent rainfalls have increased the number of urban flooding events in recent years, prompting adaptation efforts. Economic optimization is considered an efficient tool to decide on the design level for adaptation. The costs associated with a flooding to the T-year level and the annual capital and operational costs of adapting to this level are described with log-linear relations. The total flooding costs are developed as the expected annual damage of flooding above the T-year level plus the annual capital and operational costs for ensuring no flooding below the T-year level. The value of the return period T that corresponds to the minimum of the sum of these costs will then be the optimal adaptation level.

The change in climate, however, is expected to continue in the next century, which calls for expansion of the above model. The change can be expressed in terms of a climate factor (the ratio between the future and the current design level) which is assumed to increase in time. This implies increasing costs of flooding in the future for many places in the world. The optimal adaptation level is found for immediate as well as for delayed adaptation. In these cases the optimum is determined by considering the net present value of the incurred costs during a sufficiently long time span. Immediate as well as delayed adaptation is considered.
Optimization of hydrogen dispersion in thermophilic up-flow reactors for ex situ biogas upgrading

This study evaluates the efficiency of four novel up-flow reactors for ex situ biogas upgrading converting externally provided CO₂ and H₂ to CH₄, via hydrogenotrophic methanogenesis. The gases were injected through stainless steel diffusers combined with alumina ceramic sponge or through alumina ceramic membranes. Pore size, input gas loading and gas recirculation flow rate were modulated to optimize gas-liquid mass transfer, and thus methanation efficiency. Results showed that larger pore size diffusion devices achieved the best kinetics and output-gas quality converting all the injected H₂ and CO₂, up to 3.6L/LREACTOR·d H₂ loading rate. Specifically, reactors’ CH₄ content increased from 23 to 96% and the CH₄ yield reached 0.25LCH₄/LH₂. High throughput 16S rRNA gene sequencing revealed predominance of bacteria belonging to Anaerobaculum genus and to uncultured order MBA08. Additionally, the massive increase of hydrogenotrophic methanogens, such as Methanothermobacter thermautotrophicus, and syntrophic bacteria demonstrates the selection-effect of H₂ on community composition.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark, University of Padua
Optimizing sensitivity of Unmanned Aerial System optical sensors for low zenith angles and cloudy conditions

Satellite-based imagery in optical domains cannot provide information on the land surface during periods of cloud cover. This issue is especially relevant for high latitudes where overcast days and low solar zenith angles are common. Current remote sensing-based models of evapotranspiration or carbon assimilation are biased towards clear sky conditions, lacking important information on biophysical processes under cloudy conditions. Unmanned Aerial Vehicle (UAV) imagery has great potential to monitor and understand surface fluxes under cloudy conditions. For instance, in Denmark 73.54% of all days are non-clear (fraction of direct radiation less than 50%). UAV multispectral imagery acquired in these conditions tends to present low brightness and dynamic ranges, and high noise levels. Another problem is the influence of land cover types on the signal. For instance, over vegetated areas, even with low irradiance, saturation is reached in the near Infrared, while visible channels have low brightness. An individual camera setting for each channel and light conditions can improve sensor sensitivity while preventing saturation. This study aims to optimize the settings and radiometric corrections of a multispectral camera to produce high quality UAV imagery under low but homogeneous irradiance conditions. Laboratory experiments were conducted to link irradiance levels to different camera settings and calibration procedures. Results were tested outdoors over homogeneous and vegetated surfaces.

The multispectral camera (Tetra Mini-MCA6) has 6 channels in the visible and near Infrared. For the laboratory calibration experiment, different camera settings and typical irradiance levels from cloudy to clear sky were designed. The light-source is based on super-continuum generation to produce a continuous solar spectrum. It allows more flexible settings in illumination levels than tungsten halogen lamps. A Li-Cor 1800 integrating sphere and an ASD spectroradiometer (FieldSpec HandHeld 2) were also used. Images were acquired under varying integration time and illumination levels from 0.005 to 0.2 W∙m⁻²∙nm⁻¹∙sr⁻¹. Two radiometric calibration methods were applied to find gains to convert digital numbers (DN) into radiance and also to correct vignetting effects, apparent as the fall-off pixel intensity from the image center towards edges. The first is to apply a pixel-wise calibration from DN to radiance. The second performs a vignetting correction based on distance from each pixel to the highest DN pixel and then a global image calibration of averaged DN to radiance. To test calibration performance, images were acquired outdoors over (i) homogeneous targets (Teflon panels, grass and soil plots) and (ii) with UAV flight campaigns over a willow eddy covariance flux site under different cloudiness levels and solar zenith angles using varying camera settings. Radiance, reflectance, and vegetation indices were validated with ASD measurements and signal to noise metrics and dynamic ranges were assessed. Our results indicate that the spectral gains and camera settings can be tuned to allow higher signal to noise ratio and optimize the sensor sensitivity. This maximizes the image radiometric resolution and prevents sensor saturation for each channel. This paper is a step forward for UAV campaigns using optical cameras for low zenith angles and/or cloudy conditions.
Relations
Projects:
Optimizing sensitivity of Unmanned Aerial System optical sensors for low zenith angles and cloudy conditions
Publication: Research › Poster – Annual report year: 2017

Optimum ozonation of freshwater pilot recirculating aquaculture system - Water quality

General information
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ISBN (Print): 978-87-7481-241-8
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Organohalide-respiring bacteria community competition dynamics: Experiments and model-based interpretations

General information
State: Published
Authors: Murray, A. M. (Intern), Rolle, M. (Intern), Jin, B. (Intern), Maillard, J. (Ekstern), Broholm, M. M. (Intern), Holliger, C. (Ekstern)
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Event: Abstract from The international Society for Subsurface Microbiology (ISSM) 2017 Conference, Rotorua, New Zealand.
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Electronic versions:
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Relations
Activities:
Organohalide-respiring bacteria community competition dynamics: Experiments and model-based interpretations
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Overestimation of closed-chamber soil CO2 effluxes at low atmospheric turbulence

Soil respiration (R-s) is an important component of ecosystem carbon balance, and accurate quantification of the diurnal and seasonal variation of R-s is crucial for a correct interpretation of the response of R-s to biotic and abiotic factors, as well as for estimating annual soil CO2 efflux rates. In this study, we measured R-s hourly for 1 year by automated closed chambers in a temperate Danish beech forest. The data showed a clear diurnal pattern of R-s across all seasons with higher rates during night-time than during daytime. However, further analysis showed a clear negative relationship between flux rates and friction velocity (u(*)) above the canopy, suggesting that R-s was overestimated at low atmospheric turbulence throughout the year due to non-steady-state conditions during measurements. Filtering out data at low u(*) values removed or even inverted the observed diurnal pattern, such that the highest effluxes were now observed during daytime, and also led to a substantial decrease in the estimated annual soil CO2 efflux. By installing fans to produce
continuous turbulent mixing of air around the soil chambers, we tested the hypothesis that overestimation of soil CO2 effluxes during low \( u^* \) can be eliminated if proper mixing of air is ensured, and indeed the use of fans removed the overestimation of \( R_s \) rates during low \( u^* \). Artificial turbulent air mixing may thus provide a method to overcome the problems of using closed-chamber gas-exchange measurement techniques during naturally occurring low atmospheric turbulence conditions. Other possible effects from using fans during soil CO2 efflux measurements are discussed. In conclusion, periods with low atmospheric turbulence may provide a significant source of error in \( R_s \) rates estimated by the use of closed-chamber techniques and erroneous data must be filtered out to obtain unbiased diurnal patterns, accurate relationships to biotic and abiotic factors, and before estimating \( R_s \) fluxes over longer timescales.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Atmospheric Environment
Authors: Brændholt, A. (Intern), Larsen, K. S. (Intern), Ibrom, A. (Intern), Pilegaard, K. (Intern)
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- BFI (2017): BFI-level 1
- Scopus rating (2017): SNIP 1.235 SJR 2.072 CiteScore 3.96
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 1
- Scopus rating (2016): CiteScore 4.25 SJR 2.397 SNIP 1.315
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 1
- Scopus rating (2015): SJR 2.444 SNIP 1.326 CiteScore 4.04
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 2.237 SNIP 1.373 CiteScore 4.03
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 2.451 SNIP 1.422 CiteScore 4.21
- ISI indexed (2013): ISI indexed yes
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- BFI (2012): BFI-level 1
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- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 2.542 SNIP 1.164 CiteScore 3.86
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 2.373 SNIP 1.083
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 1.979 SNIP 1.211
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 1
- Scopus rating (2008): SJR 1.874 SNIP 1.202
Ozonation of recirculating aquaculture system based on system’s demand

General information
State: Published
Authors: Spiliotopoulou, A. (Intern), Rojas-Tirado, P. A. (Intern), Kaarsholm, K. M. S. (Intern), Martin, R. (Ekstern), Pedersen, L. (Intern), Andersen, H. R. (Intern)
Number of pages: 2
Publication date: 2017
Main Research Area: Technical/natural sciences

Particle-enhanced transportation of metal and PAH pollution reduces stormwater treatment efficiency based on settling and filtration

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Universite Claude Bernard Lyon 1, Linnaeus University
Authors: Nielsen, K. (Intern), Sebastian, C. (Ekstern), Eriksson, E. (Ekstern), Mikkelsen, P. S. (Intern)
Number of pages: 4
Publication date: 2017
Event: Abstract from 14th IWA/IAHR International Conference on Urban Drainage 2017, Prague, Czech Republic.
Main Research Area: Technical/natural sciences

Partitioning of hydrophobic organic contaminants between polymer and lipids for two silicones and low density polyethylene

Polymers are increasingly used for passive sampling of neutral hydrophobic organic substances (HOC) in environmental media including water, air, soil, sediment and even biological tissue. The equilibrium concentration of HOC in the polymer can be measured and then converted into equilibrium concentrations in other (defined) media, which however requires appropriate polymer to media partition coefficients. We determined thus polymer-lipid partition coefficients (KPL) of various PCB, PAH and organochlorine pesticides by equilibration of two silicones and low density polyethylene (LDPE) with fish oil and Triolein at 4 °C and 20 °C. We observed (i) that KPL was largely independent of lipid type and temperature, (ii) that lipid diffusion rates in the polymers were higher compared to predictions based on their molecular volume, (iii) that silicones showed higher lipid diffusion and lower lipid sorption compared to LDPE and (iv) that absorbed lipid behaved like a co-solute and did not affect the partitioning of HOC at least for the smaller molecular size HOC. The obtained KPL can convert measured equilibrium concentrations in passive sampling polymers into equilibrium concentrations in lipid, which then can be used (1) for environmental quality monitoring and assessment, (2) for thermodynamic exposure assessment and (3) for assessing the linkage between passive sampling and the traditionally measured lipid-normalized
concentrations in biota. LDPE-lipid partition coefficients may also be of use for a thermodynamically sound risk assessment of HOC contained in microplastics.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Masaryk University, TNO, Netherlands
Authors: Smedes, F. (Ekstern), Rusina, T. P. (Ekstern), Beeltje, H. (Ekstern), Mayer, P. (Intern)
Number of pages: 10
Pages: 948-957
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Chemosphere
Volume: 186
ISSN (Print): 0045-6535
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.435 SNIP 1.448 CiteScore 4.62
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.39 SJR 1.447 SNIP 1.625
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.497 SNIP 1.567 CiteScore 4.04
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.59 SNIP 1.639 CiteScore 3.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.721 SNIP 1.751 CiteScore 3.92
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.794 SNIP 1.618 CiteScore 3.5
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.962 SNIP 1.508 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.879 SNIP 1.424
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.842 SNIP 1.572
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.658 SNIP 1.58
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.5 SNIP 1.605
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.418 SNIP 1.673
Web of Science (2006): Indexed yes
Passive sampling, Partition coefficient, Lipid, Diffusion coefficient, Microplastic

DOIs: 10.1016/j.chemosphere.2017.08.044

Source: FindIt
Source-ID: 2372987805
Publication: Research - peer-review › Journal article – Annual report year: 2017

Passive dosing of triclosan in multi-generation tests with copepods - Stable exposure concentrations and effects at the low µg L⁻¹ range

Ecotoxicity testing is a crucial component of chemical risk assessment. Still, due to methodological difficulties related to controlling exposure concentrations over time, data on long-term effects of organic chemicals at low concentrations are limited. The aim of the present study was therefore to test the applicability of passive dosing to maintain stable concentrations of the organochlorine bacteriocide triclosan in the water phase during a 6-week multi-generation population development test with the harpacticoid copepod Nitocra spinipes. Triclosan was loaded into silicone (1000 mg), which was used as passive dosing phase in the exposure vials. The distribution ratio for triclosan between silicone and water (D_{silicone-water}) was 10466 ± 1927. A population development test was conducted at three concentration levels of triclosan that were measured to be 3-5 µg L⁻¹, 7-11 µg L⁻¹ and 16-26 µg L⁻¹. Our results demonstrate that passive dosing is applicable for long-term ecotoxicity testing of organic chemicals, including during significant growth of the test organism population. Shifts in the demographic structure of the population during exposure suggest the most severe effects were exerted on juvenile development. Progressively lower development index values in the populations exposed to increasing triclosan concentrations suggest developmental retardation. Our results further stress the need for chronic exposure during ecotoxicity testing in chemical risk assessment as even the most sensitive endpoint was not significant until after 7 days of exposure. This article is protected by copyright. All rights reserved.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Stockholm University
Authors: Ribbenstedt, A. (Ekstern), Mustajärvi, L. (Ekstern), Breitholtz, M. (Ekstern), Gorokhova, E. (Ekstern), Mayer, P. (Intern), Sobek, A. (Ekstern)
Pages: 1254-1260
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication Information
Journal: Environmental Toxicology and Chemistry
Volume: 36
Issue number: 5
ISSN (Print): 0730-7268
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 1.018 SJR 1.178 CiteScore 2.87
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.74 SJR 1.231 SNIP 1.021
Pathways and Controls of N₂O Production in Nitritation-Anammox Biomass

Nitrous oxide (N₂O) is an unwanted byproduct during biological nitrogen removal processes in wastewater. To establish strategies for N₂O mitigation, a better understanding of production mechanisms and their controls is required. A novel stable isotope labeling approach using 15N and 18O was applied to investigate pathways and controls of N₂O production by biomass taken from a full-scale nitritation-anammox reactor. The experiments showed that heterotrophic denitrification was a negligible source of N₂O under oxic conditions (>0.2 mg O₂ L⁻¹). Both hydroxylamine oxidation and nitrifier denitrification contributed substantially to N₂O accumulation across a wide range of conditions with varying concentrations of O₂, NH₄⁺, and NO₂⁻. The O₂ concentration exerted the strongest control on net N₂O production with both production pathways stimulated by low O₂, independent of NO₂⁻ concentrations. The stimulation of N₂O production from hydroxylamine oxidation at low O₂ was unexpected and suggests that more than one enzymatic pathway may be involved in this process. N₂O production by hydroxylamine oxidation was further stimulated by NH₄⁺, whereas nitrifier denitrification at low O₂ levels was stimulated by NO₂⁻ at levels as low as 0.2 mM. Our study shows that 15N and 18O isotope labeling is a useful approach for direct quantification of N₂O production pathways applicable to diverse environments.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, University of Southern Denmark
Authors: Ma, C. (Ekstern), Jensen, M. M. (Intern), Smets, B. F. (Intern), Thamdrup, B. (Ekstern)
Number of pages: 11
Pages: 8981–8991
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Environmental Science and Technology
Volume: 51
Issue number: 16
ISSN (Print): 0013-936X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.535 SNIP 1.941 CiteScore 6.58
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.26 SJR 2.559 SNIP 1.902
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.546 SNIP 1.838 CiteScore 5.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.777 SNIP 2.003 CiteScore 5.5
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.952 SNIP 2.102 CiteScore 5.52
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.115 SNIP 2.043 CiteScore 5.17
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.18 SNIP 1.945 CiteScore 5.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Pellets fra central blødgøring - fra affald til ressource

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, HOFOR A/S
Authors: Tang, C. (Intern), Albrechtsen, H. (Intern), Lopato, L. (Ekstern), Nyberg Kornholt, S. (Ekstern)
Pages: 54-55
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: DanskVand
Issue number: 1
ISSN (Print): 1602-3609
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
DanskVand_2017.pdf
Source: PublicationPreSubmission
Source-ID: 128828780
Publication: Research › Journal article – Annual report year: 2017
Pesticide degradation potential of pesticides in biological rapid sand filters at 10 different waterworks

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Danish Technological Institute, Kemio A/S
Authors: Lee, C. O. (Intern), Musovic, S. (Ekstern), Hedegaard, M. J. (Intern), Tatari, K. (Intern), Laugesen, H. (Ekstern), Albrechtsen, H. (Intern)
Number of pages: 7
Publication date: 2017
Event: Abstract from Water Quality Technology Conference (WQTC) 2017, Portland, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
Lee_et_al__Pesticide_Degradation_RSF_AWWA_WQTC_2017_ext_abstr_logo.pdf
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Plasmid host range (permisiveness) in communities of activated sludge in wastewater treatment plant

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Li, L. (Intern), Dechesne, A. (Intern), Smets, B. F. (Intern)
Pages: 93-94
Publication date: 2017

Host publication information
Title of host publication: The Danish Microbiological Society Annual Congress 2017 - Programme & Abstracts
Place of publication: Copenhagen, Denmark
Publisher: American Society for Microbiology
Article number: P98
Main Research Area: Technical/natural sciences
Conference: Danish Microbiological Society 2017 Congress, Copenhagen, Denmark, 13/11/2017 - 13/11/2017
Electronic versions:
ABSTRACT BOOK
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Plasmid host range (permisiveness) in microbial communities of activated sludge in wastewater treatment plant.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Li, L. (Intern), Dechesne, A. (Intern), Smets, B. F. (Intern)
Number of pages: 1
Publication date: 2017
Event: Abstract from Danish Microbiological Society, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Possibilities for reuse of calcium carbonate pellets from drinking water softening

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, HOFOR A/S
Authors: Tang, C. (Intern), Lopato, L. (Ekstern), Nyberg Kornholt, S. (Ekstern), Albrechtsen, H. (Intern)
Pages: 24-24
Publication date: 2017

Host publication information
Title of host publication: Abstract proceedings - 11th annual meeting danish water forum
Place of publication: Frederiksberg
Publisher: University of Copenhagen
Prediction of required ozone dosage for pilot recirculating aquaculture systems based on laboratory studies

In recirculating aquaculture systems (RAS), the water quality changes continuously. Organic and inorganic compounds accumulate creating toxic conditions for the farmed organisms. Ozone improves water quality diminishing significantly both bacteria load and dissolved organic matter. However, in a non-meticulously designed system, residual ozone might reach the culture tanks causing significant harm to cultured species or excess costs. The aim of the study was to predict the suitable ozone dosage in pilot RAS, for water treatment purposes, based on laboratory studies. The ozone effect on water quality of freshwater RAS and system's ozone demand was investigated. Bench-scale ozonation experiments revealed the ozone demand of the system to be 180 mg O₃/h. Three different ozone dosages were applied to four replicated systems with fixed feed loading (1.56 kg feed/m³ make up water). Results suggested that the optimal ozone dosage was 15g O₃/kg feed. Selected water quality parameters were measured, assessing biofilters performance as well as nitrogen and carbon-based compound concentration change during ozonation. Overall, this study contributed to a better understanding of the challenges of an ozonated RAS leading to the optimal design of such systems.

General information
State: Published
Authors: Spiliotopoulou, A. (Intern), Rojas-Tirado, P. A. (Intern), Kaarsholm, K. M. S. (Intern), Martin, R. (Ekstern), Pedersen, L. (Intern), Andersen, H. R. (Intern)
Number of pages: 4
Publication date: 2017

Host publication information
Title of host publication: Proceedings of 15th International Conference on Environmental Science and Technology
Main Research Area: Technical/natural sciences
Conference: 15th International Conference on Environmental Science and Technology, Rhodes, Greece, 31/08/2017 - 31/08/2017
Ozonation, water quality, Recirculating aquaculture systems, Pilot-scale, Laboratory study

Bibliographical note
Session 14 - Water and wastewater treatment
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Pressure retarded osmosis from hypersaline sources - A review
Salinity gradient power has been identified as a promising new renewable energy technology, but previous attempts to commercialize the technology have failed due to low energy densities and power densities when using seawater as the saline water. One way to overcome these challenges is to use concentrated saline waters, in this context termed hypersaline waters. Hypersaline waters have higher energy densities and very high power densities are possible. Use of desalination brines has already shown promising results in pilot scale, and solutions of higher salinity may offer a potential route for commercialization. The scope of this paper is to review the existing knowledge on the use of hypersaline waters in the salinity gradient process, pressure retarded osmosis. Although only few papers have had the specific aim of investigating hypersaline waters, concentrated solutions have been used in many papers. In this review, the experiences gained from these experiments are collected and used to evaluate both the potential and challenges of using hypersaline waters. In the second part of the review, an overview is made of where hypersaline resources can be found. Finally, we provide an outlook for hypersaline based salinity gradient energy and point to the areas that require further research.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Aalborg University
Authors: Bajraktari, N. (Intern), Hélix-Nielsen, C. (Intern), Madsen, H. T. (Ekstern)
The optimal use of biomass from a global warming mitigation perspective depends upon numerous factors, including competition for land and other constraints. The goal of this study is identifying optimal uses of domestic biomass resources for the case of Denmark, with the objectives of minimizing global warming contribution and fossil energy resource consumption. For this purpose, consequential life cycle assessment of the different options for biomass was performed. Optimal solutions were identified, given specific national environmental targets, using linear programming. Results highlighted that utilizing the energy potential of manure and straw represents the primary opportunity for further global warming mitigation. For this purpose, co-digestion (for manure) and combustion with heat-and-power production (for straw) appear as the most promising technologies. The utilization of biomass (or biogas) for electricity/heat is generally preferred, as long as coal/oil is still used within the energy system. Yet, to fulfill environmental targets for renewable energy in the transport sector, the diversion of a significant share of biogas (and/or other biofuels) from these more beneficial uses is necessary. To completely phase out coal/oil, additional biomass (to current domestic resources) must be included, either through domestic energy crops cultivation or biomass/biofuel import; alternatively, natural gas could be used.
Probabilistic predictions using a groundwater model informed with airborne EM data

Some hydrological model predictions are particularly sensitive to the hydrostratigraphy of numerical groundwater models, which are used extensively in the management of groundwater resources. In this paper we present a method to estimate hydrological prediction uncertainty originating from uncertainty in subsurface structure. Densely sampled airborne electromagnetic (AEM) data, which captures the main geological features, along with borehole lithological information are used as input to the hydrostratigraphic models. Geophysical resistivity models obtained from spatially constrained 1-D inversion of the AEM data are translated into clay-fraction values with a spatially variable translator function. Hydrostratigraphic units are identified by k-means clustering on the 2-D space defined by estimated resistivity values and clay-fraction values. Areas with no data are represented stochastically using sequential indicator simulation (SIS) where the spatial model of each hydrostratigraphic unit is characterized by an indicator variogram. This results in an ensemble of equally likely hydrostratigraphic representations of the subsurface. A hydraulic conductivity value of each hydrostratigraphic unit of each realization is estimated in a groundwater model calibration constrained by observations of hydraulic head and stream base flow. Pumping well catchment areas are calculated for each realization. The result is a probabilistic well catchment area, which is checked for bias with a manually constructed geological model. There is a probability of 85% of the catchment extending beyond the manually constructed geology. The method is applied to the 45 km² large groundwater model of the Kasted site in Denmark. The method presented in the paper has the advantage of being data-driven, making the modeling process entirely reproducible.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Aarhus University, NIRAS A/S
Authors: Marker, P. A. (Intern), Vilhelmsen, T. N. (Ekstern), Foged, N. (Ekstern), Werner, T. (Ekstern), Auken, E. (Ekstern), Bauer-Gottwein, P. (Intern)
Number of pages: 13
Pages: 86-98
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Advances in Water Resources
Volume: 103
ISSN (Print): 0309-1708
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 1.561 SJR 1.551 CiteScore 3.49
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.53 SJR 2.202 SNIP 2.036
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.24 SNIP 2.062 CiteScore 4.31
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.951 SNIP 1.951 CiteScore 3.66
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.432 SNIP 1.748 CiteScore 3.03
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.567 SNIP 1.743 CiteScore 2.81
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.614 SNIP 1.714 CiteScore 2.84
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.712 SNIP 1.466
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.866 SNIP 1.639
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.566 SNIP 1.579
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.503 SNIP 1.497
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.296 SNIP 1.538
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.632 SNIP 1.86
Scopus rating (2004): SJR 1.358 SNIP 1.575
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.314 SNIP 1.536
Scopus rating (2002): SJR 1.117 SNIP 1.421
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.174 SNIP 0.995
Scopus rating (2000): SJR 1.192 SNIP 1.377
Scopus rating (1999): SJR 1.43 SNIP 1.021

Original language: English
Airborne electromagnetics, Hydrogeophysical inversion, Hydrological prediction uncertainty, Hydrostratigraphic uncertainty, Well catchment area
Process performance and comparative metagenomic analysis during co-digestion of manure and lignocellulosic biomass for biogas production

Mechanical pretreatment is considered to be a fast and easily applicable method to prepare the biomass for anaerobic digestion. In the present study, the effect of mechanical pretreatment on lignocellulosic silages biodegradability was elucidated in batch reactors. Moreover, co-digestion of the silages with pig manure in continuously fed biogas reactors was examined. Metagenomic analysis for determining the microbial communities in the pig manure digestion system was performed by analysing unassembled shotgun genomic sequences. A comparative analysis allowed to identify the microbial species firmly attached to the digested grass particles and to distinguish them from the planktonic microbes floating in the liquid medium. It was shown that the methane yield of ensiled grass was significantly increased by 12.3% due to mechanical pretreatment in batch experiments. Similarly, the increment of the methane yield in the co-digestion system reached 6.4%. Regarding the metagenomic study, species similar to Coprothermobacter proteolyticus and to Clostridium thermocellum, known for high proteolytic and cellulolytic activity respectively, were found firmly attached to the solid fraction of digested feedstock. Results from liquid samples revealed clear differences in microbial community composition, mainly dominated by Proteobacteria. The archaeal community was found in higher relative abundance in the liquid fraction of co-digestion experiment compared to the solid fraction. Finally, an unclassified Alkaliphilus sp. was found in high relative abundance in all samples.
Purification and functional characterization of nine human Aquaporins produced in Saccharomyces cerevisiae for the purpose of biophysical characterization

The sparse number of high-resolution human membrane protein structures severely restricts our comprehension of molecular physiology and ability to exploit rational drug design. In the search for a standardized, cheap and easily handled human membrane protein production platform, we thoroughly investigated the capacity of *S. cerevisiae* to deliver high yields of prime quality human AQPs, focusing on poorly characterized members including some previously shown to be difficult to isolate. Exploiting GFP labeled forms we comprehensively optimized production and purification procedures resulting in satisfactory yields of all nine AQP targets. We applied the obtained knowledge to successfully upscale purification of histidine tagged human AQP10 produced in large bioreactors. Glycosylation analysis revealed that AQP7 and 12 were O-glycosylated, AQP10 was N-glycosylated while the other AQPs were not glycosylated. We furthermore performed functional characterization and found that AQP 2, 6 and 8 allowed flux of water whereas AQP3, 7, 9, 10, 11 and 12 also facilitated a glycerol flux. In conclusion, our *S. cerevisiae* platform emerges as a powerful tool for isolation of functional, difficult-to-express human membrane proteins suitable for biophysical characterization.

**General information**

*State:* Published

*Organisations:* Technical University of Denmark, Department of Environmental Engineering, Water Technologies, University of Copenhagen, Aquaporin A/S

*Authors:* Pedersen, P. A. (Ekstern), Gourdon, P. E. (Ekstern), Godfrey, K. (Ekstern), Hansen, K. M. (Ekstern), Hélix-Nielsen, C. (Intern), Bomholt, J. (Ekstern), Spulber, M. (Ekstern), Missel, J. W. (Ekstern), Bühring Bjørkskov, F. (Ekstern), Lyngaa Krabbe, S. (Ekstern), Nurup, C. N. (Ekstern)

*Number of pages:* 21
Quantification of greenhouse gas emissions from a biological waste treatment facility

Whole-site emissions of methane and nitrous oxide, from a combined dry anaerobic digestion and composting facility treating biowaste, were quantified using a tracer dispersion technique that combines a controlled tracer gas release from the treatment facility with time-resolved concentration measurements downwind of the facility. Emission measurements were conducted over a period of three days, and in total, 80 plume traverses were obtained. On-site screening showed that important processes resulting in methane emissions were aerobic composting reactors, anaerobic digester reactors, composting windrows and the site's biofilter. Average whole-site methane emissions measured during the three days were 27.5±7.4, 28.5±6.1 and 30.1±11.4 kg CH₄ h⁻¹, respectively. Turning the windrows resulted in an increase in methane emission from about 26.3-35.9 kg CH₄ h⁻¹. Lower emissions (21.5 kg CH₄ h⁻¹) were measured after work hours ended, in comparison to emissions measured during the facility's opening hours (30.2 kg CH₄ h⁻¹). Nitrous oxide emission was too...
small for a downwind quantification. Direct on-site measurements, however, suggested that the main part of the emitted nitrous oxide came from the biofilter (about 1.4kg N2O h⁻¹). Whole-site emissions were compared to emissions previously measured at different point sources on-site. Whole-site fugitive emissions were three to eight times higher than the sum of emissions measured at on-site sources. The magnitude of the emissions had a significant influence on the overall environmental impact of the treatment facility, assessed by consequential life cycle assessment. Including the higher whole-site fugitive emissions led to an increase in global warming potential, from a saving of 97kgCO2-eq.tonne⁻¹ of treated waste (wet weight) to a loading of 71kg CO2-eq. tonne⁻¹, ultimately flipping the environmental profile of the treatment facility.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Jensen, M. B. (Intern), Møller, J. (Intern), Mønster, J. (Intern), Scheutz, C. (Intern)
Pages: 375-384
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Waste Management
Volume: 67
ISSN (Print): 0956-053X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.456 SNIP 2.059 CiteScore 4.94
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.407 SNIP 2.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.732 SNIP 2.263 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.763 SNIP 2.49 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.815 SNIP 2.413 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.59 SNIP 2.18 CiteScore 2.91
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.694 SNIP 2.071 CiteScore 2.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.553 SNIP 1.821
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.519 SNIP 1.919
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.375 SNIP 2.145
Web of Science (2008): Indexed yes
Quantification of the methane emissions from masons landfill, UK

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, University of Southampton
Authors: Mønster, J. (Intern), Rees-White, T. (Ekstern), Beaven, R. (Ekstern), Scheutz, C. (Intern)
Number of pages: 6
Publication date: 2017

Host publication information
Title of host publication: Proceedings Sardina 2017
Place of publication: S. Margherita di Pula, Cagliari, Italy
Publisher: CISA Publisher
Main Research Area: Technical/natural sciences
Conference: Sardina 2017, 16th International Waste Management and Landfill Symposium, S. Margherita di Pula, Italy, 02/10/2017 - 02/10/2017
Electronic versions:
600.pdf
Source: PublicationPreSubmission
Source-ID: 2370876340
Publication: Research - peer-review › Journal article – Annual report year: 2017

Quantitative assessment of micro- and nanoplastic ingestion and interactions with feeding in Daphnia magna

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Rist, S. (Intern)
Pages: 70-70
Publication date: 2017

Host publication information
Title of host publication: YES 2017 environmental science in a warming world - abstract book
Publisher: SETAC
Main Research Area: Technical/natural sciences
Other: Young Environmental Scientists YES 2017, Stockholm, Sweden, 16/02/2017 - 16/02/2017
Electronic versions:
YES_Abstract_Sinja_Rist.pdf
Rapid biochemical methane potential prediction of urban organic waste with near-infrared reflectance spectroscopy

The anaerobic digestibility of various biomass feedstocks in biogas plants is determined with biochemical methane potential (BMP) assays. However, experimental BMP analysis is time-consuming, costly and challenging to optimise stock management and feeding to achieve improved biogas production. The aim of the present study is to develop a fast and reliable model based on near-infrared reflectance spectroscopy (NIRS) for the BMP prediction of urban organic waste (UOW). The model comprised 87 UOW samples. Additionally, 88 plant biomass samples were included, to develop a combined model predicting BMP. The coefficient of determination (R2) and root mean square error in prediction (RMSEP) of the UOW model were 0.88 and 44 mL CH4/g VS, while the combined model was 0.89 and 50 mL CH4/g VS. Improved model performance was obtained for the two individual models compared to the combined version. The BMP prediction with NIRS was satisfactory and moderately successful.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Southern Denmark
Authors: Fitamo, T. M. (Intern), Triolo, J. M. (Ekstern), Boldrin, A. (Intern), Scheutz, C. (Intern)
Pages: 242-251
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Water Research
Volume: 119
Issue number: 242-251
ISSN (Print): 0043-1354
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.601 SNIP 2.358 CiteScore 7.55
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.663 SNIP 2.563
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.592 SNIP 2.192
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
React now regarding nanomaterial regulation
The time has come to implement a regulatory framework tailored to manufactured materials. I propose a new legislative framework that combines registration, evaluation, authorization and categorization of nanomaterials.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Hansen, S. F. (Intern)
Number of pages: 3
Pages: 714-716
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Nature Nanotechnology
Volume: 12
Issue number: 8
ISSN (Print): 1748-3387
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 20.612 SNIP 8.171 CiteScore 25.47
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 21.85 SJR 18.916 SNIP 7.649
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Readiness of control banding tools for safe innovation and regulatory occupational exposure assessment of nanomaterials

General information
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Organisations: Department of Environmental Engineering, Environmental Chemistry, Steinbeis Advanced Risk Technologies GmbH, GAIKER Technology Center, ECSIN-ECAMRICERT, National Research Center for Working Environment
Pages: 142-142
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Place of publication: Elsinore, Denmark
Publisher: National research centre for the working environment
Main Research Area: Technical/natural sciences
Conference: 8th international symposium on nanotechnology, occupational and environmental health, Elsinore, Denmark, 29/05/2017 - 29/05/2017
Electronic versions:
Nanotech_symp_P64.pdf
Publication: Research - peer-review » Conference abstract in proceedings – Annual report year: 2017
Recirculation of biomass ashes onto forest soils: Ash composition, mineralogy and leaching properties

In Denmark, increasing amounts of wood ashes are generated from biomass combustion for energy production. The utilisation of ashes on top of forest soil for liming purposes has been proposed as an alternative to landfilling. Danish wood ash samples were collected and characterised with respect to chemical composition, mineralogy and leaching properties (batch leaching at L/S 2 and 10L/kg, and pH-dependent leaching at 10L/kg). Large variations in the ash liming properties were observed (ANC7.5: 1.8-6.4meqH+/g), indicating that similar soil application dosages may result in different liming effects. High contents of Ca, Si, P, K and Mg were observed in all samples, while the highest contents of S and N were found in fly ashes and mixed ashes (combination of fly and bottom ashes). Similarly, the highest contents of some trace metals, e.g. Cd, Mo and Se, were observed for fly ash. Releases of major, minor and trace elements were affected significantly by pH: high releases of PO4 3-., Mg, Zn, Cu and Cd were found for acidic conditions relevant to forest soils, while the highest releases of Mo and Cr were observed in alkaline conditions. Mineral phases were selected based on XRD analyses and the existing literature, and they were applied as inputs for the geochemical modelling of pH-dependent leaching. Mineral dissolution was found adequate for a wide range of major elements and nutrients, while the description of trace elements could be done only for parts of the pH-range. Content and leaching of PAHs were observed below detection limits. The source-term release of Ca, K, Mg, Mn, and P in acidic conditions relevant to forest soils was higher than ten years of atmospheric deposition, in contrast to the relatively low release of Al, Fe and Na. The potential release of Cd was found to be the most critical element compared with soil quality criteria, whereas the maximum theoretical loads of Ba, Cd, Cr, Sr, Mo, Ni, Pb, Sb, Se, Sn and V were relatively low.

General information
State: Published
Authors: Maresca, A. (Intern), Hyks, J. (Ekstern), Astrup, T. F. (Intern)
Pages: 127-138
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Waste Management
Volume: 70
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Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.456 SNIP 2.059 CiteScore 4.94
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.407 SNIP 2.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.732 SNIP 2.263 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.763 SNIP 2.49 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.815 SNIP 2.413 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.59 SNIP 2.18 CiteScore 2.91
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.694 SNIP 2.071 CiteScore 2.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Recycling of plastic waste: Screening for brominated flame retardants (BFRs)

Flame retardants are chemicals vital for reducing risks of fire and preventing human casualties and property losses. Due to the abundance, low cost and high performance of bromine, brominated flame retardants (BFRs) have had a significant share of the market for years. Physical stability on the other hand, has resulted in dispersion and accumulation of selected BFRs in the environment and receiving biota. A wide range of plastic products may contain BFRs. This affects the quality of waste plastics as secondary resource: material recycling may potentially reintroduce the BFRs into new plastic product cycles and lead to increased exposure levels, e.g. through use of plastic packaging materials. To provide quantitative and qualitative data on presence of BFRs in plastics, we analysed bromophenols (tetrabromobisphenol A (TBBPA), dibromophenols (2,4- and 2,6-DBP) and 2,4,6-tribromophenol (2,4,6-TBP)), hexabromocyclododecane stereoisomers (α-, β-, and γ-HBCD), as well as selected polybrominated diphenyl ethers (PBDEs) in samples of household waste plastics, virgin and recycled plastics. A considerable number of samples contained BFRs, with highest concentrations associated with acrylonitrile butadiene styrene (ABS, up to 26,000,000 ng TBBPA/g) and polystyrene (PS, up to 330,000 ng ΣHBCD/g). Abundance in low concentrations of some BFRs in plastic samples suggested either unintended addition in plastic products or degradation of higher molecular weight BFRs. The presence of currently restricted flame retardants (PBDEs and HBCD) identified in the plastic samples illustrates that circular material flows may be contaminated for extended periods. The screening clearly showed a need for improved documentation and monitoring of the presence of BFRs in plastic waste routed to recycling.

General information

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, National Food Institute, Research Group for Analytical Food Chemistry, Environmental Chemistry
Authors: Pivnenko, K. (Intern), Granby, K. (Intern), Eriksson, E. (Intern), Astrup, T. F. (Intern)
Number of pages: 9
Pages: 101-109
Publication date: 2017
Regional frequency analysis of short duration rainfall extremes using gridded daily rainfall data as co-variate

A regional partial duration series (PDS) model is applied for estimation of intensity duration frequency relationships of extreme rainfalls in Denmark. The model uses generalised least squares regression to relate the PDS parameters to gridded rainfall statistics from a dense network of rain gauges with daily measurements. The Poisson rate is positively correlated to the mean annual precipitation for all durations considered (1 min to 48 hours). The mean intensity can be assumed constant over Denmark for durations up to 1 hour. For durations larger than 1 hour the mean intensity is significantly correlated to the mean extreme daily precipitation. A Generalised Pareto distribution with a regional constant shape parameter is adopted. Compared to previous regional studies in Denmark a general increase in extreme rainfall intensity for durations up to 1 hour is found, whereas for larger durations both increases and decreases are seen. A subsample analysis is conducted to evaluate the impacts of non-stationarities in the rainfall data. The regional model includes the nonstationarities as an additional source of uncertainty together with sampling uncertainty and uncertainty caused by spatial variability.
Nanoecotoxicology as a discipline has matured significantly over the last years, from the first paper in 2004 to close to a thousand studies published today. We are therefore no longer facing a scarcity of data as severe as only a few years ago. From a regulatory standpoint, it is timely to question whether ecotoxicity testing is now able to facilitate regulatory decision-making on manufactured nanomaterials (MNs). In this paper, we review the state of aquatic ecotoxicity testing of MNs as well as the overarching issues that challenge the reliability and relevance of such testing. We conclude that within the field there is an increased focus on characterization of the exposure rather than controlling exposure as it is traditionally done in guideline testing of chemicals. However, the lack of characterization options under actual testing conditions makes it difficult to make meaningful comparisons between studies, which question the regulatory reliability of the data currently available. Accordingly, lack of data suited for regulatory decision-making is still a pressing issue in nanoecotoxicology even though the data availability has increased. Nevertheless, we emphasize that by deliberately directing test method developments towards increased regulatory reliability and acknowledging the implicit limitations in the dual purpose of guideline testing for chemical risk assessment (i.e. for hazard identification and for hazard assessment) it is possible to generate data sufficient for regulatory needs.
Regulatory adequacy of ecotoxicity data for risk assessment of nanomaterials - the NanoCRED framework

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Stockholm University
Authors: Hartmann, N. B. (Intern), Ågerstrand, M. (Ekstern), Lützhøft, H. H. (Intern), Baun, A. (Intern)
Pages: 143-143
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Conference: 8th international symposium on nanotechnology, occupational and environmental health, Elsinore, Denmark, 29/05/2017 - 29/05/2017
Electronic versions: Nanotech_symp_P65.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Regulatory relevant and reliable methods and data for determining the environmental fate of manufactured nanomaterials

The widespread use of manufactured nanomaterials (MN) increases the need for describing and predicting their environmental fate and behaviour. A number of recent reviews have addressed the scientific challenges in disclosing the governing processes for the environmental fate and behaviour of MNs, however there has been less focus on the regulatory adequacy of the data available for MN. The aim of this paper is therefore to review data, testing protocols and guidance papers which describe the environmental fate and behaviour of MN with a focus on their regulatory reliability and relevance. Given the often identified need for modification of OECD testing guidelines, the use of these cannot per se be assigned high regulatory adequacy. Though the specific test considerations will differ between conventional chemicals and MN, the ultimate endpoints of interest are similar. The water compartment must be considered as one of the main points of entry, facilitating dispersion of MN in the environment and establishing a link to the other environmental compartments such as soil, sediment, air, and biota. Once released to water various processes like dissolution, agglomeration, heteroagglomeration, sedimentation, interaction with natural organic matter, transformation and uptake by biota are processes of high relevance for the fate of MN in water. In the review it is found that the OECD draft test guidelines for dissolution and agglomeration will greatly assist in the generation of regulatory relevant and reliable data. Gaps do however exist in test methods for environmental fate, such as methods to estimate heteroagglomeration and the tendency for MNs to transform in the environment.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, nanoRisk Analytics, Aix-Marseille University
Authors: Baun, A. (Intern), Sayre, P. (Ekstern), Steinhäuser, K. G. (Ekstern), Rose, J. (Ekstern)
Pages: 1-10
Publication date: 2017
Main Research Area: Technical/natural sciences
Removal efficiency and economic cost comparison of hydrated electron-mediated reductive pathways for treatment of bromate

Bromate, a potential carcinogen, is a well known highly persistent and environmentally recalcitrant contaminant. UV-254/sulfite-based advanced reductive pathways (ARPs) were proposed to eliminate bromate successfully from water. Experiments with N₂, N₂O, 2-chlorophenol, inorganic ions, and different pH (highly acidic to highly basic) proved that UV-254/sulfite successfully provides aqueous electron that effectively participate in bromate removal from water. Significant removal, 86%, of initially 39.0 µM bromate was achieved by UV-254/sulfite under conditions that dominate aqueous electron based pathways. The high second-order rate constant of 5.3×10⁹ M⁻¹s⁻¹ determined proved high reactivity of aqueous electron with bromate. The kinetic and removal efficiency of bromate showed linear relationship with the rate of aqueous electron formation. An increase in kinetic and removal efficiency of bromate was observed with increasing initial sulfite concentration and decreasing bromate concentration. The impacts of different initial concentrations of the typical ions commonly found in water were studied in detail to extend the UV-254/sulfite-based process for potential practical applications. The lower molar absorptivity of bromate at 254nm determined proved insignificant removal of bromate under direct photolysis. The impacts of initial sulfite concentration on removal of bromate in UV-254/sulfite-based process also minimized role of direct photolysis. The cost evaluation and rapid decomposition of bromate into bromide proved UV-254/sulfite-based ARPs to be economical and highly rewarding in efficient decomposition of bromate and other inorganic oxyhalides.
Numerous pollutants such as pharmaceuticals and personal care products are continuously released into municipal wastewater treatment plants (WWTP). Present at concentration of nano- to milligram per liter, they are defined as micropollutants. Micropollutants are only partially removed, possibly due to design and operational limitation of conventional WWTP. Eventually, micropollutant parent compounds and transformation products are discharged into receiving water bodies, possibly causing acute and chronic toxic effects on aquatic organisms even at very low concentrations. Therefore, research currently focuses on the enhancement of conventional WWTPs via physical-chemical and biological treatment processes. Biofilm-based treatment processes, such as the Moving Bed Biofilm Reactor (MBBR), were shown to harbour bio-catalytic potential that can enhance the biotransformation of a number of micropollutants compared to conventional activated sludge. In MBBRs, biofilm grow on plastic carriers kept in suspension in the reactor basin via mechanical mixing or aeration, offering a suit of benefits, amongst all comparably small footprint. Despite few existing evidences in aerobic MBBR, an in-depth understanding of the fate of micropollutants in such systems under different operational conditions is still required. In this context, this PhD thesis investigated different optimization strategies using MBBRs towards the removal of 23 commonly detected micropollutants (i.e., pharmaceuticals) in municipal wastewater. Specifically, I studied the impact of (i) biofilm thickness on the diffusion, sorption and biotransformation of the selected pharmaceuticals in nitrifying MBBR; and (ii) of organic carbon quality and availability on micropollutant biotransformation in anoxic pre- and post-denitrifying MBBRs. In both case, the influence of (i) and (ii) on the microbial activity (nitrification and denitrification) and microbial community composition and diversity were investigated. The existence of possible relationships between microbial diversity (analyzed via 16S rRNA amplicon sequencing) and biotransformation of micropollutants was evaluated to investigate which microbial processes and factors underlay the removal of micropollutants. The PhD objectives were evaluated in long- and short-term experiments in three laboratory-scale MBBR systems for pre-denitrification (MBBR1), nitrification (MBBR2) and post-denitrification (MBBR3). Biokinetics of nitrification, denitrification and micropollutant biotransformation rate constants (kBio, L g-1 d-1) were estimated through batch experiments using Activated Sludge Models (ASMs) and ASM for Xenobiotics (ASM-X), respectively. In the pre-denitrifying MBBR1 study, denitrification, biotransformation of micropollutants and microbial community were evaluated in three-stage (S) and single-stage (U) MBBR configurations. The three-stage configuration produced a prolonged exposure of the biofilm to a gradient of organic carbon loading and complexity, leading to a significant differentiation of denitrification and biotransformation kinetics in the three MBBR sub-reactors. The highest and lowest biotransformation kinetics were found in the first and the last stage, respectively (up to 4-fold decrease for selected compounds), suggesting a possible correlation of micropollutant biotransformation with denitrification rates. The long term-operation with carbon availability and complexity gradient led to higher (p<0.05) biodiversity in the three-stage system, with a more diverse and even microbial community in the last stage. Specific taxa such as Candidate division WS6 and Deinococcales were selected in...
S. possibly due to oligotrophic conditions occurring in the last reactor stage. The influence of biofilm thickness was studied in nitrifying MBBR2 using newly developed Z-carriers that allow the control of defined biofilm thickness. The use of thinner biofilms (~50 µm), rather than thicker biofilms (>200 µm), had a positive effect on nitrification rates and on the biotransformation kinetics of a number of compound such as diclofenac (kBio up to 6 L g-1 d-1) and the three sulfonamide antibiotics. However, the biotransformation of more than 60% of targeted compounds was enhanced in thicker biofilms, that exhibited higher (p<0.05) microbial diversity and were more even. Additionally, a biofilm model was developed and calibrated to evaluate sorption and diffusion of micropollutants in nitrifying biofilms. Sorption was significant only for eight out of the targeted compounds. All compounds removed by sorption were predicted to carry a net positive charge at the experimental pH, suggesting the importance of electrostatic interactions on sorption in biofilms. Sorption coefficients Kd (L g-1) and effective diffusivity coefficients f increased with increasing biofilm thickness, suggesting reduced diffusion limitation and higher surface area accessibility in the thickest, least dense biofilm (~500 µm). Two types of commonly dosed degradable carbon sources (methanol and ethanol) were investigated in two parallel post-denitrifying systems (MBBR3). The methanol-dosed MBBR exhibited in the enhancement of kBio (up to 2.5-fold) for a number of micropollutants (nine out 23) compared to the ethanol-dosed MBBR, while for 10 compounds biokinetics were similar between the two reactors. The higher denitrification rates exhibited by the ethanol-dosed MBBR during batch experiments likely influenced the biotransformation of the sulfonamides antibiotics, in analogy with what observed in MBBR2. A strong cometabolic effect (i.e., an enhancement of micropollutant biotransformation in the presence of organic carbon) was observed for venlafaxine, carbamazepine, sulfamethoxazole and sulfamethizole. However, an increase in methanol or ethanol loading to the MBBRs during continuous-flow experiment did not influence the removal of the targeted micropollutants, most likely due to the short hydraulic residence time (2 hours) used in the study as well as in full-scale reactors. Diversity-function relationships (assessed through Pearson correlation analyses) were tested by comparing diversity estimators against biomass-normalized biotransformation rates. A positive influence of biodiversity for most of the targeted compounds (~60%) was shown in MBBR2 study, while biotransformation of few compounds (diclofenac and sulfonamides) was positively associated to microbial activity (i.e., nitrification). Similarly, a positive association (p<0.05) with the specific denitrification rate was shown in MBBR1, while biotransformation of most of the detected pharmaceuticals in wastewater did not associate or negatively associated with biodiversity. The relationship between biodiversity and micropollutant biotransformation may depend on whether its biotransformation is catalysed by a narrow (i.e., performed by few species) or broad processes. It is likely that for highly redundant microbial processes (such as denitrification), micropollutant biotransformation may be catalysed by broadly distributed enzymes and pathways, and microbial diversity provides no benefit. Conversely, increasing biodiversity under nitrifying conditions may be necessary to increase the inclusion of microorganisms with specific functionality towards micropollutant biotransformation. Overall, the biotransformation rates were significantly enhanced in MBBR3 compared to MBBR1 and MBBR2 for the majority of micropollutants (~60%) suggesting the positive impact of easily degradable carbon sources (such as methanol or ethanol) on micropollutant removal. Finally, the removal of compounds such propranolol atenolol, citalopram, venlafaxine (under post-denitrifying conditions) and diclofenac (under aerobic conditions) was improved compared to conventional activated sludge. It can be thus concluded that MBBRs can offer a suitable technology that can be optimized for the removal of micropollutants in municipal wastewaters under a range of operating conditions (nitrifying, pre- and post-denitrifying).

**General information**

State: Published
Organisations: Department of Environmental Engineering, Water Technologies, AnoxKaldnes AB
Authors: Torresi, E. (Intern), Plósz, B. G. (Intern), Christensson, M. (Ekstern), Smets, B. F. (Intern)
Number of pages: 80
Publication date: 2017

**Publication information**

Place of publication: Kgs. Lyngby
Publisher: Department of Environmental Engineering, Technical University of Denmark (DTU)
Original language: English
Main Research Area: Technical/natural sciences
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**Relations**

Projects:
Removal of micropollutants in Moving Bed Biofilm reactors (MBBRs)
Publication: Research › Ph.D. thesis – Annual report year: 2017

**Removal of pharmaceuticals in conventionally treated wastewater by a polishing Moving Bed Biofilm Reactor (MBBR) with intermittent feeding**

Previous studies have demonstrated that aerobic moving bed biofilm reactors (MBBRs) remove pharmaceuticals better than activated sludge. Thus we used a MBBR system to polish the effluent of an activated sludge wastewater treatment plant. To overcome that effluent contain insufficient organic matter to sustain enough biomass, the biofilm was intermittently fed with raw wastewater.

The capacity of pharmaceutical degradation was investigated by spiking pharmaceuticals. Actual removal during treatment was assessed by sampling the inlets and outlets of reactors. The removal of the majority of pharmaceuticals was
enhanced through the intermittent feeding of the MBBR. First-order rate constants for pharmaceutical removal, normalised to biomass, were significantly higher compared to other studies on activated sludge and suspended biofilms, especially for diclofenac, metoprolol and atenolol. Due to the intermittently feeding, degradation of diclofenac occurred with a half-life of only 2.1 hours and was thus much faster than any hitherto described wastewater bioreactor treatment.
Removal of pharmaceuticals in Moving Bed Biofilm Reactors – The impact of design and operating conditions

**General information**
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Organisations: Department of Environmental Engineering, Water Technologies, Environmental Chemistry, AnoxKaldnes AB
Authors: Torresi, E. (Intern), Polesel, F. (Intern), Smets, B. F. (Intern), Andersen, H. R. (Intern), Christensson, M. (Ekstern), Plósz, B. G. (Intern)
Number of pages: 4
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Removal of pharmaceuticals in pre-denitrifying MBBR – Influence of organic substrate availability in single- and three-stage configurations

Due to the limited efficiency of conventional biological treatment, innovative solutions are being explored to improve the removal of trace organic chemicals in wastewater. Controlling biomass exposure to growth substrate represents an appealing option for process optimization, as substrate availability likely impacts microbial activity, hence organic trace chemical removal. This study investigated the elimination of pharmaceuticals in pre-denitrifying moving bed biofilm reactors (MBBRs), where biofilm exposure to different organic substrate loading and composition was controlled by reactor staging. A three-stage MBBR and a single-stage reference MBBR (with the same operating volume and filling ratio) were operated under continuous-flow conditions (18 months). Two sets of batch experiments (day 100 and 471) were performed to quantify and compare pharmaceutical removal and denitrification kinetics in the different MBBRs. Experimental results revealed the possible influence of retransformation (e.g., from conjugated metabolites) and enantioselectivity on the removal of selected pharmaceuticals. In the second set of experiments, specific trends in denitrification and biotransformation kinetics were observed, with highest and lowest rates/rate constants in the first (S1) and the last (S3) staged sub-reactors, respectively. These observations were confirmed by removal efficiency data obtained during continuous-flow operation, with limited removal (<10%) of recalcitrant pharmaceuticals and highest removal in S1 within the three-stage MBBR. Notably, biotransformation rate constants obtained for non-recalcitrant pharmaceuticals correlated with mean specific denitrification rates, maximum specific growth rates and observed growth yield values. Overall, these findings suggest that: (i) the long-term exposure to tiered substrate accessibility in the three-stage configuration shaped the denitrification and biotransformation capacity of biofilms, with significant reduction under substrate limitation; (ii) biotransformation of pharmaceuticals may have occurred as a result of cometabolism by
heterotrophic denitrifying bacteria.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Water Technologies, Technical University of Denmark, Aarhus University, AnoxKaldnes AB
Authors: Polesel, F. (Intern), Torresi, E. (Intern), Loreggian, L. (Ekstern), Escola Casas, M. (Ekstern), Christensson, M. (Ekstern), Bester, K. (Ekstern), Plósz, B. G. (Intern)
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Web of Science (2017): Indexed yes
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Web of Science (2016): Indexed yes
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Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
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BFI (2013): BFI-level 2
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ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
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Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.073 SNIP 2.178
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.94 SNIP 2.184
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.902 SNIP 2.233
Web of Science (2006): Indexed yes
Revising REACH guidance on information requirements and chemical safety assessment for engineered nanomaterials for aquatic ecotoxicity endpoints: recommendations from the EnvNano project

The European Chemical Agency (ECHA) is in the process of revising its guidance documents on how to address the challenges of ecotoxicological testing of nanomaterials. In these revisions, outset is taken in the hypothesis that ecotoxicological test methods, developed for soluble chemicals, can be made applicable to nanomaterials. European Research Council project EnvNano—Environmental Effects and Risk Evaluation of Engineered, which ran from 2011 to 2016, took another outset by assuming that: “The behaviour of nanoparticles in suspension is fundamentally different from that of chemicals in solution”. The aim of this paper is to present the findings of the EnvNano project and through these provide the scientific background for specific recommendations on how ECHA guidance could be further improved. Key EnvNano findings such as the need to characterize dispersion and dissolution rates in stock and test media have partially been addressed in the updated guidance. However, it has to be made clear that multiple characterization methods have to be applied to describe state of dispersion and dissolution over time and for various test concentration. More detailed information is called for on the specific characterization methods and techniques available and their pros and cons. Based on findings in EnvNano, we recommend that existing algal tests are supplemented with tests where suspensions of nanomaterials are aged for 1–3 days for nanomaterials that dissolve in testing media. Likewise, for daphnia tests we suggest to supplement with tests where (a) exposure is shortened to a 3 h pulse exposure in daphnia toxicity tests with environmentally hazardous metal and metal oxide nanomaterials prone to dissolution; and (b) food abundance is three to five times higher than normal, respectively. We further suggest that the importance of considering the impact of shading in algal tests is made more detailed in the guidance and that it is specified that determination of uptake, depuration and trophic transfer of nanomaterials for each commercialized functionalization of the nanomaterials is required. Finally, as an outcome of the project a method for assessing the regulatory adequacy of ecotoxicological studies of nanomaterials is proposed.
Revisiting conceptual stormwater quality models by reconstructing virtual state-variables

General information
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Source-ID: 137542234
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Risk assessing heavy metals in the groundwater-surface water interface at a contaminated site

Increasing anthropogenic pressure on water resources is causing serious problems, especially in industrialised countries such as Denmark. The Water Framework Directive sets criteria and new objectives to reach good water quality status through integrated assessments on different compartments such as surface water and groundwater (EC, 2017). The
current study quantified and assessed the contamination of As, Cd, Cr, Cu, Ni, Pb and Zn in the shallow aquifer, hyporheic zone, stream water and streambed sediments at Rådavad site, a former metal manufacturing industrial area located in Denmark, investigating sources, pathways and final targets of contamination. Previous studies showed the presence of contact zones in the northern part of the area between the unconfined aquifer and the stream passing through the site, besides revealing a heterogeneous contamination (CAH, BTEX in the water and heavy metals in the soil). Stream water was sampled in 12 points, while groundwater was sampled in 4 wells close to the stream where the interaction was suspected. Sediments and hyporheic zone were sampled in pair, where upward hydraulic heads have been detected. A drain discharging in the river was also sampled. Sediments were divided in different layers and both heavy metal total concentration and chemical partitioning were analysed. Redox species and dissolved organic matter were also analysed in the water samples, while fraction of organic carbon was investigated in the extracted sediments. Results showed a high degree of heavy metal contamination in all the investigated resources. Groundwater was found under reduced conditions and polluted by Pb, Ni and Zn, exceeding the quality criteria by a factor of 2.7, 4.2 and 9 respectively. No clear correlation between groundwater and hyporheic zone was detected. Consequently, it was not possible to deduce where the polluted groundwater was flowing. Once entered in the contaminated site, the stream was also found polluted by Zn and Cu, confirming the anthropogenic role to the environmental pollution of the area. Sediments’ total concentration analysis revealed high pollution of all the investigated heavy metals especially in the top sediments (0-10 cm), suggesting run-off contribution. However, the high concentrations cannot be explained just from the soil contamination found in the previous studies. Thus, past disposal of metal or construction/demolition waste could be another source of contamination. Chemical fractionation showed that Zn and Cd were the most easily available heavy metals, since a high portion of them was bound to acid soluble/exchangeable fraction, which can explain the high stream water Zn concentrations. Cr, Ni and As were mostly bounded to the residual fraction, while Cu and Pb were mainly associated with the oxidizable and reducible fractions respectively. Finally, the classification of the compartments ordered according to the risk they pose was defined as: 1) soil contamination, evaluated as the major concern at Rådavad site since the risk of exposure to heavy metals is very high in the northern and southern part of the area, where a Naturskole and residential houses have been built to reclaim the area; 2) sediment contamination, due to Zn and Cd high portion in the acid soluble/exchangeable fraction that pose high ecological risk; 3) stream water contamination, as Zn and Cu were exceeding the maximum allowable concentration in many investigated points; 4) shallow aquifer contamination, evaluated as the least risky since the detected upward flow from the deeper aquifer to the shallow contaminated aquifer would probably avoid downward migration of the leachate to the deeper aquifer, which is used for drinking water purposes. The current method used to evaluate the contamination and assess the risk, highlighted the importance of studying contaminated sites at a broader scale. Integrated approaches could help determining the fate and distribution of pollutants, building classification risks to prioritize and optimize the management of contaminated sites.

Risk Perception of Plastic Pollution: Importance of Stakeholder Involvement and Citizen Science
Risk perception has a significant impact on how society reacts to a given risk. There have been cases where a mismatch between the actual risk and the perception of it has led to poor decisions on societal initiatives, such as inappropriate regulatory measures. It is therefore important that the perception of risk is based on an informed foundation acknowledging the biases and drivers that inevitably go with risk perception. Plastic pollution differs in regard to other classical risks, such as those posed by chemicals or genetically modified organisms (GMOs), since the pollution is more visible and already has a significant magnitude. At the same time, everyone is familiar with using plastic, and our daily lives are highly dependent on the use of plastic. This offers some potential to strengthen the societal risk perception and subsequently implement effective measures to address the pollution.

In this chapter, we define eight risk perception drivers (voluntariness, control, knowledge, timing, severity, benefit, novelty, and tangibility) and relate these drivers to plastic pollution. We discuss the process in which plastic pollution has been recognized as an important environmental problem by scientists, the public, and policy makers and elaborate on how the eight risk drivers have influenced this process. Plastic pollution has several of the characteristics that can enhance people’s perception of the risk as being important and which has generated great awareness of the problem. The chapter finally discusses how risk perception can be improved by greater stakeholder involvement and utilization of citizen science and thereby improve the foundation for timely and efficient societal measures.
SAHM - Simplification of one-dimensional hydraulic networks by automated processes evaluated on 1D/2D deterministic flood models

We present an algorithm for automated simplification of 1D pipe network models. The impact of the simplifications on the flooding simulated by coupled 1D-2D models is evaluated in an Australian case study. Significant reductions of the simulation time of the coupled model are achieved by reducing the 1D network model. The simplifications lead to an underestimation of flooded area because interaction points between network and surface are removed and because water is transported downstream faster. These effects can be mitigated by maintaining nodes in flood-prone areas in the simplification and by adjusting pipe roughness to increase transport times.

General information
State: Published
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Salinity-gradient energy driven microbial electrosynthesis of hydrogen peroxide

Hydrogen peroxide (H₂O₂) as a strong oxidant, is widely used in various chemical industries and environmental remediation processes. In this study, we developed an innovative method for cost-effective production of H₂O₂ by using a microbial reverse-electrodialysis electrolysis cell (MREC). In the MREC, electrical potential generated by the exoelectrogens and the salinity-gradient between salt and fresh water were utilized to drive the high-rate H₂O₂ production. Operational parameters such as air flow rate, pH, cathodic potential, flow rate of salt and fresh water were investigated. The optimal H₂O₂ production was observed at salt and fresh water flow rate of 0.5 mL min⁻¹, air flow rate of 12–20 mL min⁻¹, cathode potential of −0.485 ± 0.025 V (vs Ag/AgCl). The maximum H₂O₂ accumulated concentration of 778 ± 11 mg L⁻¹ was obtained at corresponding production rate of 11.5 ± 0.5 mg L⁻¹ h⁻¹. The overall energy input for the synthesis process was 0.45 ± 0.03 kWh kg⁻¹ H₂O₂. Cathode potential was the key factor for H₂O₂ production, which was mainly affected by the air flow rate. This work for the first time proved the potential of MREC as an efficient platform technology for simultaneous electrosynthesis of valuable chemicals and utilization of salinity-gradient energy.

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Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.656 SNIP 1.809
Web of Science (2005): Indexed yes
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Screening for illicit drugs in pooled human urine and urinated soil samples and studies on the stability of urinary excretion products of cocaine, MDMA, and MDEA in wastewater by hyphenated mass spectrometry techniques

Monitoring population drug use through wastewater-based epidemiology (WBE) is a useful method to quantitatively follow trends and estimate total drug consumption in communities. Concentrations of drug biomarkers might be low in wastewater due to dilution; and therefore analysis of pooled urine (PU) is useful to detect consumed drugs and identify targets of illicit drugs use. The aims of the study were (1) to screen PU and urinated soil (US) samples collected at festivals for illicit drug excretion products using hyphenated techniques; (2) to develop and validate a hydrophilic interaction liquid chromatography – mass spectrometry / mass spectrometry (HILIC-MS/MS) method of quantifying urinary targets of identified drugs in wastewater; and (3) to conduct a 24 h stability study, using PU and US to better reflect the chemical environment for targets in wastewater. Cocaine (COC) and ecstasy-like compounds were the most frequently detected illicit drugs; an analytical method was developed to quantify their excretion products. Hydroxymethoxymethamphetamine (HMMA), 3,4-methylenedioxymethamphetamine (MDMA), 3,4-methylenedioxymethamphetamine (MDA), HMMA sulfate (HMMA-S), benzoylecgonine (BE), and cocaethylene (CE) had 85–102% of initial concentration after 8 h of incubation, whereas COC and ecgonine methyl ester (EME) had 74 and 67% after 8 h, respectively. HMMA showed a net increase during 24 h of incubation (107% ± 27, n = 8), possibly due to the cleavage of HMMA conjugates, and biotransformation of MDMA. The results suggest HMMA as an analytical target for MDMA consumption in WBE, due to its stability in wastewater and its excretion as the main phase I metabolite of MDMA.

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Screening method to assess the greenhouse gas mitigation potential of old landfills, based on downwind methane concentration measurements

A nationwide effort is taking place in Denmark to mitigate methane emissions from landfills, by using biocovers. A large number of older landfills were found to be potential candidates for biocover implementation, but very little information was available for these sites to help evaluate if significant methane emissions occur. To assess these sites, we developed a low-cost and quick remote sensing methodology, whereby downwind methane concentrations from 91 landfills were measured using a mobile analytical platform, and emission rates were calculated using an inverse dispersion model. The method was found useful in gauging whether the sites were relevant for biocover implementation or not. The method is considered a screening technique, and alternative approaches such as the tracer gas dispersion method must be applied for emission quantification.

General information

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Screening tool for landfill gas emission hot spots based on infrared images

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Organisations: Department of Environmental Engineering, Residual Resource Engineering, NIRAS A/S
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Seaweed as innovative feedstock for energy and feed – Evaluating the impacts through a Life Cycle Assessment

Offshore cultivation of seaweed provides an innovative feedstock for biobased products supporting blue growth in northern Europe. This paper analyzes two alternative exploitation pathways: energy and protein production. The first pathway is based on anaerobic digestion of seaweed which is converted into biogas, for production of electricity and heat, and digestate, used as fertilizer; the second pathway uses seaweed hydrolysate as a substrate for cultivation of heterotrophic microalgae. As a result the seaweed sugars are consumed while new proteins are produced enhancing the total output. We performed a comparative Life Cycle Assessment of five scenarios identifying the critical features affecting resource efficiency and environmental performance of the systems with the aim of providing decision support for the design of future industrial scale production processes. The results show that all scenarios provide environmental benefits in terms of mitigation of climate change, with biogas production from dried Laminaria digitata being the most favorable scenario, quantified as −18.7*102 kg CO2 eq./ha. This scenario presents also the lowest consumption of total cumulative energy demand, 1.7*104 MJ/ha, and even resulting in a net reduction of the fossil energy fraction, −1.9*104 MJ/ha compared to a situation without seaweed cultivation. All scenarios provide mitigation of marine eutrophication thanks to bioextraction of nitrogen and phosphorus during seaweed growth. The material consumption for seeded lines has 2–20 times higher impact on human toxicity (cancer) than the reduction achieved by energy and protein substitution. However, minor changes in cultivation design, i.e. use of stones instead of iron as ballast to weight the seeded lines, dramatically reduces human toxicity (cancer). Externalities from the use of digestate as fertilizer affect human toxicity (non-cancer) due to transfer of arsenic from aquatic environment to agricultural soil. However concentration of heavy metals in digestate does not exceed the limit established by Danish regulation. The assessment identifies seaweed productivity as the key parameter to further improve the performance of the production systems which are a promising service provider of environmental restoration and climate change mitigation.

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Organisations: Department of Environmental Engineering, Residual Resource Engineering, Aarhus University, University of Siena
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Selective removal of heavy metal ions by disulfide linked polymer networks

Heavy metal contaminated surface water is one of the oldest pollution problems, which is critical to ecosystems and human health. We devised disulfide linked polymer networks and employed as a sorbent for removing heavy metal ions...
from contaminated water. Although the polymer network material has a moderate surface area, it demonstrated cadmium removal efficiency equivalent to highly porous activated carbon while it showed 16 times faster sorption kinetics compared to activated carbon, owing to the high affinity of cadmium towards disulfide and thiol functionality in the polymer network. The metal sorption mechanism on polymer network was studied by sorption kinetics, effect of pH, and metal complexation. We observed that the metal ions—copper, cadmium, and zinc showed high binding affinity in polymer network, even in the presence of competing cations like calcium in water.

**General information**

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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 6.31 SJR 1.742 SNIP 2.061
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.633 SNIP 1.931 CiteScore 5.54
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.814 SNIP 2.258 CiteScore 5.21
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BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.953 SNIP 2.443 CiteScore 4.73
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Scopus rating (2010): SJR 1.677 SNIP 1.706
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.648 SNIP 2.032
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BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.25 SNIP 1.528
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Setup for Scenario-free Modelling of Urban Flood Risk in Non-stationary Climate and Urban Development Conditions

An early flood warning system has been developed for urban catchments and is currently running in online operation in Copenhagen. The system is highly dependent on the quality of rainfall forecast inputs. An investigation of precipitation inputs from Radar Nowcast (RN), Numerical Weather Prediction (NWP) with assimilation of radar and cloud data (RA3), and Ensemble NWP with 25 members (S05) is conducted by comparing against rain gauge measurements and flood extent. Despite lower spatial and temporal resolution, the ensemble product seems promising for forecasting extreme events. A combination of the three forecast products is expected to yield the optimal input for flood warning.

Simple control rules for mitigating N₂O emissions in phase isolated fullscale WWTPs

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Simple control strategy for mitigating N₂O emissions in phase isolated full-scale WWTPs

Nitrous oxide (N₂O) is a strong greenhouse gas (GHG) and ozone depleter, with a warming potential 300 times higher than carbon dioxide (CO₂). 1.2% of the total anthropogenic N₂O emissions are believed to originate from the wastewater treatment (WWT) sector. Conventional biological nutrient removal processes relying on nitrification and denitrification are known to produce N₂O. A one year long-term study of N₂O production and emissions was performed at Lynetten, Denmark's largest WWTP. Nitrification and denitrification takes place by alternating process conditions as well as influent and effluent flows in 20 pairs of interconnected and surface aerated reactors. The long-term data revealed that the N₂O emissions contribute to as much as 30% of the total CO₂ footprint from the WWTP. High ammonium concentrations and long aeration phases lead to high N₂O production and emissions rates. Nitrification phases were identified to produce and emit most of the N₂O. High production and emissions were also associated with the afternoon loading peaks at the WWTP. During denitrification phases N₂O was produced initially but consumed consequently. An effective control strategy was implemented, whereby N₂O emissions were reduced from 0.8% to 0.3% of the nitrogen load during the mitigation period.

Simplification of one-dimensional hydraulic networks by automated processes evaluated on 1D/2D deterministic flood models

Evaluation of pluvial flood risk is often based on computations using 1D/2D urban flood models. However, guidelines on choice of model complexity are missing, especially for one-dimensional (1D) network models. This study presents a new automatic approach for simplification of 1D hydraulic networks (SAHM) using trimming and merging techniques, with performance evaluated in a 1D/2D case study. Decreasing the number of elements in the 1D model by 66% yielded a 35% decrease in computation time of the coupled 1D/2D simulation. The simplifications increased flow in some downstream branches and removing nodes eliminated connection to some areas. This promoted errors in two-dimensional (2D) flood results with changes in spatial location of flooding in the reduced 1D/2D models. Applying delayed rain inputs to compensate for changes in travel time and preserving network volume by expanding node diameters did not improve overall results. Investigations on the expected annual damages (EAD) showed that differences in EAD are smaller than deviations in the simulated flooded areas, suggesting that spatial changes are limited to local displacements. Probably, minor improvements of the simplification procedure will further improve results of the reduced models.
Social construction of stormwater control measures in Melbourne and Copenhagen: A discourse analysis of technological change, embedded meanings and potential mainstreaming

Urban stormwater systems in cities around the world are challenged by urbanization and climate change, and a range of Stormwater Control Measures (SCMs) are being implemented as solutions to these challenges. We developed a conceptual framework of technological stabilization based on Social Construction of Technology (SCOT) and Transition Science, and conducted 16 in-depth actor interviews as a basis for mapping the historical development of in the two cities. The SCMs applied in Melbourne and Copenhagen are similar, but using a new framework for technological stabilization we identify differences in their application due to different physical, organizational and cultural contexts in the two cities, drought being the main driver during the past decade in Melbourne (1997–2010) and pluvial flooding in Copenhagen (2007-). In Melbourne there is currently a strong integrated understanding of SCMs: after decades of “new technology” development, “testing” and “opportunity” seeking a large degree of “agreement” about stormwater management as a mainstreamed professional practice has arisen. In Copenhagen there are currently multiple conflicting understandings of SCMs and signs of an emerging integrated understanding that offers “opportunities” for further development and implementation. It is clear from Melbourne’s history that: successful full scale demonstration projects supported and developed by a wide range of actors helps building a common vision for SCM technologies, supportive policies across several governmental levels provide incentives for implementation, and inclusive actions in the closure process provides a sense of ownership for SCM technologies across disciplines.
Sorption and diffusion of micropollutants on/in biofilms: experimental observations and a model-based interpretation

In this study we investigated the diffusion and sorption of 22 pharmaceuticals in/on nitrifying biofilms of different thickness. Experimental observations were subject to model-based interpretation and the assessment of a sorption coefficient $K_d$ and effective diffusivity coefficient $f$. Three biofilm depths were obtained by using Z-carriers (AnoxKaldnes) as support, which allows tight control of biofilm thickness. Biofilms of increasing thickness had increased porosity (and thus decreasing density). Sorption was significant for the positively charged compounds at experimental pH (with few exceptions) and $K_d$ increased with biofilm thickness. The effective diffusivity $f$ negatively correlated with biofilm density, suggesting that diffusion of micropollutants in thinner biofilms could be limited. Overall, this study elucidated how biofilm thickness can positively influence sorption of micropollutants on biofilm as well as how diffusion limitation is strongly impacted by biofilm characteristics (density and porosity) and the specific chemical.
Spatial bias and uncertainty in numerical weather predictions for urban runoff forecasts with long time horizons

Numerical Weather Predictions (NWP) can be used to forecast urban runoff with long lead times. However, NWP exhibit large spatial uncertainties and using forecasted precipitation directly above the catchment might therefore not be an ideal approach in an online setup. We use the Danish Meteorological Institute’s NWP ensemble and investigate a large spatial neighborhood around the catchment over a two-year period. When compared against in-sewer observations, runoff forecasts forced with precipitation from north-east of the catchment are most skillful. This highlights spatial biases in the coupled hydro-meteorological setup, which a forecaster should be aware of.

Statistical analysis of solid waste composition data: Arithmetic mean, standard deviation and correlation coefficients

Data for fractional solid waste composition provide relative magnitudes of individual waste fractions, the percentages of which always sum to 100, thereby connecting them intrinsically. Due to this sum constraint, waste composition data represent closed data, and their interpretation and analysis require statistical methods, other than classical statistics that are suitable only for non-constrained data such as absolute values. However, the closed characteristics of waste composition data are often ignored when analysed. The results of this study showed, for example, that unavoidable animal-derived food waste amounted to 2.21 ± 3.12% with a confidence interval of (−4.03; 8.45), which highlights the problem of the biased negative proportions. A Pearson’s correlation test, applied to waste fraction generation (kg mass), indicated a positive correlation between avoidable vegetable food waste and plastic packaging. However, correlation tests applied to waste fraction compositions (percentage values) showed a negative association in this regard, thus demonstrating that statistical analyses applied to compositional waste fraction data, without addressing the closed characteristics of these data, have the potential to generate spurious or misleading results. Therefore, compositional data should be transformed adequately prior to any statistical analysis, such as computing mean, standard deviation and correlation coefficients.
Stochastic Greybox Modeling for Control of an Alternating Activated Sludge Process

We present a stochastic greybox model of a BioDenitro WWTP that can be used for short time horizon Model Predictive Control. The model is based on a simplified ASM1 model and takes model uncertainty into account. It estimates unmeasured state variables in the system, e.g. the inlet concentration or the sensor measurements in case of temporary sensor faults. This improves control performance without adding additional or redundant sensors. We fitted the parameters of the model to actual plant data and demonstrate the state estimation capabilities with this data set. The model now runs online at a WWTP in Denmark.

Sustainability assessment of stormwater management systems

We quantify ecotoxicity impacts caused by different solutions to manage stormwater using life cycle assessment. As a novelty, we include emissions of a wide range of pollutants present in runoff. These emissions turn out to be of great importance, especially in decentralized, above surface systems.
**Sustainability assessment of stormwater management systems and the importance of pollutants in runoff**

We develop a method to systematically include impacts caused by runoff discharge into the sustainability assessment of stormwater management systems. By defining priority pollutants and calculating mean concentrations, an average ecotoxicity impact per litre of runoff is calculated. Of all assessed substance groups present in runoff, metals cause the highest impacts. To integrate this method into holistic sustainability assessment, we assess the complete life cycle of a complex stormwater management. We show that runoff discharges have a high relative importance: The impacts exceed the combined impacts of implementation, maintenance and decommissioning of the stormwater management system.

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**Authors:** Brudler, S. (Intern), Arnbjerg-Nielsen, K. (Intern), Ammitsøe, C. (Ekstern), Hauschild, M. Z. (Ekstern), Rygaard, M. (Intern)  
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**Event:** Abstract from 14th IWA/IAHR International Conference on Urban Drainage 2017, Prague, Czech Republic.

**Systematic Quantification of Biogas Potential in Urban Organic Waste**

Currently, there is growing interest in introducing the separate collection of biowaste from households, restaurants and commercial and industrial sources for biological treatment and the recovery of energy and nutrients. Upcoming policies and legislations promote and incentivise the production of biogas from organic waste rather than incineration and landfilling. The production of biogas from urban organic waste is expected to contribute to reaching the EU target of 20% of overall energy production and 10% of vehicle fuel derived from renewable sources by 2020. The Danish energy strategy is for Denmark to become a 100% fossil fuel-free nation by 2050. However, existing technical challenges and barriers must be overcome to make the production of biogas more attractive. In this respect, a systematic quantification of the biogas production potential of various urban organic waste sources is necessary, in order to analyse and improve processes for biogas production. Conventionally, the potential biogas production of organic waste sources is quantified through biochemical methane potential (BMP) analysis and anaerobic digestion in biogas reactors. However, the determination of BMP in batch incubation tests, and monitoring of production in laboratory reactors, for example, is considerably time-consuming and lasts from 30 up to 90 days, or sometimes even longer.

Analytical and modelling methods were combined to develop a rapid, reliable and robust method for the BMP prediction of urban organic waste sources. In total, the methane potentials of 87 urban organic waste samples were determined. In addition, 88 plant biomass samples were included in the dataset used for building a combined methane prediction model based on near-infrared reflectance spectroscopy (NIRS). The model was moderately successful in predicting the BMP of urban organic waste sources and could potentially replace traditional techniques currently employed for BMP measurement. The model provides firsthand estimations of BMP and biochemical transformation in fewer than 72 hours, and it could provide support to biogas plant operators seeking to characterise substrate quickly, thereby enabling rapid decisions to improve methane production, optimise feedstock management and help identify slowly degradable feedstock before making a decision on which materials to utilize in the digesters.

**General information**

**State:** Published  
**Organisations:** Department of Environmental Engineering, Residual Resource Engineering  
**Authors:** Fitamo, T. M. (Intern), Scheutz, C. (Intern), Boldrin, A. (Intern)  
**Number of pages:** 58  
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**Publisher:** Technical University of Denmark, DTU Environment  
**Original language:** English  
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Teaching nanosafety

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Hansen, S. F. (Intern), Baun, A. (Intern)
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Main Research Area: Technical/natural sciences

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BFI (2017): BFI-level 2
Scopus rating (2017): SJR 20.612 SNIP 8.171 CiteScore 25.47
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 21.85 SJR 18.916 SNIP 7.649
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 18.842 SNIP 8.019 CiteScore 22.1
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 17.177 SNIP 8.047 CiteScore 21.76
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 16.688 SNIP 7.784 CiteScore 21.94
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 15.706 SNIP 7.569 CiteScore 17.55
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 14.582 SNIP 8.354 CiteScore 17.25
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 11.876 SNIP 7.037
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 8.006 SNIP 5.396
Termination of nanoscale zero-valent iron reactivity by addition of bromate as a reducing reactivity competitor

Remediation of contaminated groundwater by nanoscale zero-valent iron (nZVI) is widely becoming a leading environmentally friendly solution throughout the globe. Since a wide range of various nZVI-containing materials have been developed for effective remediation, it is necessary to determine an appropriate way to terminate the reactivity of any nZVI-containing material for a practical experimental procedure. In this study, bimetallic Ni/Fe-NPs were prepared to enhance overall reduction kinetics owing to the catalytic reactivity of nickel on the surface of nZVI. We have tested several chemical strategies in order to terminate nZVI reactivity without altering the concentration of volatile compounds in the solution. The strategies include surface passivation in alkaline conditions by addition of carbonate, and consumption of nZVI by a reaction competitor. Four halogenated chemicals, trichloroethylene, 1,1,1-trichloroethane, atrazine, and 4-chlorophenol, were selected and tested as model groundwater contaminants. Addition of carbonate to passivate the nZVI surface was not effective for trichloroethylene. Nitrate and then bromate were applied to competitively consume nZVI by their faster reduction kinetics. Bromate proved to be more effective than nitrate, subsequently terminating nZVI reactivity for all four of the tested halogenated compounds. Furthermore, the suggested termination method using bromate was successfully applied to obtain trichloroethylene reduction kinetics. Herein, we report the simple and effective method to terminate the reactivity of nZVI by addition of a reducing reactivity competitor.
BFI (2018): BFI-level 1  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 1  
Scopus rating (2017): SNIP 0.603 SJR 0.528 CiteScore 1.93  
Web of Science (2017): Indexed yes  
BFI (2016): BFI-level 1  
Scopus rating (2016): CiteScore 1.74 SJR 0.496 SNIP 0.557  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 1  
Scopus rating (2015): SJR 0.568 SNIP 0.696 CiteScore 1.97  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 1  
Scopus rating (2014): SJR 0.672 SNIP 0.861 CiteScore 2.17  
Web of Science (2014): Indexed yes  
BFI (2013): BFI-level 1  
Scopus rating (2013): SJR 0.753 SNIP 1.01 CiteScore 2.54  
ISI indexed (2013): ISI indexed yes  
BFI (2012): BFI-level 1  
Scopus rating (2012): SJR 0.855 SNIP 1.024 CiteScore 2.56  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 1  
Scopus rating (2011): SJR 1.092 SNIP 1.437 CiteScore 3.52  
ISI indexed (2011): ISI indexed yes  
Web of Science (2011): Indexed yes  
BFI (2010): BFI-level 1  
Scopus rating (2010): SJR 0.974 SNIP 1.242  
Web of Science (2010): Indexed yes  
BFI (2009): BFI-level 1  
Scopus rating (2009): SJR 0.979 SNIP 1.055  
Web of Science (2009): Indexed yes  
BFI (2008): BFI-level 1  
Scopus rating (2008): SJR 0.991 SNIP 1.124  
Scopus rating (2007): SJR 0.882 SNIP 1.089  
Scopus rating (2006): SJR 0.869 SNIP 1.267  
Scopus rating (2005): SJR 0.813 SNIP 1.161  
Scopus rating (2004): SJR 0.811 SNIP 1.321  
Scopus rating (2003): SJR 0.58 SNIP 0.877  
Scopus rating (2002): SJR 0.993 SNIP 1.243  
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Scopus rating (2000): SJR 0.296 SNIP 0.425  
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Testing high resolution synthetic rainfall time series representing current and future climates on CSO and other indicators

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Aalborg University
Authors: Sørup, H. J. D. (Intern), Davidsen, S. (Intern), Löwe, R. (Intern), Thorndahl, S. L. (Forskerdatabase), Borup, M. (Intern), Ambjerg-Nielsen, K. (Intern)
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Long term simulations, LTS, CSO, Climate change, Combined sewer overflow, Rainfall generator
Electronic versions:
Abstract_ICUD.pdf
Source: PublicationPreSubmission
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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Test of aerobic TCE degradation by willows (Salix viminalis) and willows inoculated with TCE-cometabolizing strains of Burkholderia cepacia
Trichloroethylene (TCE) is a widespread soil and groundwater pollutant and clean-up is often problematic and expensive. Phytoremediation may be a cost-effective solution at some sites. This study investigates TCE degradation by willows (S. viminalis) and willows inoculated with three strains of B. cepacia (301C, PR1-31 and VM1330-pTOM), using chloride formation as an indicator of dehalogenation. Willows were grown in non-sterile, hydroponic conditions for 3 weeks in chloride-free nutrient solution spiked with TCE. TCE was added weekly due to rapid loss by volatilization. Chloride and TCE in solution were measured every 2-3 days and chloride and metabolite concentrations in plants were measured at test termination. Based on transpiration, no tree toxicity of TCE exposure was observed. However, trees grown in chloride-free solution showed severely inhibited transpiration. No or very little chloride was formed during the test, and levels of chloride in TCE-exposed trees were not elevated. Chloride concentrations in chloride containing TCE-free nutrient solution doubled within 23 days, indicating active exclusion of chloride by root cell membranes. Only traces of TCE-metabolites were detected in plant tissue. We conclude that TCE is not, or to a limited extent (less than 3%), aerobically degraded by the willow trees. The three strains of B. cepacia did not enhance TCE mineralization. Future successful application of rhizo- and phytodegradation of TCE requires measures to be taken to improve the degradation rates.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Water Resources Engineering, Aarhus University
Authors: Clausen, L. P. W. (Intern), Broholm, M. M. (Intern), Gosewinkel, U. B. (Ekstern), Trapp, S. (Intern)
Number of pages: 12
Pages: 18320–18331
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ISSN (Print): 0944-1344
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BFI (2017): BFI-level 1
Scopus rating (2017): SJR 0.858 SNIP 0.942 CiteScore 2.84
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.66 SJR 0.891 SNIP 1.109
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
The applicability of chemical alternatives assessment for engineered nanomaterials

The use of alternatives assessment to substitute hazardous chemicals with inherently safer options is gaining momentum worldwide as a legislative and corporate strategy to minimize consumer, occupational, and environmental risks. Engineered nanomaterials represent an interesting case for alternatives assessment approaches as they can be considered both emerging "chemicals" of concern, as well as potentially safer alternatives to hazardous chemicals. However, comparing the hazards of nanomaterials to traditional chemicals or to other nanomaterials is challenging and critical elements in chemical hazard and exposure assessment may have to be fundamentally altered to sufficiently address nanomaterials. The aim of this paper is to assess the overall applicability of alternatives assessment methods for
nanomaterials and outline recommendations to enhance their use in this context. This paper focuses on the adaptability of existing hazard and exposure assessment approaches to engineered nanomaterials as well as strategies to design inherently safer nanomaterials. We argue that alternatives assessment for nanomaterials is complicated by the sheer number of nanomaterials possible. As a result, the inclusion of new data tools that can efficiently and effectively evaluate nanomaterials as substitutes are needed to strengthen the alternatives assessment process. However, we conclude that with additional tools to enhance traditional hazard and exposure assessment modules of alternatives assessment, such as the use of mechanistic toxicity screens and control banding tools, alternatives assessment can be adapted to evaluate engineered nanomaterials both as potential substitutes for chemicals of concern and to ensure safer nanomaterials are incorporated in the design of new products. This article is protected by copyright. All rights reserved

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, University of Massachusetts
Authors: Hjorth, R. (Intern), Hansen, S. F. (Intern), Jacobs, M. (Ekstern), Tickner, J. (Ekstern), Ellenbecker, M. (Ekstern), Baun, A. (Intern)
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Web of Science (2018): Indexed yes
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Scopus rating (2017): SNIP 0.954 SJR 0.779 CiteScore 1.72
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.714 SNIP 0.715 CiteScore 1.56
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.803 SNIP 0.643 CiteScore 1.34
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.866 SNIP 1.047 CiteScore 1.39
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.855 SNIP 1.386 CiteScore 2
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.196 SNIP 1.105 CiteScore 1.65
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.823 SNIP 0.744 CiteScore 1.29
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.797 SNIP 0.751
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.392 SNIP 0.553
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.766 SNIP 0.962
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Original language: English
Alternatives assessment, Engineered nanomaterials, hadax, Safety by design, Decision-making

Electronic versions:
The Challenges of Applying Planetary Boundaries as a Basis for Strategic Decision-Making in Companies with Global Supply Chains

The Planetary Boundaries (PB) framework represents a significant advance in specifying the ecological constraints on human development. However, to enable decision-makers in business and public policy to respect these constraints in strategic planning, the PB framework needs to be developed to generate practical tools. With this objective in mind, we analyse the recent literature and highlight three major scientific and technical challenges in operationalizing the PB approach in decision-making: first, identification of thresholds or boundaries with associated metrics for different geographical scales; second, the need to frame approaches to allocate fair shares in the 'safe operating space' bounded by the PBs across the value chain and; third, the need for international bodies to co-ordinate the implementation of the measures needed to respect the Planetary Boundaries. For the first two of these challenges, we consider how they might be addressed for four PBs: climate change, freshwater use, biosphere integrity and chemical pollution and other novel entities. Four key opportunities are identified: (1) development of a common system of metrics that can be applied consistently at and across different scales; (2) setting 'distance from boundary' measures that can be applied at different scales; (3) development of global, preferably open-source, databases and models; and (4) advancing understanding of the interactions between the different PBs. Addressing the scientific and technical challenges in operationalizing the planetary boundaries needs be complemented with progress in addressing the equity and ethical issues in allocating the safe operating space between companies and sectors.

General information
State: Published
Organisations: Department of Environmental Engineering, Department of Management Engineering, Quantitative Sustainability Assessment, University of Surrey, Unilever R&D, Radboud University Nijmegen, Unilever R&D, CIRAIG, Stanford University, Humboldt-University of Berlin, Columbia University, University of Bayreuth, Stockholm University, UNEP, University of Technology, Sydney
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Scopus rating (2016): CiteScore 1.96 SJR 0.548 SNIP 0.938
Web of Science (2016): Indexed yes
Scopus rating (2015): SJR 0.482 SNIP 0.936 CiteScore 1.78
Web of Science (2015): Indexed yes
The competitive edge: competition and biofilm composition, an individual-based modelling approach

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, University of Birmingham, Friedrich Schiller University
Authors: Cockx, B. (Intern), Clegg, R. J. (Ekstern), Lang, S. (Ekstern), Kreft, J. (Ekstern), Smets, B. F. (Intern)
Number of pages: 3
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Main Research Area: Technical/natural sciences
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Source-ID: 134953589
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

The complete genome sequence of Trueperella pyogenes UFV1 reveals a processing system involved in the quorum sensing signal response

We present here the complete genome sequence of Trueperella pyogenes UFV1. The 2.3-Mbp genome contains an extremely interesting Ai-2 transporter and processing system related to the quorum-sensing signal response. This specific feature is described in this species for the first time and might be responsible for a new pathogenic behavior.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Universidade Federal de Vicos, University of Padova
Authors: Duarte, V. D. S. (Ekstern), Treu, L. (Intern), Campanaro, S. (Ekstern), Dias, R. S. (Ekstern), Silva, C. C. D. (Ekstern), Giacomini, A. (Ekstern), Corich, V. (Ekstern), de Paula, S. O. (Ekstern)
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The effect of UV treatment on highly polluted and normal operated swimming pools

Water samples from 2 indoor public swimming pool facilities with significantly different organic matter concentrations in the recirculation were tested to evaluate UV-induced effects on water chemistry. The aim of the study was to investigate the impact of poor water quality due to increased organic carbon (TOC) and the potential effect of increased nitrate concentration on disinfection by-product (DBP) formation in pool water. Concentration change on total trihalomethanes (TTHM) was investigated utilising medium pressure UV treatment in conjunction with chlorine. Post-UV chlorine consumption increased, UV dose-dependently. The post-UV chlorination clearly induced TTHM formation in both polluted and normal operated pools. However, elevated TOC concentration did not increase significantly the DBP formation. Regarding the brominated fraction of the halogens in the formed TTHMs, it appeared to decrease when the sample was subjected to post-UV chlorination in the normal operated pool, having the opposite result in the highly polluted pool. The addition of nitrate (when subjected to irradiation it forms radicals) and the subsequent post-UV chlorination were contradicting with the radical mechanisms; nitrite shielded the water surface inhibiting the UV penetration and therefore less TTHMs were formed.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Spiliotopoulou, A. (Intern), Kaarsholm, K. M. S. (Intern), Andersen, H. R. (Intern)
Number of pages: 3
Publication date: 2017

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Main Research Area: Technical/natural sciences
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DBP formation, Medium pressure UV lamp, polluted pool, Trihalomethane
Source: PublicationPreSubmission
Source-ID: 137196005
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The effect of UV treatment on highly polluted and normal operated swimming pools

"It should be light blue, transparent" (Mario Andrada, speakerman, Olympic Games, Rio, 2016) was the comment for the "green lake". Swimming pools are sensitive recirculating systems. A malfunction in water treatment units or a poor operating decision could possibly lead to health-endangering or aesthetically unacceptable conditions for swimmers, with a lengthy and expensive remediation.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Spiliotopoulou, A. (Intern), Kaarsholm, K. M. S. (Intern), Andersen, H. R. (Intern)
Number of pages: 1
Publication date: 2017
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Main Research Area: Technical/natural sciences
Electronic versions:
poster_PS_2017_FinalfA0_Print_for_wall.pdf
The impact of anode acclimation strategy on microbial electrolysis cell treating hydrogen fermentation effluent

The impact of different anode acclimation methods for enhancing hydrogen production in microbial electrolysis cell (MEC) was investigated in this study. The anodes were first acclimated in microbial fuel cells using acetate, butyrate and corn stalk fermentation effluent (CSFE) as substrate before moving into MECs, respectively. Subsequently, CSFE was used as feedstock in all the three MECs. The maximum hydrogen yield with the anode pre-acclimated with butyrate (5.21 ± 0.24 L H2/L CSFE) was higher than that pre-acclimated with acetate (4.22 ± 0.19 L H2/L CSFE) and CSFE (4.55 ± 0.14 L H2/L CSFE). The current density (480 ± 11 A/m3) and hydrogen production rate (4.52 ± 0.13 m3/m3/d) with the anode pre-acclimated with butyrate were also higher than another two reactors. These results demonstrated that the anode biofilm pre-acclimated with butyrate has significant advantages in CSFE treatment and could improve the performance of hydrogen production in MEC.
The impact of mass transfer limitations and heterogeneity contrasts on the parameterization of longitudinal dispersion in numerical models

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Stanford University
The release of silver nanoparticles from commercial toothbrushes

The use of silver nanoparticles (NPs) in commercial products has become increasingly common in the past decade, mostly due to their antimicrobial properties. Using Ag NP-containing articles may lead to particle release, which raises concern of human and environmental safety. The published literature addressing particle release is scarce, especially when it comes to quantifying exposure to NPs specifically. In this study, we have experimentally investigated the release of total Ag and Ag NP from commercially available toothbrushes i.e. biodegradable toothbrushes for adults and toothbrushes for children. Toothbrushes were immersed and abraded in tap water for 24 h corresponding to more than the whole intended usage time of a toothbrush. The total amount of released Ag was quantified by inductively coupled plasma-mass spectrometry (ICP-MS) analysis, and the Ag NPs were characterized by single particle ICP-MS and transmission electron microscopy (TEM). The median size of the released Ag NPs ranged from 42 to 47 nm, and the maximum total Ag release was 10.2 ng per toothbrush. The adult toothbrushes were generally releasing more total Ag and NPs than children toothbrushes. In conclusion, our results indicate that the use of Ag NP-impregnated toothbrushes can cause consumer as well as environmental exposure to Ag NPs.
The Role of Alternative Testing Strategies in Environmental Risk Assessment of Engineered Nanomaterials

Within toxicology there is a pressure to find new test systems and organisms to replace, reduce and refine animal testing. In nanoecotoxicology the need for alternative testing strategies (ATS) is further emphasized as the validity of tests and risk assessment practices developed for dissolved chemicals are challenged. Nonetheless, standardized whole organism animal testing is still considered the gold standard for environmental risk assessment. Advancing risk analysis of engineered nanomaterials (ENMs) through ATS was discussed in September 2014 at an international Society for Risk Analysis (SRA) workshop in Washington, D.C. and serves as the point of departure for this paper. Here we present the main outcomes by describing and defining the use of ATS for ENMs as well as discussing its future role in environmental risk science. We conclude that diversity in testing should be encouraged to avoid “selective ignorance” and that, through an iterative process with low-tier and high-tier testing, data-generation can be validated to ensure relevant endpoints. Furthermore, simplified screening of ENMs could enable early decision-making on material design, while complex multispecies studies should be utilized to skip uncertain environmental extrapolations and give rise to more accurate risk analysis.
The role of metals in methane production from shredder waste in landfills

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Fathi Aghdam, E. (Intern), Schuetz, C. (Intern), Kjeldsen, P. (Intern)
Number of pages: 2
Publication date: 2017
Event: Abstract from 5th International Conference on Sustainable Solid Waste Management, Athens, Greece.
Main Research Area: Technical/natural sciences
Electronic versions:
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The shortfall of risk assessment for decision-making

General information
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Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Hjorth, R. (Intern)
Number of pages: 2
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The sun tiered modeling-based inhalation, dermal, oral and inadvertent oral exposure assessment framework for nanomaterials
The toxicity of plastic nanoparticles to green algae as influenced by surface modification, medium hardness and cellular adsorption

To investigate processes possibly underlying accumulation and ecological effects of plastic nano-particles we have characterized their interaction with the cell wall of green algae. More specifically, we have investigated the influence of particle surface functionality and water hardness (Ca2+ concentration) on particle adsorption to algae cell walls. Polystyrene nanoparticles with different functional groups (non-functionalized, –COOH and –NH2) as well as coated (starch and PEG) gold nanoparticles were applied in these studies. Depletion measurements and atomic force microscopy (AFM) showed that adsorption of neutral and positively charged plastic nanoparticles onto the cell wall of P. subcapitata was stronger than that of negatively charged plastic particles. Results indicated that binding affinity is a function of both inter-particle and particle-cell wall interactions which are in turn influenced by the medium hardness and particle concentration. Physicochemical modelling using DLVO theory was used to interpret the experimental data, using also values for interfacial surface free energies. Our study shows that material properties and medium conditions play a crucial role in the rate and state of nanoparticle bio-adsorption for green algae. The results show that the toxicity of nanoparticles can be better described and assessed by using appropriate dose metrics including material properties, complexation/agglomeration behavior and cellular attachment and adsorption. The applied methodology provides an efficient and feasible approach for evaluating potential accumulation and hazardous effects of nanoparticles to algae caused by particle interactions with the algae cell walls.
The value of DCIP geophysical surveys for contaminated site investigations

Geophysical methods are increasingly being used in contaminant hydrogeology to map lithology, hydraulic properties, and contaminant plumes with a high ionic strength. Advances in the Direct Current resistivity and Induced Polarization (DCIP) method allow the collection of high resolution three dimensional (3D) data sets. The DC resistivity can describe both soil properties and the water electrical conductivity, while the IP can describe the lithology and give information on hydrogeological properties.
The aim of the study was to investigate a large contaminant plume discharging to a stream from an old factory site by combining traditional geological, hydrological, and contaminant concentration data with DCIP surveys. The plume consisted of xenobiotic organic compounds and inorganics. The study assesses benefits and limitations of DCIP geophysics for contaminated site investigations.

A 3D geological model was developed from borehole logs and DCIP data as framework for the complex transport pathways near the meandering stream. IP data were useful in indicating the continuity and the changes in thickness of local clay layers between the borehole logs. The geological model was employed to develop a groundwater flow model describing groundwater flows to the stream. The hydraulic conductivity distribution was based on IP data, slug tests and grain size analysis. The distribution of contaminant concentrations revealed two chemically distinct plumes, separated by a clay layer, with different transport paths to the stream. The DC resistivity was useful in mapping ionic compounds, but also organic compounds whose spatial distribution coincided with the ionic compounds. A conceptual model describing the contaminant plume was developed, and it matched well with contaminant concentrations in stream water and below the streambed.

Surface DCIP surveys supported the characterization of the spatial variability in geology, hydraulic conductivity and contaminant concentration. Though DCIP data interpretation required additional borehole data, the DCIP survey reduced the number of boreholes required and helped design field campaigns. The results suggest DCIP surveys are useful and inexpensive tools, which has potential as an integrated part of contaminated site investigations.

Three Decades of Volume Change of a Small Greenlandic Glacier Using Ground Penetrating Radar, Structure from Motion, and Aerial Photogrammetry

Glaciers in the Arctic are losing mass at an increasing rate. Here we use surface topography derived from Structure from Motion (SfM) and ice volume from ground penetrating radar (GPR) to describe the 2014 state of Aqqutikitsoq glacier (2.85 km) on Greenland's west coast. A photogrammetrically derived 1985 digital elevation model (DEM) was subtracted from a 2014 DEM obtained using land-based SfM to calculate geodetic glacier mass balance. Furthermore, a detailed 2014 ground penetrating radar survey was performed to assess ice volume. From 1985 to 2014, the glacier has lost 49.8 ± 9.4 10 m of ice, corresponding to roughly a quarter of its 1985 volume (148.6 ± 47.6 10 m) and a thinning rate of 0.60 ± 0.11 m a. The computations are challenged by a relatively large fraction of the 1985 DEM (~50% of the glacier surface) being deemed unreliable owing to low contrast (snow cover) in the 1985 aerial photography. To address this issue, surface elevation in low contrast areas was measured manually at point locations and interpolated using a universal kriging approach. We conclude that ground-based SfM is well suited to establish high-quality DEMs of smaller glaciers. Provided favorable topography, the approach constitutes a viable alternative where the use of drones is not possible. Our investigations constitute the first glacier on Greenland's west coast where ice volume was determined and volume change calculated. The glacier's thinning rate is comparable to, for example, the Swiss Alps and underlines that arctic glaciers are subject to fast changes.
Timing of the compensation of winter respiratory carbon losses provides explanatory power for net ecosystem productivity of forests

Accurate predictions of net ecosystem productivity (NEPc) of forest ecosystems are essential for climate change decisions and requirements in the context of national forest growth and greenhouse gas inventories. However, drivers and underlying mechanisms determining NEPc (e.g. climate, nutrients) are not entirely understood yet, particularly when considering the influence of past periods.

Here we explored the explanatory power of the compensation day (cDOY) —defined as the day of year when winter net carbon losses are compensated by spring assimilation— for NEPc in 26 forests in Europe, North America, and Australia, using different NEPc integration methods.

We found cDOY to be a particularly powerful predictor for NEPc of temperate evergreen needle-leaf forests ($R^2=0.58$) and deciduous broadleaf forests ($R^2=0.68$). In general, the latest cDOY correlated with the lowest NEPc. The explanatory power of cDOY depended on the integration method for NEPc, forest type, and whether the site had a distinct winter net respiratory carbon loss or not. The integration methods starting in autumn led to better predictions of NEPc from cDOY than the classical calendar method starting at January 1. Limited explanatory power of cDOY for NEPc was found for warmer sites with no distinct winter respiratory loss period.

Our findings highlight the importance of the influence of winter processes and the delayed responses of previous seasons’ climatic conditions on current year’s NEPc. Such carry-over effects may contain information from climatic conditions, carbon storage levels and hydraulic traits of several years back in time.

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BFI (2015): BFI-level 2
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.853 SNIP 1.757 CiteScore 3.27
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.088 SNIP 1.809 CiteScore 3.38
ISI indexed (2013): ISI indexed yes
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BFI (2012): BFI-level 2
The present study deals with the application of an advanced oxidation process combining UV irradiation in the presence of the photocatalyst titanium dioxide (TiO2), as an effective pretreatment method of wheat straw as means for increasing its biodegradability for increased biogas production by anaerobic digestion (AD). Especially attention was paid in oxidation of the lignin in straw, besides release the sugars from the lignocellulosic structure of straw. Specifically, four different TiO2 concentrations (0.0, 0.5, 1.0, 1.5, and 2.0% (w/w) TiO2) were tested at three different irradiation times (0, 1, 2, and 3 h). Products of lignin-fraction oxidation, namely, vanillic acid, ferullic acid and acetic acid were quantified for each set of pretreatment conditions. Subsequently, biochemical methane potentials (BMPs) assays were conducted under thermophilic conditions from differentially pretreated samples and the pretreatment with the best performance was further tested in continuous mode operation. From BMP assays, 1.5% (w/w) TiO2/straw at 3 h of UV light exposure pretreatment resulted in 37% (p < 0.05) increase in methane yield and 25% in CSTRs. It was concluded that the presence of TiO2 and the products of lignin oxidation did not inhibit the AD process. Finally, a simplified energy assessment showed that all pretreatment conditions become feasible when amounts of substrate to be treated are greater than the threshold value of 1.15 g.
Total methane emission from five Icelandic landfills - Quantification using tracer gas dispersion method

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources
Authors: Fredenslund, A. M. (Intern), Scheutz, C. (Intern)
Number of pages: 15
Publication date: 2017

Total methane loss from biogas plants, determined by tracer dispersion measurements
Methane losses from biogas plants are problematic, since methane emitted into the atmosphere contributes to global warming, and any losses may thus reduce the environmental benefits of biogas production. A tracer gas dispersion method was used to measure total methane emissions from seven biogas plants, and more measurement campaigns are planned. Emissions varied between 1.3 and 13.4 (kg CH4 h-1), and losses expressed in percentages of production varied between 0.3 and 6.4%. The tracer gas dispersion method was found to be useful in quantifying total methane emissions from biogas plants, whereas the detection and quantification of individual leaks at the plants require other methods.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Fredenslund, A. M. (Intern), Scheutz, C. (Intern)
Number of pages: 7
Publication date: 2017

Towards a domain-based framework for use of rainfall forecasts in control of integrated urban wastewater systems
An increasing number of Model Predictive Control (MPC) tools have recently been developed. These MPC methods utilize as input a wide range of rainfall forecasts, which differ in their characteristics and prediction skills. Operators need to identify the most appropriate MPC and rainfall forecast for their needs. A domain-based framework is proposed to distinguish between four operational domains, which consider the magnitude of the forecasted rain and the expected
status of the system. The framework is presented by using selected Danish case studies as examples, and it will provide a support to operators in the implementation of MPC strategies.

**General information**

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**Toxicity of 56 substances to trees**

Toxicity data of substances to higher plants is needed for the purpose of risk assessment, site evaluation, phytoremediation, and plant protection. However, the results from the most common phytotoxicity tests, like the OECD algae and Lemma test, are not necessarily valid for higher terrestrial plants. The willow tree toxicity test uses inhibition of transpiration (aside of growth and water use efficiency) of willow cuttings grown in spiked solutions or soils as end point to quantify toxicity. This overview presents results from 60 studies including 24 new unpublished experiments for 56 different chemicals or substrates. Highest toxicity (EC50 <1 mg/L) was observed from exposure to heavy metals like copper and cadmium. Also, organotins and free cyanide showed very high toxicity. The toxic effect of chlorophenols on willows was comparable to that on duck weed (Lemma) and green algae, while volatile compounds like chlorinated solvents or benzene, toluene, ethylbenzene, and xylene had less effect on trees than on these aquatic plants, due to volatilization from leaves and test media. In particular low (g/L range) toxicity was observed for tested nanomaterials. Effects of pharmaceuticals (typically weak acids or bases) depended strongly of the solution pH. Like for algae, baseline toxicity was observed for willows, which is related to the water solubility of the compounds, with absolute chemical activity ranging from 0.01 to 0.1, but with several exceptions. We conclude that the willow tree toxicity test is a robust method for relating uptake, accumulation, and metabolism of substances to the toxicity to trees.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Clausen, L. P. W. (Intern), Trapp, S. (Intern)
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Tracking and understanding AMR dynamics across European urban water systems

General information
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**Training the urban water engineers of the future – the challenge of stormwater TSS models**

**General information**
- State: Published
- Organisations: Department of Environmental Engineering, Urban Water Systems, University of Lyon
- Authors: Vezzaro, L. (Intern), Sandoval, S. (Ekstern), Bertrand-Krajewski, J. (Ekstern)
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**Bibliographical note**
Proceedings of the 14th International Conference on Urban Drainage (14ICUD), Prague, Czech Republic, 10th-15th September 2017<br/>Authors: Vezzaro, L. (DTU: luve)<br/>Sandoval, S.<br/>Bertrand-Krajewski, J.-L<br/>Source: PublicationPreSubmission<br/>Source-ID: 137542359<br/>Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

**Transformation and sorption of illicit drug biomarkers in sewer biofilms**

In-sewer transformation of drug biomarkers (excreted parent drugs and metabolites) can be influenced by the presence of biomass in suspended form as well as attached to sewer walls (biofilms). Biofilms are likely the most abundant and biologically active biomass fraction in sewers. In this study, 16 drug biomarkers were selected, including the major human metabolites of mephedrone, methadone, cocaine, heroin, codeine and tetrahydrocannabinol (THC). Transformation and sorption of these substances were assessed in targeted batch experiments using laboratory-scale biofilm reactors operated under aerobic and anaerobic conditions. A one-dimensional model was developed to simulate diffusive transport, abiotic and biotic transformation and partitioning of drug biomarkers. Model calibration to experimental results allowed estimating transformation rate constants in sewer biofilms, which were compared to those obtained using in-sewer suspended biomass. Our results suggest that sewer biofilms can enhance the transformation of most compounds. Through scenario simulations, we demonstrated that the estimation of transformation rate constants in biofilm can be significantly biased if the boundary layer thickness is not accurately estimated. This study complements our previous investigation on the transformation and sorption of drug biomarkers in the presence of only suspended biomass in untreated sewage. A better understanding of the role of sewer biofilms-also relative to the in-sewer suspended solids-and improved prediction of associated fate processes can lead to more accurate estimation of daily drug consumption in urban areas in wastewater-based epidemiological assessments.

**General information**
- State: Published
- Organisations: Department of Environmental Engineering, Water Technologies, Department of Chemical and Biochemical Engineering, Environmental Chemistry, KWR Watercycle Research Institute, University of Amsterdam
- Authors: Ramin, P. (Intern), Brock, A. L. (Intern), Causanilles Llanes, A. (Ekstern), Valverde Pérez, B. (Intern), Emke, E. (Ekstern), de Voogt, P. (Ekstern), Polesel, F. (Intern), Plösz, B. G. (Intern)
Transformation products of clindamycin in moving bed biofilm reactor (MBBR)

Clindamycin is widely prescribed for its ability to treat a number of common bacterial infections. Thus, clindamycin enters wastewater via human excretion or disposal of unused medication and widespread detection of pharmaceuticals in rivers proves the insufficiency of conventional wastewater treatment plants in removing clindamycin. Recently, it has been discovered that attached biofilm reactors, e.g., moving bed biofilm reactors (MBBRs) obtain a higher removal of pharmaceuticals than conventional sludge wastewater treatment plants. Therefore, this study investigated the capability of MBBRs applied in the effluent of conventional wastewater treatment plants to remove clindamycin. First, a batch experiment was executed with a high initial concentration of clindamycin to identify the transformation products. It was shown that clindamycin can be removed from wastewater by MBBR and the treatment process converts clindamycin into the, possibly persistent, products clindamycin sulfoxide and N-desmethyl clindamycin as well as 3 other mono-oxygenated products. Subsequently, the removal kinetics of clindamycin and the formation of the two identified products were investigated in batch experiments using MBBR carriers from polishing and nitrifying reactors. Additionally, the presence of these two metabolites in biofilm-free wastewater effluent was studied. The nitrifying biofilm reactor had a higher biological activity with k-value of 0.1813 h⁻¹ than the reactor with polishing biofilm (k = 0.0161 h⁻¹) which again has a much higher biological activity for removal of clindamycin than of the suspended bacteria (biofilm-free control). Clindamycin sulfoxide was the main transformation product which was found in concentrations exceeding 10% of the initial clindamycin concentration after 1 day of MBBR treatment. Thus, MBBRs should not necessarily be considered as reactors mineralizing clindamycin as they perform transformation reactions at least to some extent.
Treatment of Arctic Wastewater by Chemical Coagulation, UV and Peracetic Acid Disinfection

Conventional wastewater treatment is challenging in the Arctic region due to the cold climate and scattered population. Thus, no wastewater treatment plant exists in Greenland and raw wastewater is discharged directly to nearby waterbodies without treatment. We investigated the efficiency of physico-chemical wastewater treatment, in Kangerlussuaq, Greenland. Raw wastewater from Kangerlussuaq was treated by chemical coagulation and UV disinfection. By applying 7.5 mg Al/L polyaluminium chloride (PAX XL100), 73% of turbidity and 28% phosphate was removed from raw wastewater. E. coli and Enterococcus were removed by 4 and 2.5 log, respectively, when UV irradiation of 0.70 kWh/m³ was applied to coagulated wastewater. Furthermore, coagulated raw wastewater in Denmark, which has a chemical quality similar to Greenlandic wastewater, was disinfected by peracetic acid or UV irradiation. Removal of heterotrophic bacteria by applying 6 mg/L and 12 mg/L peracetic acid was 2.8 and 3.1 log, respectively. Similarly, removal of heterotrophic bacteria
by applying 0.21 kWh/m³ and 2.10 kWh/m³ for UV irradiation was 2.1 and greater than 4 log, respectively. Physico-
chemical treatment of raw wastewater followed by UV irradiation and/or peracetic acid disinfection showed the potential for
treatment of arctic wastewater.

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Organisations: Department of Environmental Engineering, Water Technologies, Department of Civil Engineering, ARTEK,
Section for Arctic Engineering and Sustainable Solutions, Technical University of Denmark
Authors: Chhetri, R. K. (Intern), Klupsch, E. (Ekstern), Andersen, H. R. (Intern), Jensen, P. E. (Intern)
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Scopus rating (2015): SJR 0.906 SNIP 1.049 CiteScore 2.5
Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 0.99 SNIP 1.199 CiteScore 2.57
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BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.942 SNIP 1.179 CiteScore 2.34
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
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ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.203 SNIP 1.171 CiteScore 2.3
ISI indexed (2011): ISI indexed yes
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BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.148 SNIP 1.107
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.085 SNIP 1.021
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.952 SNIP 1.035
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.814 SNIP 0.989
Web of Science (2007): Indexed yes
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Scopus rating (2005): SJR 0.595 SNIP 0.933
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Tuning biomimetic membrane barrier properties by hydrocarbon, cholesterol and polymeric additives

The barrier properties of cellular membranes are increasingly attracting attention as a source of inspiration for designing biomimetic membranes. The broad range of potential technological applications makes the use of lipid and lately also polymeric materials a popular choice for constructing biomimetic membranes, where the barrier properties can be controlled by the composition of the membrane constituent elements. Here we investigate the membrane properties reported by the light-induced proton pumping activity of bacteriorhodopsin (bR) reconstituted in three vesicle systems of different membrane composition. Specifically we quantify how the resulting proton influx and efflux rates are influenced by the membrane composition using a variety of membrane modulators. We demonstrate that by adding hydrocarbons to vesicles with reconstituted bR formed from asolectin lipids the resulting transmembrane proton fluxes changes proportional to the carbon chain length when compared against control. We observe a similar proportionality in single-component 1,2-Dioleoyl-sn-glycero-3-phosphocholine (DOPC) model membranes when using cholesterol. Lastly we investigate the effects of adding the amphiphilic di-block co-polymer polybutadiene-polyethyleneoxide (PB_{12}-PEO_{10}) to phospholipid membranes formed from DOPC, 1,2-Dioleoyl-sn-glycero-3-phosphatidylethanolamine (DOPE), and 1,2-Dioleoyl-sn-glycero-3-phosphatidylserine (DOPS). The proton pumping activity of bR (measured as a change in extravesicular pH) in mixed lipid/PB_{12}-PEO_{10} lipid systems is up to six-fold higher compared to that observed for bR containing vesicles made from PB_{12}-PEO_{10} alone. Interestingly, bR inserts with apparent opposite orientation in pure PB_{12}-PEO_{10} vesicles as compared to pure lipid vesicles. Addition of equimolar amounts of lipids to PB_{12}-PEO_{10} results in bR orientation similar to that observed for pure lipids. In conclusion our results show how the barrier properties of the membranes can be controlled by the composition of the membrane. In particular the use of mixed lipid-polymer systems may pave the way for constructing biomimetic membranes tailored for optimal properties in various applications including drug delivery systems, biosensors and energy conservation technology.
General information
State: Published
Organisations: Department of Physics, Biophysics and Fluids, Quantum Physics and Information Technology, Department of Environmental Engineering, Water Technologies, University of Copenhagen, Lund University
Authors: Palanco, M. E. (Intern), Skovgaard, N. (Ekstern), Hansen, J. S. (Ekstern), Berg-Sørensen, K. (Intern), Hélix-Nielsen, C. (Intern)
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Scopus rating (2016): CiteScore 2.6 SJR 0.909 SNIP 1.232
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BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.077 SNIP 1.679 CiteScore 2.87
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Scopus rating (2013): SJR 0.954 SNIP 1.868 CiteScore 3.04
ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 0.751 SNIP 1.73 CiteScore 2.47
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BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.691 SNIP 1.448 CiteScore 2.18
ISI indexed (2011): ISI indexed no
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Scopus rating (2010): SJR 0.548 SNIP 1.154
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Unmanned Aerial Vehicle observations of water surface elevation, depth and surface velocity

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Organisations: Department of Environmental Engineering, Water Resources Engineering, Photrack AG
Authors: Bandini, F. (Intern), Kittel, C. M. M. (Intern), Lüthi, B. (Ekstern), Garcia, M. (Intern), Bauer-Gottwein, P. (Intern)
Number of pages: 2
Urban runoff forecasting with ensemble weather predictions
This research shows how ensemble weather forecasts can be used to generate urban runoff forecasts up to 53 hours into the future. The results highlight systematic differences between ensemble members that needs to be accounted for when these forecasts are used in practice.

Use of fluorescence spectroscopy to control ozone dosage in recirculating aquaculture systems
The aim of this study was to investigate the potential of fluorescence spectroscopy to be used as an ozone dosage determination tool in recirculating aquaculture systems (RASs), by studying the relationship between fluorescence intensities and dissolved organic matter (DOM) degradation by ozone, in order to optimise ozonation treatment. Water samples from six different Danish facilities (two rearing units from a commercial trout RAS, a commercial eel RAS, a pilot RAS and two marine water aquariums) were treated with different O3 dosages (1.0–20.0 mg/L ozone) in bench-scale experiments, following which fluorescence intensity degradation was eventually determined. Ozonation kinetic experiments showed that RAS water contains fluorescent organic matter, which is easily oxidised upon ozonation in relatively low concentrations (0–5 mg O3/L). Fluorescence spectroscopy has a high level of sensitivity and selectivity in relation to associated fluorophores, and it is able to determine accurately the ozone demand of each system. The findings can potentially be used to design offline or online sensors based on the reduction by ozone of natural fluorescent-dissolved organic matter in RAS. The suggested indirect determination of ozone delivered into water can potentially contribute to a safer and more adequate ozone-based treatment to improve water quality.
Natural fluorescence, Online fluorescence sensor, Ozonation, Ozone dosage determination, Recirculating aquaculture, Ecological Modeling, Water Science and Technology, Waste Management and Disposal, Pollution
Using a time-lagged method to enhance Numerical Weather Prediction for urban drainage applications

General information
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Organisations: Department of Environmental Engineering, Urban Water Systems, Krüger A/S
Authors: Courdent, V. (Ekstern), Pedersen, J. W. (Intern), Munk-Nielsen, T. (Ekstern), Mikkelsen, P. S. (Intern)
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UV-Vis spectrophotometry for Wastewater Resource Recovery with Algae Photobioreactors

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Organisations: Department of Environmental Engineering, Water Technologies, Technical University of Denmark, Swiss Federal Institute of Aquatic Science and Technology
Authors: Valverde Pérez, B. (Intern), Wágner, D. S. (Intern), Steidl, M. (Ekstern), Villez, K. (Ekstern), Plósz, B. G. (Intern)
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Volatile compounds emission and health risk assessment during composting of organic fraction of municipal solid waste
Degradation of mechanically sorted organic fraction (MSOF) of municipal solid waste in composting facilities is among the major contributors of volatile compounds (VCs) generation and emission, causes nuisance problems and health risks on site as well as in the vicinages. The aim of current study was to determine the seasonal (summer and winter) variation and human health risk assessment of VCs in the ambient air of different processing units in MSOF at composting plant in China. Average concentration of VCs was 58.50 and 138.03 mg/m³ in summer and winter respectively. Oxygenated compounds were found to be the highest concentration (46.78–91.89 mg/m³) with ethyl alcohol as the major specie (43.90–85.31 mg/m³) in the two seasons respectively. Nevertheless, individual non-carcinogenic ( Hazard relation i.e HR < 1) and carcinogenic risk (CR < 1.0E-04) of the quantified VCs were within acceptable limit except naphthalene at biofilter unit. In addition, cumulative non-carcinogenic risk exceeded from the threshold limit both in summers and winters in all units except at biofilter unit during winter. Furthermore cumulative carcinogenic risk also exceeded at same unit during the summer season. Therefore special attention should be made to minimize cumulative non-carcinogenic and carcinogenic risk as people are well exposed to mixture of compounds, not to individual.

General information
State: Published
Organisations: Department of Environmental Engineering, Tsinghua University
Authors: Mustafa, M. F. (Ekstern), Liu, Y. (Ekstern), Duan, Z. (Intern), Guo, H. (Ekstern), Xu, S. (Ekstern), Wang, H. (Ekstern), Lu, W. (Ekstern)
Waste prevention for sustainable resource and waste management

Although the 2Rs (reduce and reuse) are considered high-priority approaches, there has not been enough quantitative research on effective 2R management. The purpose of this paper is to provide information obtained through the International Workshop in Kyoto, Japan, on 11–13 November 2015, which included invited experts and researchers in several countries who were in charge of 3R policies, and an additional review of 245 previous studies. It was found that, regarding policy development, the decoupling between environmental pressures and economy growth was recognized as an essential step towards a sustainable society. 3R and resource management policies, including waste prevention, will play a crucial role. Approaches using material/substance flow analyses have become sophisticated enough to describe the fate of resources and/or hazardous substances based on human activity and the environment, including the final sink. Life-cycle assessment has also been developed to evaluate waste prevention activities. Regarding target products for waste prevention, food loss is one of the waste fractions with the highest priority because its countermeasures have significant upstream and downstream effects. Persistent organic pollutants and hazardous compounds should also be taken into account in the situation where recycling activities are globally widespread for the promotion of a material-cycling society.
Wastewater-based epidemiology to assess pan-European pesticide exposure

Human biomonitoring, i.e. the determination of chemicals and/or their metabolites in human specimens, is the most common and potent tool for assessing human exposure to pesticides, but it suffers from limitations such as high costs and biases in sampling. Wastewater-based epidemiology (WBE) is an innovative approach based on the chemical analysis of specific human metabolic excretion products (biomarkers) in wastewater, and provides objective and real-time information on xenobiotics directly or indirectly ingested by a population. This study applied the WBE approach for the first time to evaluate human exposure to pesticides in eight cities across Europe. 24 h-composite wastewater samples were collected from the main wastewater treatment plants and analyzed for urinary metabolites of three classes of pesticides, namely triazines, organophosphates and pyrethroids, by liquid chromatography-tandem mass spectrometry. The mass loads (mg/day/1000 inhabitants) were highest for organophosphates and lowest for triazines. Different patterns were observed among the cities and for the various classes of pesticides. Population weighted loads of specific biomarkers indicated higher exposure in Castellon, Milan, Copenhagen and Bristol for pyrethroids, and in Castellon, Bristol and Zurich for organophosphates. The lowest mass loads (mg/day/1000 inhabitants) were found in Utrecht and Oslo. These results were in agreement with several national statistics related to pesticides exposure such as pesticides sales. The daily intake of pyrethroids was estimated in each city and it was found to exceed the acceptable daily intake (ADI) only in one city (Castellon, Spain). This was the first large-scale application of WBE to monitor population exposure to pesticides. The results indicated that WBE can give new information about the "average exposure" of the population to pesticides, and is a useful complementary biomonitoring tool to study population-wide exposure to pesticides.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, Istituto di Ricerche Farmacologiche Mario Negri, University Jaume I, Norwegian Institute for Water Research, University of Bath, KWR Watercycle Research Institute, University of Antwerp, Swiss Federal Institute of Aquatic Science and Technology (Eawag)
Authors: Rousis, N. I. (Ekstern), Gracia-Lor, E. (Ekstern), Zuccato, E. (Ekstern), Bade, R. (Ekstern), Baz-Lomba, J. A. (Ekstern), Castrignanò, E. (Ekstern), Causanilles, A. (Ekstern), Covaci, A. (Ekstern), de Voogt, P. (Ekstern), Hernández, F. (Ekstern), Kasprzyk-Hordern, B. (Ekstern), Kinyua, J. (Ekstern), McCall, A. (Ekstern), Plösz, B. G. (Intern), Ramin, P. (Intern), Ryu, Y. (Ekstern), Thomas, K. V. (Ekstern), van Nuijs, A. (Ekstern), Yang, Z. (Ekstern), Castiglioni, S. (Ekstern)
Pages: 270-279
Water level observations from Unmanned Aerial Vehicles for improving estimates of surface water-groundwater interaction

Integrated hydrological models are usually calibrated against observations of river discharge and piezometric head in groundwater aquifers. Calibration of such models against spatially distributed observations of river water level can potentially improve their reliability and predictive skill. However, traditional river gauging stations are normally spaced too far apart to capture spatial patterns in the water surface, while spaceborne observations have limited spatial and temporal resolution. UAVs (Unmanned Aerial Vehicles) can retrieve river water level measurements, providing: i) high spatial resolution; ii) spatially continuous profiles along or across the water body; iii) flexible timing of sampling. A semi-synthetic study was conducted to analyse the value of the new UAV-borne datatype for improving hydrological models, in particular estimates of GW (Groundwater)- SW (Surface Water) interaction. Mølleåen River (Denmark) and its catchment were simulated using an integrated hydrological model (MIKE 11-MIKE SHE). Calibration against distributed surface water levels using the DiffeRential Evolution Adaptive Metropolis (DREAM) algorithm demonstrated a significant improvement in estimating spatial patterns and time series of GW-SW interaction. After water level calibration, the sharpness of the estimates of GW-SW time series improves of ca. 50% and RMSE (Root Mean Square Error) decreases by ca. 75% compared to a model calibrated against discharge only.
Weather radar rainfall data in urban hydrology

Application of weather radar data in urban hydrological applications has evolved significantly during the past decade as an alternative to traditional rainfall observations with rain gauges. Advances in radar hardware, data processing, numerical models, and emerging fields within urban hydrology necessitate an updated review of the state of the art in such radar rainfall data and applications. Three key areas with significant advances over the past decade have been identified: (1) temporal and spatial resolution of rainfall data required for different types of hydrological applications, (2) rainfall estimation, radar data adjustment and data quality, and (3) nowcasting of radar rainfall and real-time applications. Based on these three fields of research, the paper provides recommendations based on an updated overview of shortcomings, gains, and novel developments in relation to urban hydrological applications. The paper also reviews how the focus in urban hydrology research has shifted over the last decade to fields such as climate change impacts, resilience of urban areas to hydrological extremes, and online prediction/warning systems. It is discussed how radar rainfall data can add value to the aforementioned emerging fields in current and future applications, but also to the analysis of integrated water systems.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Aalborg University, hydro & meteo GmbH & Co. KG, KU Leuven, Delft University of Technology, ETH Zurich
Authors: Thorndahl, S. (Ekstern), Einfalt, T. (Ekstern), Willems, P. (Ekstern), Nielsen, J. E. (Ekstern), ten Veldhuis, M. (Ekstern), Arnbjerg-Nielsen, K. (Intern), Rasmussen, M. R. (Ekstern), Molnar, P. (Ekstern)
Number of pages: 22
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Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Hydrology and Earth System Sciences
Volume: 21
Issue number: 3
ISSN (Print): 1027-5606
What can nanosafety learn from drug development? The feasibility of "safety by design"

"Safety by design" (SbD) is an intuitively appealing concept that is on the rise within nanotoxicology and nanosafety research, as well as within nanotechnology research policy. It leans on principles established within drug discovery and development (DDD) and seeks to address safety early, as well as throughout product development. However, it remains unclear what the concept of SbD exactly entails for engineered nanomaterials (ENMs) or how it is envisioned to be implemented. Here, we review the concept as it is emerging in European research and compare its resemblance with the safety testing and assessment practices in DDD. From this comparison, it is clear that "safety" is not obtained through DDD, and that SbD should be considered a starting point rather than an end, meaning that products will still need to progress through thorough safety evaluations and regulation. We conclude that although risk reduction is clearly desirable, the way SbD is currently communicated tends to treat safety as an inherent material property and that this is fundamentally problematic as it represents a recasting and reduction of societal issues into technical problems. SbD therefore faces a multitude of challenges, from practical implementation to unrealistic stakeholder expectations.
What type of shopping bag to use? Perspectives on the functionality and recycling of polymers

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Damgaard, A. (Intern), Bisinella, V. (Intern)
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Place of publication: Kgs. Lyngby, Denmark
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ABSTRACT BOOK
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Whole-genome sequence of Starmerella bacillaris PAS13, a nonconventional enological yeast with antifungal activity
Starmerella bacillaris is a fermentative yeast commonly found in vineyards. Here, we present the draft genome sequence of S. bacillaris PAS13, a nonconventional enological yeast with a potential role as a biocontrol agent. This gene sequence will provide insights into the genetic basis of yeast activity against gray mold disease (Botrytis cinerea).

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padova, Universidade Federal de Vicosa
Authors: Lemos Junior, W. J. F. (Ekstern), Treu, L. (Intern), Duarte, V. D. S. (Ekstern), Carlot, M. (Ekstern), Nadai, C. (Ekstern), Campanaro, S. (Ekstern), Giacomini, A. (Ekstern), Corich, V. (Ekstern)
Number of pages: 2
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Genome Announcements
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Scopus rating (2015): SJR 0.591 SNIP 0.398
Scopus rating (2014): SJR 0.539 SNIP 0.344
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Original language: English
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10.1128/genomeA.00788-17
Whole-Genome Sequences of Three Streptococcus macedonicus Strains isolated from Italian Cheeses in the Veneto Region

We report here the genome sequences of three Streptococcus macedonicus strains isolated from different cheeses in the Veneto region of Italy. The presented data aim at increasing the scarce genomic information available for this species, which is frequently encountered in fermented foods and appears to be a promising technological microorganism.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padua, Agricultural University of Athens, Technical University of Denmark
Authors: Treu, L. (Intern), de Diego-Díaz, B. (Ekstern), Papadimitriou, K. (Ekstern), Tsakalidou, E. (Ekstern), Giacomini, A. (Ekstern), Corich, V. (Ekstern)
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Scopus rating (2017): SNIP 0.407 SJR 0.553 CiteScore 1.01
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Web of Science (2016): Indexed yes
Scopus rating (2015): SJR 0.591 SNIP 0.398
Scopus rating (2014): SJR 0.539 SNIP 0.344
ISI indexed (2013): ISI indexed no
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DOIs:
10.1128/genomeA.01358-17
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Wirelessly powered submerged-light illuminated photobioreactors for efficient microalgal cultivation

A novel submerged-light photobioreactor (SL-PBR) with free-floating, wireless internal light sources powered by near-field resonant inductive coupling was investigated using a quick (Chlorella vulgaris) and a slow (Haematococcus pluvialis) growing microalgal species. During testing of the SL-PBR, the yield on photons was 1.18 and 1.15 g biomass mol−1 photons for C. vulgaris and H. pluvialis, respectively. At the same time, a conventional, externally illuminated PBR with the same internal light intensity produced yields of 0.78 and 0.05 g biomass mol−1 photons for C. vulgaris and H. pluvialis, respectively. Thus, the wireless internal light source was proven to be up to fivefold more effective light delivery system compared to the conventional illumination system. Meanwhile, it was discovered that some of the internal light sources had ceased to function, which might have caused underestimation of the true yield. Interestingly, the SL-PBR provided more uniform light to the culture and had the ability to reduce the presence of dark zones and the effect of self-shading. Thus, the SL-PBR showed potential, if subsequent prototype designs address the technical challenges identified during this study.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Residual Resource Engineering, Swiss Federal Institute of Technology
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WISE – Water Innovation SmE’s – Innovative solutions with in the water field

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Godskesen, B. (Intern)
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Publisher: University of Copenhagen
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Main Research Area: Technical/natural sciences
Conference: 11th Annual Meeting of Danish Water Forum, Copenhagen, Denmark, 30/01/2017
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System and method to control h2o2 level in advanced oxidation processes
The present invention relates to a bio-electrochemical system (BES) and a method of in-situ production and removal of H2O2 using such a bio-electrochemical system (BES). Further, the invention relates to a method for in-situ control of H2O2 content in an aqueous system of advanced oxidation processes (AOPs) involving in-situ generation of hydroxyl radical (OH) by using such a bio-electrochemical system (BES) and to a method for treatment of wastewater and water disinfection. The bio-electrochemical system (BES) according to the invention comprises: - an aqueous cathode compartment comprising a first cathode and a second cathode, - an aqueous anode compartment comprising an anode at
least partly covered in biofilm, wherein the first cathode is connected to a first circuit and the second cathode is connected to a second circuit, wherein the first and the second circuit are connected to the system by an external switch.

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State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Angelidaki, I. (Intern), Zhang, Y. (Intern)
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30 years of geophysical data - one groundwater model structure

General information
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Organisations: Department of Environmental Engineering, Water Resources Engineering, Aarhus University
Authors: Vilhelmsen, T. N. (Ekstern), Christiansen, A. V. (Ekstern), Foged, N. (Ekstern), Marker, P. A. (Intern), Auken, E. (Ekstern)
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Main Research Area: Technical/natural sciences
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Electronic versions:
DWF_30_years_of_geophysical_data_one_groundwater_model_structure.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

A Bayesian belief network approach for assessing uncertainty in conceptual site models at contaminated sites
A key component in risk assessment of contaminated sites is in the formulation of a conceptual site model (CSM). A CSM is a simplified representation of reality and forms the basis for the mathematical modeling of contaminant fate and transport at the site. The CSM should therefore identify the most important site-specific features and processes that may affect the contaminant transport behavior at the site. However, the development of a CSM will always be associated with uncertainties due to limited data and lack of understanding of the site conditions. CSM uncertainty is often found to be a major source of model error and it should therefore be accounted for when evaluating uncertainties in risk assessments.

We present a Bayesian belief network (BBN) approach for constructing CSMs and assessing their uncertainty at contaminated sites. BBNs are graphical probabilistic models that are effective for integrating quantitative and qualitative information, and thus can strengthen decisions when empirical data are lacking. The proposed BBN approach facilitates a systematic construction of multiple CSMs, and then determines the belief in each CSM using a variety of data types and/or expert opinion at different knowledge levels. The developed BBNs combine data from desktop studies and initial site investigations with expert opinion to assess which of the CSMs are more likely to reflect the actual site conditions. The method is demonstrated on a Danish field site, contaminated with chlorinated ethenes. Four different CSMs are developed by combining two contaminant source zone interpretations (presence or absence of a separate phase contamination) and two geological interpretations (fractured or unfractured clay till). The beliefs in each of the CSMs are assessed sequentially based on data from three investigation stages (a screening investigation, a more detailed investigation, and an expert consultation) to demonstrate that the belief can be updated as more information becomes available.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, The James Hutton Institute, Capital Region of Denmark
Accelerated Molecular Dynamics Simulations of Phosphate Binding Proteins

General information
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Organisations: Department of Environmental Engineering, Water Technologies
Authors: Truelsen, S. F. (Intern)
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Publication information
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.06 SJR 1.988 SNIP 1.005
Web of Science (2016): Indexed yes
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Scopus rating (2015): SJR 2.13 SNIP 1.134 CiteScore 3.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.21 SNIP 1.15 CiteScore 3.33
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.245 SNIP 1.156 CiteScore 3.64
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.361 SNIP 1.143 CiteScore 3.57
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Acclimation of continuous biomethanation process to extremely high ammonia levels

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Tian, H. (Intern), Mancini, E. (Intern), Fotidis, I. (Intern), Angelidaki, I. (Intern)
Number of pages: 1
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Main Research Area: Technical/natural sciences
Adaptation, Ammonia inhibition, Anaerobic digestion, CSTR
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Source: PublicationPreSubmission
Source-ID: 132514255
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Accounting for multiple functions in environmental life cycle assessment of storm water management solutions
The wide range of approaches to handle storm water runoff have varying effects on the environment. Local stormwater control measures for retention and treatment are increasingly used components in urban climate adaptation plans. Often, these solutions modify the multiple functions of urban environments by adding green and blue elements, and they change the water balance compared to traditional, underground approaches. Additionally, different implementation and
maintenance processes are required. All of these transformations affect the environmental impacts of urban storm water management (SWM) systems, which can be quantified using Life Cycle Assessment (LCA). This study aims to define the multiple functions provided by a SWM system at sub-catchment scale, and to assess the environmental impacts arising from fulfilling these functions. The approach is tested using the Nørrebro catchment in Copenhagen, Denmark, where extensive implementation of green infrastructure is planned to mitigate the adverse effects of climate change. This « green » scenario is compared to a traditional « grey » solution, utilizing pipes and basins. The environmental impacts, which are dominated by material production in both scenarios, are significantly lower for the « green » solution (35% down to 8% of the “grey” impacts). The allocation of impacts shows that the various functions of the SWM systems cause different impacts.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Brudler, S. (Intern), Arnbjerg-Nielsen, K. (Intern), Rygaard, M. (Intern)
Number of pages: 4
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A certain shade of green: Can algal pigments reveal shading effects of nanoparticles?

General information
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Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Hjorth, R. (Intern), Sørensen, S. N. (Intern), Olsson, M. E. (Intern), Baun, A. (Intern), Hartmann, N. B. (Intern)
Number of pages: 2
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Main Research Area: Technical/natural sciences

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BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.954 SJR 0.779 CiteScore 1.72
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.714 SNIP 0.715 CiteScore 1.56
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.803 SNIP 0.643 CiteScore 1.34
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.866 SNIP 1.047 CiteScore 1.39
BFI (2013): BFI-level 1
A conceptual framework for invasion in microbial communities

There is a growing interest in controlling—promoting or avoiding—the invasion of microbial communities by new community members. Resource availability and community structure have been reported as determinants of invasion success. However, most invasion studies do not adhere to a coherent and consistent terminology nor always include rigorous interpretations of the processes behind invasion. Therefore, we suggest that a consistent set of definitions and a rigorous conceptual framework are needed. We define invasion in a microbial community as the establishment of an alien microbial type in a resident community and argue how simple criteria to define aliens, residents, and alien establishment can be applied for a wide variety of communities. In addition, we suggest an adoption of the community ecology framework advanced by Vellend (2010) to clarify potential determinants of invasion. This framework identifies four fundamental processes that control community dynamics: dispersal, selection, drift and diversification. While selection has received ample attention in microbial community invasion research, the three other processes are often overlooked. Here, we elaborate on the relevance of all four processes and conclude that invasion experiments should be designed to elucidate the role of dispersal, drift and diversification, in order to obtain a complete picture of invasion as a community process.

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Organisations: Department of Environmental Engineering, Water Technologies, Swiss Federal Institute of Aquatic Science and Technology, Newcastle University, King Abdullah University of Science and Technology, Ghent University
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A conceptual framework for invasion in microbial communities

General information
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Conference: MEWE and biofilms IWA specialist conference, Copenhagen, Denmark, 04/09/2016 - 04/09/2016
Electronic versions: MEWE2016_AbstractBookKinnunen.pdf
Nitrous oxide (N₂O), a potent greenhouse gas, is produced during biological nitrogen conversion in wastewater treatment operations. Complex mechanisms underlie N₂O production by autotrophic and heterotrophic organisms, which continue to be unravelled. Mathematical models that describe nitric oxide (NO) and N₂O dynamics have been proposed. Here, a first comprehensive model that considers all relevant NO and N₂O production and consumption mechanisms is proposed. The model describes autotrophic NO production by ammonia oxidizing bacteria associated with ammonia oxidation and with nitrite reduction, followed by NO reduction to N₂O. It also considers NO and N₂O as intermediates in heterotrophic denitrification in a 4-step model. Three biological NO and N₂O production pathways are accounted for, improving the capabilities of existing models while not increasing their complexity. Abiotic contributions from NH₂OH and HNO₂ reactions are also included. The consilient model structure can theoretically predict NO and N₂O emissions under a wide range of operating conditions and will help develop mitigation strategies.
Acute toxicity of sea-dumped chemical munitions: Luminating the environmental toxicity of legacy compounds

As a result of the disarmament of Germany after the Second World War, 65,000 tons of chemical munitions were dumped in the Baltic Sea. Approximately 13,000 tons containing chemical warfare agents (CWAs) of which 11,000 tons were dumped in the Bornholm Basin east of Bornholm. This paper addresses the ecotoxicity of compounds actually present in the Bornholm dumpsite by obtaining novel acute ecotoxicity data. EC50 values were successfully obtained for 12 CWAs from acute tests using Allivibrio fischeri (Microtox™). The three most toxic compounds were α-chloroacetophenone, 2-chlorovinylarsonic acid and 1,2,5-trithiepane having EC50 values of 11.20, 31.20 and 1170 μg L−1, respectively. A. fischeri demonstrated hormesis when exposed to triphenylarsine and triphenylarsine oxide at concentrations of 100 and 50 mg L−1, respectively. Four different mixtures were assessed including compounds which were dissolvable; a mixture of sulphur mustard degradation products, a mixture of the three most toxic sulphur mustard compounds, a mixture of organoarsenical degradation products and a mixture of all compounds. The mixtures deviate by a factor of 1.5–2.5 from the prediction of the concentration addition model and hence, the mixtures demonstrate no sign of synergism or antagonism. The compounds presented in this study are mainly CWA.

General information
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Organisations: Department of Environmental Engineering, Environmental Chemistry, Technical University of Denmark, Aarhus University
Authors: Mohammed Abdullah Christensen, I. (Ekstern), Sanderson, H. (Ekstern), Baatrup, E. (Ekstern), Storgaard, M. S. (Ekstern), Fauser, P. (Ekstern), Hansen, S. F. (Intern)
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Chemical warfare agents, Baltic sea, Environmental toxicity, Allivibrio fischeri, Legacy compounds
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Christensen_et_al_2016_Sea_dumped_chemicals_.pdf
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10.1080/23779497.2016.1219962
Source: FindIt
Source-ID: 2341877482
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Adaptation of water resources systems to changing society and environment: a statement by the International Association of Hydrological Sciences

We explore how to address the challenges of adaptation of water resources systems under changing conditions by supporting flexible, resilient and low-regret solutions, coupled with on-going monitoring and evaluation. This will require improved understanding of the linkages between biophysical and social aspects in order to better anticipate the possible future co-evolution of water systems and society. We also present a call to enhance the dialogue and foster the actions of governments, the international scientific community, research funding agencies and additional stakeholders in order to develop effective solutions to support water resources systems adaptation. Finally, we call the scientific community to a renewed and unified effort to deliver an innovative message to stakeholders. Water science is essential to resolve the
water crisis, but the effectiveness of solutions depends, inter alia, on the capability of scientists to deliver a new, coherent and technical vision for the future development of water systems.

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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.908 SJR 0.939 CiteScore 2.01
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.061 SNIP 1.133 CiteScore 2.05
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.003 SNIP 1.004 CiteScore 1.82
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.942 SNIP 0.995 CiteScore 1.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.891 SNIP 1.108 CiteScore 1.6
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.771 SNIP 0.813 CiteScore 1.22
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.009 SNIP 1.023 CiteScore 1.63
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.002 SNIP 1.169
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.054 SNIP 1.052
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.241 SNIP 1.051
Scopus rating (2007): SJR 1.224 SNIP 1.348
Scopus rating (2006): SJR 1.412 SNIP 1.516
Scopus rating (2005): SJR 1.19 SNIP 1.204
Scopus rating (2004): SJR 1.087 SNIP 1.315
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.989 SNIP 1.249
Addressing Current Challenges on Groundwater Model Structure through Effective Use of Geophysical Data

We wish to present a method for effective generation of structural models for groundwater flow simulations. The methodology is presented for two cases. A regional scale test, where geophysical data and borehole data is used for generating the regional scale hydrostratigraphy, and a local detailed case, where the same methodology is used to address the question of structural uncertainty.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering
Authors: Vilhelmsen, T. N. (Ekstern), Marker, P. A. (Intern), Foged, N. (Ekstern), Christiansen, A. V. (Ekstern), Auken, E. (Ekstern), Bauer-Gottwein, P. (Intern)
Publication date: 2016
Event: Abstract from 78th EAGE Conference and Exhibition 2016, Vienna, Austria.
Main Research Area: Technical/natural sciences
DOIs: 10.3997/2214-4609.201601660
Source: FindIt
Source-ID: 2303933606
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Addressing structural uncertainty of groundwater model predictions with ensemble of automatically generated models from AEM geophysical data and borehole data

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Aarhus University
Authors: Marker, P. A. (Intern), Vilhelmsen, T. N. (Ekstern), Foged, N. (Ekstern), Auken, E. (Ekstern), Bauer-Gottwein, P. (Intern)
Pages: 36-36
Publication date: 2016

Addressing water challenges on the North China Plain with hydroeconomic optimization

With its diverse environment and large population, China is facing water resource challenges, both in terms of quantity and quality. The North China Plain (NCP) is one of the world’s most densely populated areas and one of the highly water stressed regions of China. It counts for 15% of the Chinese GDP, from both industry and agriculture. The high water demand for especially irrigation has caused decade long groundwater depletion, ecosystem deterioration and high pollution loads in the region. To alleviate the water crisis of Northern China the South-North Water Transfer Project has
been constructed. However, the project alone cannot solve the NCP’s water crisis. A hydroeconomic optimization model has been developed for the NCP system. The model area represents the administrative area of the Hai River Commission. The challenges addressed are the spatio-temporal distribution of costs and curtailments from achieving a sustainable water allocation policy, especially focusing on groundwater abstraction and ecological minimum flows. Efficient linear programming solvers (LP) are used to enable adequate representation of the physical water delivery system and to move away from system simplifications. This enables the representation of links and interactions between the water resources system and the power system of Northern China. The multi-reservoir LP model is formulated as a flow path based optimization, which tracks each water delivery from supplier to receiver. This is useful for the exploration of optimal water allocation as well as water trading policies and other economic measures. The suggested setup is a move towards a more applicable and implementable model.

A baseline run producing business-as-usual costs and deliveries across space and time is presented and compared with a model run including sustainability constraints. This shows changes in allocations and costs of ending groundwater depletion and keeping water quality criteria. It further reflects the conflict between sustainability and economic output of the energy, food and industrial sectors in a water resource management framework.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Chinese Academy of Sciences
Authors: Martinsen, G. (Intern), Davidsen, C. (Intern), Bauer-Gottwein, P. (Intern), Liu, S. (Ekstern), Mo, X. (Ekstern), Jia, S. (Ekstern)
Number of pages: 1
Publication date: 2016
Event: Abstract from 7th International Water Resources Management Conference of ICWRS, Bochum, Germany.
Main Research Area: Technical/natural sciences

**Advancing the Chinese water challenges with hydroeconomic modelling**

**General information**

State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Environmental Chemistry, Chinese Academy of Sciences, University of Copenhagen
Authors: Davidsen, C. (Intern), Liu, S. (Ekstern), Mo, X. (Ekstern), Holm, P. E. (Ekstern), Trapp, S. (Intern), Bauer-Gottwein, P. (Intern)
Pages: 20-20
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Publisher: Danish Water Forum
Main Research Area: Technical/natural sciences
Conference: 10th annual meeting of Danish Water Forum (DWF), Frederiksberg, Denmark, 28/01/2016 - 28/01/2016
Electronic versions:

DWF_Addressing_the_Chinese_water_challenges_with_hydroeconomic_modelling.pdf

Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

**Advances in FACE and manipulation techniques**

Experimental techniques to expose plants and ecosystems to elevated CO₂ have been around for decades, starting out with branch cuvettes, chambers and green houses and in the 90ies leading to the development of the FACE (Free Air Carbon Enrichment) technique, which has been and still is widely used. The FACE technique is used under field conditions and has been developed over the years to be applied for many types of ecosystems from low stature shrub, grass and arable lands to high stature forest trees. These experiments have provided extensive knowledge and data on CO₂ effects on individual plants and processes as well as whole terrestrial ecosystems. The ultimate goal of any experiment is to mimic future conditions and stress factors in a realistic and/or relevant way and to measure important and relevant responses at various spatial scales. FACE experiments are still facing some clear challenges when it comes to the experimentation or scenarios typically tested as well as the response measurements performed, challenges that limits our knowledge and understanding and need to be addressed and overcome in the future. With respect to the experimentation and scenarios, a significant constraint for FACE experiments is the cost of the CO₂ in such experiments which increases substantially with ring sizes and vegetation height as well as of course the number of replicates. FACE experiments can relatively easily be combined with other stress factors, but for every factor a full factorial combination doubles the costs. Consequently, very few combination studies exist and knowledge on interactions among CO₂ and other
factors is still very limited, and especially interactions with extreme weather events are largely unknown. However, recent data suggests that such interactions are important and may not be easily forecasted from single factor experiments. With respect to response measurements, a key scientific question is how elevated CO$_2$ will affect the atmosphere-biosphere feedback. However, there are significant challenges associated with directly measuring the ecosystem carbon balance in FACE experiments, and despite numerous such experiments, there is a general lack of carbon feedback measurements.

General information
State: Published
Organisations: Department of Environmental Engineering, Atmospheric Environment, University of Copenhagen
Authors: Beier, C. (Ekstern), Larsen, K. S. (Ekstern), Mikkelsen, T. N. (Intern)
Number of pages: 1
Publication date: 2016
Event: Abstract from FACEing the future, Giessen, Germany.
Main Research Area: Technical/natural sciences
Electronic versions:
Pages_from_FACEingTheFuture_Giessen_2016_Book_of_Abstracts.pdf
Source: PublicationPreSubmission
Source-ID: 127313096
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

Advancing Alternative Analysis: Integration of Decision Science
Decision analysis—a systematic approach to solving complex problems—offers tools and frameworks to support decision making that are increasingly being applied to environmental challenges. Alternatives analysis is a method used in regulation and product design to identify, compare, and evaluate the safety and viability of potential substitutes for hazardous chemicals. Assess whether decision science may assist the alternatives analysis decision maker in comparing alternatives across a range of metrics. A workshop was convened that included representatives from government, academia, business, and civil society and included experts in toxicology, decision science, alternatives assessment, engineering, and law and policy. Participants were divided into two groups and prompted with targeted questions. Throughout the workshop, the groups periodically came together in plenary sessions to reflect on other groups’ findings. We conclude the further incorporation of decision science into alternatives analysis would advance the ability of companies and regulators to select alternatives to harmful ingredients, and would also advance the science of decision analysis. We advance four recommendations: (1) engaging the systematic development and evaluation of decision approaches and tools; (2) using case studies to advance the integration of decision analysis into alternatives analysis; (3) supporting transdisciplinary research; and (4) supporting education and outreach efforts.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Malloy, T. F. (Ekstern), Zaunbrecher, V. M. (Ekstern), Batteate, C. (Ekstern), Blake, A. (Ekstern), Carroll, W. F. (Ekstern), Corbett, C. J. (Ekstern), Hansen, S. F. (Intern), Lempert, R. (Ekstern), Linkov, I. (Ekstern), McFadden, R. (Ekstern), Moran, K. D. (Ekstern), Olivetti, E. (Ekstern), Ostrov, N. (Ekstern), Romero, M. (Ekstern), Schoenung, J. (Ekstern), Seager, T. (Ekstern), Sinsheimer, P. (Ekstern), Thayer, K. (Ekstern)
Number of pages: 53
Publication date: 2016
Main Research Area: Technical/natural sciences
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Journal: Environmental Health Perspectives
ISSN (Print): 0091-6765
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SNIP 2.351 SJR 3.41 CiteScore 6.07
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.62 SJR 3.131 SNIP 2.394
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 3.573 SNIP 2.391 CiteScore 5.58
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Advancing the Applicability of Alternatives Assessment for Engineered Nanomaterials

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, University of Massachusetts
Authors: Hjorth, R. (Intern), Hansen, S. F. (Intern), Jacobs, M. (Ekstern), Tickner, J. A. (Ekstern), Ellenbecker, M. (Ekstern), Baun, A. (Intern)
Pages: 166-167
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Afgivelse af organiske stoffer fra plastrør til drikkevand - videnstatus og løsninger

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Organisations: Department of Environmental Engineering
Authors: Arvin, E. (Intern)
Number of pages: 32
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Erik_Arvin_Plastindustrien_Dansk_Industri_18_marts_2016.pdf
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Publication: Research › Sound/Visual production (digital) – Annual report year: 2016

Afværgeforanstaltninger og monitorering

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Production and Service Management, Department of Management Engineering, Engineering Systems
Authors: Hansen, S. F. (Intern), Kozin, I. (Intern)
Pages: 25-30
Publication date: 2016

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Title of host publication: Videnskabelig udredning af international viden om skifergas relateret til en dansk kontekst : DTU, GEUS, DCE
Publisher: Aarhus Universitet, GEUS og Danmarks Tekniske Universitet
Chapter: 1.4
Main Research Area: Technical/natural sciences
Electronic versions:
DTU_GEUS_DCE_2016_Videnskabelig_udredning_af_international_viden_om_skifergas_relateret_til_en_dansk_kontekst.pdf
Publication: Commissioned › Report chapter – Annual report year: 2016

A global approach for sparse representation of uncertainty in Life Cycle Assessments of waste management systems
Purpose: Identification of key inputs and their effect on results from Life Cycle Assessment (LCA) models is fundamental. Because parameter importance varies greatly between cases due to the interaction of sensitivity and uncertainty, these features should never be defined a priori. However, exhaustive parametrical uncertainty analyses may potentially be complicated and demanding, both with analytical and sampling methods. Therefore, we propose a systematic method for selection of critical parameters based on a simplified analytical formulation that unifies the concepts of sensitivity and uncertainty in a Global Sensitivity Analysis (GSA) framework. Methods: The proposed analytical method based on the calculation of sensitivity coefficients (SC) is evaluated against Monte Carlo sampling on traditional uncertainty assessment procedures, both for individual parameters and for full parameter sets. Three full-scale waste management scenarios are modelled with the dedicated waste LCA model EASETECH and a full range of ILCD recommended impact categories. Common uncertainty ranges of 10 % are used for all parameters, which we assume to be normally distributed. The applicability of the concepts of additivity of variances and GSA is tested on results from both uncertainty propagation...
methods. Then, we examine the differences in discernibility analyses results carried out with varying numbers of sampling points and parameters. Results and discussion: The proposed analytical method complies with the Monte Carlo results for all scenarios and impact categories, but offers substantially simpler mathematical formulation and shorter computation times. The coefficients of variation obtained with the analytical method and Monte Carlo differ only by 1 %, indicating that the analytical method provides a reliable representation of uncertainties and allows determination of whether a discernibility analysis is required. The additivity of variances and the GSA approach show that the uncertainty in results is determined by a limited set of important parameters. The results of the discernibility analysis based on these critical parameters vary only by 1 % from discernibility analyses based on the full set, but require significantly fewer Monte Carlo runs. Conclusions: The proposed method and GSA framework provide a fast and valuable approximation for uncertainty quantification. Uncertainty can be represented sparsely by contextually identifying important parameters in a systematic manner. The proposed method integrates with existing step-wise approaches for uncertainty analysis by introducing a global importance analysis before uncertainty propagation.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Department of Applied Mathematics and Computer Science, Image Analysis & Computer Graphics
Authors: Bisinella, V. (Intern), Conradsen, K. (Intern), Christensen, T. H. (Intern), Astrup, T. F. (Intern)
Pages: 378-394
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Main Research Area: Technical/natural sciences

**Publication Information**
Journal: International Journal of Life Cycle Assessment
Volume: 21
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- BFI (2018): BFI-level 2
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Scopus rating (2017): SJR 1.268 SNIP 1.454 CiteScore 3.71
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 3.43 SJR 1.386 SNIP 1.517
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 1.53 SNIP 1.579 CiteScore 3.49
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 1.726 SNIP 1.78 CiteScore 3.65
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 2
- Scopus rating (2013): SJR 1.672 SNIP 1.978 CiteScore 3.35
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 2
- Scopus rating (2012): SJR 1.529 SNIP 1.707 CiteScore 2.89
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
- Scopus rating (2011): SJR 1.595 SNIP 1.737 CiteScore 2.82
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 2
- Scopus rating (2010): SJR 1.447 SNIP 1.826
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 2
- Scopus rating (2009): SJR 1.247 SNIP 1.644
Agricultural contamination in soil-groundwater-surface water systems in the North China Plain

The North China Plain is one of China's major economic zones and one of the most densely populated areas in the country. It covers a broad expanse of eastern China, extending from just below Beijing in the north down towards the Yangtze River in the south. This alluvial plain region is also one of China's main agricultural production zones, accounting for about one third of the national grain output. The dominant crop system is a winter wheat and summer maize rotation. Beginning in the 1980s, in an effort to increase agricultural productivity, China's government heavily promoted the use of fertilizers and pesticides. Unfortunately, the lack of regulation or oversight has led to the overuse of these agrochemicals: current application rates (in kg/ha) are two- to threefold higher than in most developed countries, and this is taking its toll on the environment. Problems include severe surface water and groundwater pollution by nitrogen and pesticides, soil degradation, bioaccumulation of toxic compounds, and more. It is crucial for China to do improve the safeguarding of its water resources in order to sustain the livelihoods of its people and ensure safe supply of drinking water.

Recently, the Chinese government and the scientific research community have acknowledged the need for more sustainable production techniques, and increasing quantities of money and effort are being directed toward achieving this goal. There has already been a great deal of improvement in determining the appropriate amounts of agricultural inputs, such as irrigation and fertilizers, as well as the ideal times to apply them. In terms of pesticides, most studies have focused on pesticide residues, crop resistances, and on the efficient treatment of specific pests. Despite this groundwork, however, statistical records show that the application of agrochemicals per hectare continues to increase, and the water quality within the river basins of the North China Plain remains substantially worse than in other parts of the country.

Taking this background into consideration, this PhD study focused on four different objectives: (a) to quantify the nutrient loading in groundwater and surface water at a sample field site in order to understand their exchange and removal pathways; (b) to review the current use and monitoring of pesticides (and especially herbicides) in the NCP; (c) to assess the occurrence of selected herbicides at a sample field site in the NCP; and (d) to provide a new basis for discussion and guidance on how to address the issue of water pollution caused by the improper use of agrochemicals in China. For the field investigation, a study site located within the NCP with river water-groundwater interaction was chosen, and field work was performed between October 2012 and March 2014.

Results from the field study showed that fertilizer inputs were excessive, and could be reduced substantially. Contaminated river water was infiltrating – and carrying ammonium pollution – into the shallow groundwater. Additionally, nitrate was infiltrating from the surface of the field into the aquifer. Anammox, denitrification, and cation exchange were the suggested dominant removal processes in the soil-surface water-groundwater system examined in this study, which showed a very high nitrogen removal capacity. However, if the composition of the river water were to change (if, for instance, the ammonium concentration were to decrease) the removal processes in the system would also be altered. Consequently, further monitoring of nitrate pollution is suggested.

Regarding pesticides, a literature review and data assessment revealed that the most commonly applied herbicides in the North China Plain wheat-maize cropping system are 2,4-D, acetochlor, and atrazine. Although 2,4-D and atrazine are listed in the Chinese Drinking Water Guideline, there is currently no systematic monitoring of these compounds taking
place, and most research studies have focused on the monitoring of legacy pesticides such as hexachlorocyclohexanes (HCHs) and dichlorodiphenyltrichloroethanes (DDTs).

In the river water and groundwater samples drawn during this study, mainly 2,4-D and atrazine residues, were discovered in concentrations of several µg/l (these results were consistent across all four sampling campaigns). Most of the pollution seemed to have been caused by the river water carrying pesticides into the groundwater system. This indicates that it may be important to pay more attention to the investigation of currently-used pesticides, especially in areas where surface water infiltrates into shallow aquifers.

The overall observation on agricultural activities in the North China plain was that much improvement is needed in educating farmers on sustainable production techniques and the proper application of agrochemicals. One way to increase farmers' understanding and knowledge of the environmental impact of agriculture would be to shift to a more formal training regime, for example vocational education. One possible side effect of such a change could be to raise the status and income opportunities enjoyed by agricultural workers, thereby giving the younger generation an incentive to choose farming as a profession.

In conclusion, this PhD study gave insights into a more systemic understanding of nutrient degradation and the occurrence of particular herbicides at a specific field site. The research into the use and monitoring of pesticides in the North China Plain was reviewed and new recommendations were developed to enhance the dissemination of knowledge from environmental researchers to farmers.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Chinese Academy of Sciences
Authors: Brauns, B. (Intern), Bjerg, P. L. (Intern), Jakobsen, R. (Intern), Song, X. (Ekstern)
Number of pages: 45
Publication date: 2016

**Publication information**
Place of publication: Kgs. Lyngby
Publisher: Technical University of Denmark, DTU Environment
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
Publication: Research › Ph.D. thesis – Annual report year: 2016

**Algal toxicity of platinum nanoparticles - Implications of NP aggregation, dissolution and shading**

**General information**
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Department of Chemistry, NanoChemistry, Organic Chemistry, Department of Micro- and Nanotechnology, Nano Bio Integrated Systems, University of Geneva, Technical University of Denmark
Authors: Sørensen, S. N. (Intern), Engelbrekt, C. (Intern), Lützhøft, H. H. (Intern), Jiménez-Lamana, J. (Ekstern), Noori, J. S. (Intern), Giron Delgado, C. (Ekstern), Slaveykova, V. (Ekstern), Baun, A. (Intern)
Pages: 29-29
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Title of host publication: SETAC Europe 26th Annual Meeting - abstract book
Place of publication: Nantes, France
Publisher: SETAC Europe
Main Research Area: Technical/natural sciences
Conference: SETAC Europe 26th Annual Meeting, Nantes, France, 22/05/2016 - 22/05/2016
Electronic versions:
SETAC_Europe_Abstractbook_Nantes.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

**Alternate switching between MFC and MEC for H₂O₂ synthesis and residual removal in Bioelectro-Fenton system**
Sustainable H₂O₂ supply and elimination of residual H₂O₂ are two key challenges to the Fenton processes treating recalcitrant contaminants. In this study, an innovative Bioelectro-Fenton system capable of alternate switching between microbial electrolysis cell (MEC) and microbial fuel cell (MFC) mode of operation was developed to meet the challenges. In the MEC mode, H₂O₂ was electrochemically produced which reacts with Fenton’s reagent (Fe II) to form hydroxyl radical. The residual H₂O₂ (unused H₂O₂) is removed as electron acceptor by switching the system to MFC mode. Complete decolorization and mineralization of 50 mg L⁻¹ methylene blue (MB) was achieved in the MEC mode with apparent first order rate constants of 0.43 and 0.22 h⁻¹, respectively. After switching to the MFC mode, residual H₂O₂ of 180 mg L⁻¹ was removed at a removal rate of 4.61 mg L⁻¹ h⁻¹ while generating a maximum current density of 0.49 A m⁻².
The MB degradation and residual H2O2 removal were affected by external resistance, cathode pH and initial MB concentration. Furthermore, the system performance was enhanced under stack operation. This study provides a proof-in-concept new system for efficient and cost-effective H2O2 control and recalcitrant pollutants removal.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Zhang, Y. (Intern), Angelidaki, I. (Intern)
Pages: 91-91
Publication date: 2016

**Host publication information**

Title of host publication: Book of abstracts : The 3rd european meeting of the international society for microbial electrochemistry and technology (EU-ISMET 2016)
Place of publication: Rome, Italy
Editors: Aulenta, F., Majone, M.
Main Research Area: Technical/natural sciences
Conference: 3rd European Meeting of the International Society for Microbial Electrochemistry and Technology (EU-ISMET 2016), Rome, Italy, 26/09/2016 - 26/09/2016
Electronic versions:

Book_of_Abstracts_PDF.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

**Alternative co-digestion scenarios for efficient fixed-dome reactor biomethanation processes**

Many of the existing low-tech biogas reactors in the remote rural areas of developing countries have been abandoned due to the lack of substrates. This study investigated if unutilized biomasses are able to support an efficient biomethanation process with low carbon footprint, in these rural areas where low-tech reactors have been abandoned. Thus, the aims of this study were: a) to identify and evaluate alternative biomasses as anaerobic digestion substrates at a remote rural area site in India; b) to propose an efficient continuous biomethanation scenario for low-tech reactors; c) to assess the influence of the operational parameters on the stability of the anaerobic digestion process. The highest methane yield (137–159 NmL CH4 L−1) and co-digestion synergy (>20% more CH4 than expected) were achieved by co-digestion of wastewater, cow manure, banana and rice by-products at 79.3/4.2/16.3/0.2 ww−1 VS ratio, respectively. Three fixed-dome reactors, R30, R45 and R60, fed with all substrates, operated with hydraulic retention times of 30, 45, and 60 days and organic loading rates of 2.18, 1.46, and 1.09 g VS L−1 d−1, respectively (different co-digestion scenarios). R60 was the best continuous co-digestion scenario with 45% and 13% higher energy recovery from biomasses' utilization and 69% and 25% less greenhouse gas (GHG) emissions, compared to R30 and R45, respectively. These results indicate that it is possible to operate efficiently low-tech biogas reactors with utilized biomasses as anaerobic digestion substrates.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Fotidis, I. (Intern), Laranjeiro, T. (Ekstern), Angelidaki, I. (Intern)
Pages: 610-617
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Main Research Area: Technical/natural sciences

**Publication information**

Journal: Journal of Cleaner Production
Volume: 127
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.467 SNIP 2.194 CiteScore 5.79
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.83 SJR 1.659 SNIP 2.502
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.635 SNIP 2.375 CiteScore 5.57
Web of Science (2015): Indexed yes
A methodological approach to the design of optimising control strategies for sewer systems

This study focuses on designing an optimisation based control for sewer system in a methodological way and linking it to a regulatory control. Optimisation based design is found to depend on proper choice of a model, formulation of objective function and tuning of optimisation parameters. Accordingly, two novel optimisation configurations are developed, where the optimisation either acts on the actuators or acts on the regulatory control layer. These two optimisation designs are evaluated on a sub-catchment of the sewer system in Copenhagen, and found to perform better than the existing control; a rule based expert system. On the other hand, compared with a regulatory control technique designed earlier in Mollerup et al. (2015), the optimisation showed similar performance with respect to minimising overflow volume. Hence for operation of small sewer systems, regulatory control strategies can offer promising potential and should be considered along more advanced strategies when identifying novel solutions.
Ammonia inhibition on hydrogen enriched anaerobic digestion of manure under mesophilic and thermophilic conditions

Capturing of carbon dioxide by hydrogen derived from excess renewable energy (e.g., wind mills) to methane in a microbially catalyzed process offers an attractive technology for biogas production and upgrading. This bioconversion process is catalyzed by hydrogenotrophic methanogens, which are known to be sensitive to ammonia. In this study, the tolerance of the biogas process under supply of hydrogen, to ammonia toxicity was studied under mesophilic and thermophilic conditions. When the initial hydrogen partial pressure was 0.5 atm, the methane yield at high ammonia load (7 g NH₄+-N L⁻¹) was 41.0% and 22.3% lower than that at low ammonia load (1 g NH₄+-N L⁻¹) in mesophilic and thermophilic condition, respectively. Meanwhile no significant effect on the biogas composition was observed. Moreover, we found that hydrogenotrophic methanogens were more tolerant to the ammonia toxicity than acetoclastic methanogens in the hydrogen enriched biogas production and upgrading processes. The highest methane production yield was achieved under 0.5 atm hydrogen partial pressure in batch reactors at all the tested ammonia levels. Furthermore, the thermophilic methanogens at 0.5 atm of hydrogen partial pressure were more tolerant to high ammonia levels (≥5 g NH₄+-N L⁻¹), compared with mesophilic methanogens. The present study offers insight in developing resistant hydrogen enriched biogas production and upgrading processes treating ammonia-rich waste streams.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Wang, H. (Intern), Zhang, Y. (Intern), Angelidaki, I. (Intern)
Number of pages: 6
Pages: 314-319
Publication date: 2016
Main Research Area: Technical/natural sciences

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Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
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Ammonia - LCFA synergetic co-inhibition effect in manure-based continuous biomethanation process

In the current study it has been hypothesized that, when organic loading of an anaerobic reactor is increased, the additional cell biomass biosynthesis would capture more ammonia nitrogen and thereby reduce the ammonia toxicity. Therefore, the alleviation of the toxicity of high ammonia levels using lipids (glycerol trioleate-GTO) or carbohydrates (glucose-GLU) as co-substrates in manure-based thermophilic continuous stirred-tank reactors (RGTO and RGLU, respectively) was tested. At 5 g NH4+-N L−1, relative methane production of RGTO and RGLU, was 10.5% and 41% compared to the expected uninhibited production, respectively. At the same time control reactor (RCTL), only fed with manure, reached 32.7% compared to the uninhibited basis production. Therefore, it seems that using lipids to counteract the ammonia effect in CSTR reactors creates an “ammonia–LCFA (long chain fatty acids) synergetic co-inhibition” effect. Moreover, co-digestion with glucose in RGLU was more robust to ammonia toxicity compared to RCTL.

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State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Wang, H. (Intern), Fotidis, I. (Intern), Angelidaki, I. (Intern)
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Ammonium problems at Danish waterworks – overbearing evidence of slow-release additives

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Krüger A/S
Authors: Wagner, F. B. (Intern), Albrechtsen, H. (Intern), Borch Nielsen, P. (Ekstern), Boe-Hansen, R. (Ekstern)
Number of pages: 9
Publication date: 2016

A Multimethod Approach for Investigating Algal Toxicity of Platinum Nanoparticles
The ecotoxicity of platinum nanoparticles (PtNPs) widely used in, for example, automotive catalytic converters, is largely unknown. This study employs various characterization techniques and toxicity endpoints to investigate PtNP toxicity toward the green microalga Pseudokirchneriella subcapitata and Chlamydomonas reinhardtii. Growth rate inhibition occurred in standard ISO tests (EC50 values of 15–200 mg Pt/L), but also in a double-vial setup, separating cells from PtNPs, thus demonstrating shading as an important artifact for PtNP toxicity. Negligible membrane damage, but substantial oxidative stress was detected at 0.1–80 mg Pt/L in both algal species using flow cytometry. PtNPs caused growth rate inhibition and oxidative stress in P. subcapitata, beyond what was accounted for by dissolved Pt, indicating NP-specific toxicity of PtNPs. Overall, P. subcapitata was found to be more sensitive toward PtNPs and higher body burdens were measured in this species, possibly due to a favored binding of Pt to the polysaccharide-rich cell wall of this algal species. This study highlights the importance of using multimethod approaches in nanoecotoxicological studies to elucidate toxicity mechanisms, influence of NP-interactions with media/organisms, and ultimately to identify artifacts and appropriate end points for NP-ecotoxicity testing.

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Organisations: Department of Environmental Engineering, Environmental Chemistry, Department of Chemistry, NanoChemistry, Organic Chemistry, Infection Microbiology, Department of Micro- and Nanotechnology, University of Geneva, IPM-Intelligent Pollutant Monitoring, Technical University of Denmark
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Main Research Area: Technical/natural sciences
Anaerobic modeling for improving synergy and robustness of a manure co-digestion process

Biogas production is becoming increasingly important in the environmental area because, besides treating wastewaters, it also generates energy. Co-digestion has become more and more powerful since it is possible, with the use of abundant and cheap substrates, to dilute the inhibitory effects of various other substrates, making the process of anaerobic digestion more efficient and stable. Biogas process modelling describes the kinetics and stoichiometry of different steps in the anaerobic digestion process. This mathematical modelling provides an understanding of the processes and interactions occurring inside the biogas system. The present work investigated the interactions between different simple co-substrates (carbohydrate, lipid and protein) and real co-substrates (corn silage, fodder beet, grass and wheat straw) under co-digestion with manure, in order to verify synergetic effects. Subsequently, some experiments were reproduced, in order to evaluate the synergy obtained in the previous simulation and validate the model.

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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.46 SJR 0.428 SNIP 0.988
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Scopus rating (2015): SJR 0.421 SNIP 0.944 CiteScore 1.29
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.41 SNIP 0.849 CiteScore 1.3
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.447 SNIP 0.895 CiteScore 1.26
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.453 SNIP 0.835 CiteScore 1.04
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.395 SNIP 0.733 CiteScore 1.23
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.387 SNIP 0.717
Web of Science (2010): Indexed yes
Analyzing tree cores to detect petroleum hydrocarbon-contaminated groundwater at a former landfill site in the community of Happy Valley-Goose Bay, eastern Canadian subarctic

This research examines the feasibility of analyzing tree cores to detect benzene, toluene, ethylbenzene, and m, p, o-xylene (BTEX) compounds and methyl tertiary-butyl ether (MTBE) in groundwater in eastern Canada subarctic environments, using a former landfill site in the remote community of Happy Valley-Goose Bay, Labrador. Petroleum hydrocarbon contamination at the landfill site is the result of environmentally unsound pre-1990s disposal of households and industrial solid wastes. Tree cores were taken from trembling aspen, black spruce, and white birch and analyzed by headspace-gas chromatography-mass spectrometry. BTEX compounds were detected in tree cores, corroborating known groundwater contamination. A zone of anomalously high concentrations of total BTEX constituents was identified and recommended for monitoring by groundwater wells. Tree cores collected outside the landfill site at a local control area suggest the migration of contaminants off-site. Tree species exhibit different concentrations of BTEX constituents, indicating selective uptake and accumulation. Toluene in wood exhibited the highest concentrations, which may also be due to endogenous production. Meanwhile, MTBE was not found in the tree cores and is considered to be absent in the groundwater. The results demonstrate that tree-core analysis can be useful for detecting anomalous concentrations of petroleum hydrocarbons, such as BTEX compounds, in subarctic sites with shallow unconfined aquifers and permeable soils. This method can therefore aid in the proper management of contamination during landfill operations and after site closures.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Memorial University of Newfoundland
Authors: Fonkwe, M. L. D. (Ekstern), Trapp, S. (Intern)
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Scopus rating (2016): CiteScore 2.66 SJR 0.891 SNIP 1.109
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Scopus rating (2015): SJR 0.906 SNIP 1.049 CiteScore 2.5
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BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.99 SNIP 1.199 CiteScore 2.57
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
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ISI indexed (2013): ISI indexed yes
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BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.127 SNIP 1.246 CiteScore 2.29
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Scopus rating (2011): SJR 1.203 SNIP 1.171 CiteScore 2.3
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Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.952 SNIP 1.035
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.814 SNIP 0.989
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.458 SNIP 0.618
Scopus rating (2005): SJR 0.595 SNIP 0.933
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.807 SNIP 1.022
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.574 SNIP 0.702
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.628 SNIP 0.912
Scopus rating (2001): SJR 0.565 SNIP 0.614
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A new tool for quantifying the hydrological effects of LID retrofit designs – the power of simplicity

We developed a new tool to address the needs of utility companies in the early planning and design phase of LID for retrofitting in existing urban areas, where a high degree of collaboration among stakeholders with different professional backgrounds is needed. The tool uses simplified methods to assist the user in quickly assessing two key overall performance indicators of a LID plan: 1. Return period for overflow, and 2. Impact on the annual water budget of the catchment. The tool currently allows combining three types of stormwater control measures (SCMs) commonly used in LID: permeable paving, bioretention units and local detention ponds. We present a case study to illustrate the usefulness of the tool in the context of climate change adaptation in Copenhagen and discuss further development plans including more SCMs, better user interface and assessing the uncertainties introduced by the simplifications in the tool.

An innovative process for biogas upgrading by the microbial electrolysis cell

Biogas as an alternative energy source is getting more attention which can facilitate to reduce fossil fuel utilization and greenhouse gas emissions. However, biogas is a mixture of gases and typically composed of 60-70% v/v methane (CH₄) and 30-40% v/v carbon dioxide (CO₂), small amounts of hydrogen sulfide (H₂S) and other gases. Rude biogas exhibits a significantly low Wobbe index, heating value and energy efficiency which hinder its application. Therefore, CH₄ enrichment prior to use is crucial to improve the quality of biogas. In this work, a novel bipolar membrane-microbial electrolysis cell (BPMEC) was proposed to realize biogas upgrading. The system was composed of the anode, middle and cathode chamber which were separated by a bipolar membrane (BM) and an anion exchange membrane (AEM), respectively. With an external potential, water dissociation occurred and acid was produced in the middle chamber while electrolysis happened and alkali was generated in the cathode chamber. When rude biogas was injected into the cathode chamber, CO₂ was absorbed chemically into the solution and migrated via AEM as the form of CO₃²⁻ and HCO₃⁻ into the middle chamber where they reacted with H⁺ and CO₂ was regenerated and released from the solution. The gas flow rates were varied, as well as the external voltage. Results revealed the highest cathodic pH was 10.03±0.21 and the lowest pH in the middle chamber was 1.34±0.21. The highest CO₂ removal efficiency can be reached at 98.76±1.32% and the maximum CH₄ content can be 98.13±1.12% with 19.64 ml/h gas flow rate and 1.2 V external potential. Organic matter was removed remarkably and COD of the last day was below 60 mg/l. Hydrogen (H₂) was produced and collected in the enriched gas which is another benefit of the system. This study provides a simple, efficient and sustainable way to extend the application of electrochemical technology.
An innovative way to determine on-site ozone delivery efficiency

**General information**
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Authors: Spiliotopoulou, A. (Intern), Martin, R. (Ekstern), Andersen, H. R. (Intern)
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An interdisciplinary approach to identify adaptation strategies that enhance flood resilience and urban liveability
This paper provides guidance on how to identify and design the most suitable climate adaptation strategies for enhancing the liveability and flood resilience of urban catchments. It presents findings from a case study of Elwood, a coastal Melbourne suburb regularly affected by flooding. The research integrates social science, architecture and environmental engineering to co-develop technical, design and policy solutions that respond to the local community’s vision for the future and are robust under a range of future climate, population and urban development scenarios. The paper shows that ensuring a city’s flood resilience involves a range of measures to retreat from, adapt to and defend against flooding; this necessarily requires an integrated approach and interdisciplinary expertise to develop adaptation pathways that are grounded in community aspirations and priorities, inspired by novel design solutions and informed by modelling of performance, robustness and economic viability.

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Organisations: Department of Environmental Engineering, Urban Water Systems, Monash University, Monash Art Design and Architecture (MADA), Cooperative Research Centre for Water Sensitive Cities
Authors: Rogers, B. C. (Ekstern), Bertram, N. (Ekstern), Gunn, A. (Ekstern), Löwe, R. (Intern), Murphy, C. (Ekstern), Pasman, R. (Ekstern), Radhakrishnan, M. (Ekstern), Urich, C. (Ekstern), Wong, T. (Ekstern), Arnbjerg-Nielsen, K. (Intern)
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A novel bioflocculation method to separate microalgal biomass cultivated on wastewater resources

**General information**
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Technical University of Denmark
Authors: Wágner, D. S. (Intern), Radovici, M. (Ekstern), Valverde Perez, B. (Intern), Plósz, B. G. (Intern)
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A novel, optical, on-line bacteria sensor for monitoring drinking water quality

Today, microbial drinking water quality is monitored through either time-consuming laboratory methods or indirect on-line measurements. Results are thus either delayed or insufficient to support proactive action. A novel, optical, on-line bacteria sensor with a 10-minute time resolution has been developed. The sensor is based on 3D image recognition, and the obtained pictures are analyzed with algorithms considering 59 quantified image parameters. The sensor counts individual suspended particles and classifies them as either bacteria or abiotic particles. The technology is capable of distinguishing and quantifying bacteria and particles in pure and mixed suspensions, and the quantification correlates with total bacterial counts. Several field applications have demonstrated that the technology can monitor changes in the concentration of bacteria, and is thus well suited for rapid detection of critical conditions such as pollution events in drinking water.

General information
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Organisations: Department of Environmental Engineering, Urban Water Systems, GRUNDFOS Holding A/S, HOFOR A/S
Authors: Højris, B. (Ekstern), Christensen, S. C. B. (Ekstern), Albrechtsen, H. (Intern), Smith, C. (Ekstern), Dahlqvist, M. (Ekstern)
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Web of Science (2013): Indexed yes
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Anthropogenic phosphorus flows in Denmark: Quantification and critical analysis

Phosphorus (P) is an essential plant nutrient mined from the earth’s crust as phosphate rock. It cannot be substituted, making it a crucial resource for food production. For the EU, future phosphate scarcity is a potential geopolitical and strategic threat. An increasing worldwide phosphate demand is coupled with dependence on imports from a limited number of suppliers outside the EU-28, so that the EU updated its list of critical raw materials in 2014 to include phosphate rock. As a plant nutrient, P is not destroyed by human use, but dissipated into the environment, where it is a pollutant contributing to eutrophication of water bodies and soils. The anthropogenic P is open on the global scale, with global shipments of animal feed, fertiliser, and food; and on the local scale, through the inefficient use of fertiliser or animal manure by application in excess of plant P demand, and losses in waste and wastewater treatment due to insufficient recycling.

The focus of this PhD project was on the resource aspect, as opposed to the pollution aspect, of P in Denmark. The overall goal was to quantify and evaluate the country’s anthropogenic P flows, i.e. those flows caused or significantly influenced by human action, based on a comprehensive material flow analysis (MFA). MFA is a method widely applied to establish resource budgets within a spatial – such as a country – and temporal system boundary, establish a material balance, and handle data uncertainties and data conflicts. When looking at P from a resource efficiency perspective, the most important flows to consider are those linked to agriculture, as a consumer and producer of large P flows, and waste/wastewater management, as the key processes for treating the resulting P-containing wastes. Country-wide average values regarding these processes hold limited informative value. Moreover, it became clear at the outset of the study that there were distinct differences between the P flows across regions of the country, especially between the east, with the largest urban agglomeration, and the northwest. Apart from population and industrial density, a contrast also exists in agricultural practice, with animal husbandry concentrated in the west and northwest, and the east being dominated by crop production. For the agriculture and waste management processes, the MFA was divided into 3 “typical” regions between the northwest (North Jutland), the east (Zealand and the capital region), and a middle part with more mixed characteristics (Mid-Jutland and Southern Denmark); the regional subdivisions formed a part of a complete country-scale MFA. As is typical for a European country, the Danish P budget showed a strong dependence on P imports in fertilisers and animal feed; with food products being the dominant export of P. The regional contrasts in agricultural P budgets were pronounced as expected, with a slight P deficit in the east and the largest per-hectare surplus, due to large amounts of manure, in the northwest. Manure was shown to hold the most salient potential for P recovery, yet stays quite local and adds to the surplus in the country’s northwest, posing an environmental problem. In the waste management system, two streams were identified to hold significant potential for P recovery. Sewage sludge, while already applied to land on a considerable scale, still holds potentially recoverable P not yet utilised today; and vegetable and animal kitchen and food waste from consumption currently not collected separately, with residues being lost to P recovery. These amounts are furthermore located in the east, with a slight P deficit in agricultural soils, suggesting themselves for substituting some fertiliser imports in the future. The total P quantities in these streams amounted to approximately 35% of concurrent mineral P imports.

Since MFA for regional resource budgets is often the groundwork for further analysis, the robustness and comparability of MFA studies’ outcomes when using them as sources of information is important. To this end, the MFA for Denmark was compared to a recent and methodically similar P MFA for Austria, and the effects of the structure of the data material and an MFA practitioner’s modelling choices on the outcomes identified and measured. It was demonstrated that the data available do, in fact, influence model layout. Moreover, the approach to assess uncertainty is subject to a certain degree of arbitrariness, and reflects the modeller’s belief in the quality of the data material. This, however, leads to incomparability of data quality between MFAs, as the comparison showed, since data uncertainties can be only evaluated against those in the same model. Lastly, data conflicts are normal in country-scale MFA; the extent of the necessary reconciliation of conflicting data provides a useful proxy measure for the quality of an MFA. Metadata matter; this comparison showed the quantitative effects of those aspects of MFAs not resulting from the real-world systems studied. The results thus gave a quantitative basis to requiring a transparent system definition and data characterisation in regional MFA beyond the case of P in Denmark.

A third part of this PhD project consisted of exploring the potentials for increased P recovery efficiency in the Danish anthroposphere based on the results of the initial MFA. An aspect of a secondary resource (recovered P fertiliser) is its ability to fulfil the functions of the resource substituted (mineral P fertiliser). For this purpose, the MFA system and values...
obtained in this study were adapted to reflect the typical values for availability of P from various material flows to crops, and to allow for transport of less bulky secondary-P material flows. An optimal distribution of recovered P flows (from sewage sludge and composted organic household waste) was then determined by formal optimization via linear programming. The outcome showed a gradual decline of both mineral P inputs, and net additions to soil P stocks, stabilising at a distinctly lower level than evident from the static MFA, due to P applied gradually becoming available for plants over time, showing a significantly higher (82%) potential for substituting mineral P imports than evident from the initial, static MFA (35%). While the potential improvements in closing the P cycle could be shown, this can, however, not be expected to change the reliance on imported P on one or another form.

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Authors: Klinglmair, M. (Intern), Scheutz, C. (Intern), Astrup, T. F. (Intern)
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Anthropogenic phosphorus flows in Denmark
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Anvendelse af grundrisk til lokal risikovurdering gennemgang af værktøjer med fokus på betydning af parameterværdier

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Organisations: Department of Environmental Engineering, Water Resources Engineering, Miljøstyrelsen
Authors: Binning, P. J. (Intern), Locatelli, L. (Intern), Rosenberg, L. (Intern), Søndergaard, G. L. (Intern), Aabling, J. (Ekstern), Bjerg, P. L. (Intern)
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A passive dosing method to determine fugacity capacities and partitioning properties of leaves
The capacity of leaves to take up chemicals from the atmosphere and water influences how contaminants are transferred into food webs and soil. We provide a proof of concept of a passive dosing method to measure leaf/polydimethylsiloxane partition ratios (Kleaf/PDMS) for intact leaves, using polychlorinated biphenyls (PCBs) as model chemicals. Rhododendron leaves held in contact with PCB-loaded PDMS reached between 76 and 99% of equilibrium within 4 days for PCBs 3, 4, 28, 52, 101, 118, 138 and 180. Equilibrium Kleaf/PDMS extrapolated from the uptake kinetics measured over 4 days ranged from 0.075 (PCB 180) to 0.371 (PCB 3). The Kleaf/PDMS data can readily be converted to fugacity capacities of leaves (Zleaf) and subsequently leaf/water or leaf/air partition ratios (Kleaf/water and Kleaf/air) using partitioning data from the literature. Results of our measurements are within the variability observed for plant/air partition ratios (Kplant/air) found in the literature. Log Kleaf/air from this study ranged from 5.00 (PCB 3) to 8.30 (PCB 180) compared to log Kplant/air of 3.31 (PCB 3) to 8.88 (PCB 180) found in the literature. The method we describe could provide data to characterize the variability in sorptive capacities of leaves that would improve descriptions of uptake of chemicals by leaves in multimedia fate models.

General information
A Plume Scale Model of Chlorinated Ethene Degradation

Although much is known about the biotic degradation pathways of chlorinated solvents, application of the degradation mechanism at the field scale is still challenging [1]. There are many microbial kinetic models to describe the reductive dechlorination in soil and groundwater, however none of them have a degree of accuracy suitable for engineering purposes [2]. The objective of this project is thus to advance models of plume scale transport of chlorinated solvents in order to simulate state of the art field data.

The studied case is located at Fladehøjvej 1, Rødekro in Southern Denmark. PCE has leaked from a dry cleaning facility, and a 2 km plume extends from the source in an unconfined aquifer of homogenous fluvio-glacial sand. The area has significant iron deposits, most notably pyrite, which can abiotically degrade chlorinated ethenes. The source zone underwent thermal (steam) remediation in 2006; the plume has received no treatment. The evolution of the site has been intensely documented since before the source treatment. This includes microbial analysis – Dehalococcoides sp. and vcrA genes have been identified and quantified by qPCR – and dual carbon-chlorine isotope analysis [1].

This work combines batch and transport models using the software FeFlow and PHREEQC to model chlorinated ethene degradation at the Fladehøjvej site. The dechlorination element of the model is incorporated as monod-kinetic reactions [3]. The simulation will also account for the effect of competition for hydrogen as an electron donor with bacteria that utilize other electron acceptors [4].

At the time of the conference, the model developments will be presented. The results will increase the understanding of complex degradation processes within chlorinated solvent plumes.

Applying the “WSUD potential”-tool in the framework of the Copenhagen Climate Adaptation and Cloudburst Management Plans

Water Sensitive Urban Design (WSUD) is still in the “Opportunity”-phase of its stabilization process in Copenhagen, Denmark, indicating that there are controversies surrounding its proper use and the regulatory framework is not completely adapted to the new technology. In 2015 private land owners in Denmark could get up to 100% of the construction costs of climate adaptation measures funded by the utility companies, which resulted in a race to apply for this co-funding plan. In this study we briefly review the climate adaptation framework in Copenhagen, and then discuss how well different scenarios of WSUD in a case study area interact with this framework. The impacts of the different scenarios are assessed using the “WSUD-potential” tool, which builds upon the Three Points Approach. The results indicate that there is a schism between the city’s Cloudburst Management Plan on one side and its Climate Adaptation Plan and general service goal on the other side, which may result in over-sizing of the collective stormwater management system.
Approaches for assessing sustainable remediation

Sustainable remediation seeks to reduce direct contaminant point source impacts on the environment, while minimizing the indirect cost of remediation to the environment, society and economy. This paper presents an overview of available approaches for assessing the sustainability of alternative remediation strategies for a contaminated site. Most approaches use multi-criteria assessment methods (MCA) to structure a decision support process. Different combinations of environmental, social and economic criteria are employed, and are assessed either in qualitative or quantitative forms with various tools such as life cycle assessment and cost benefit analysis. Stakeholder involvement, which is a key component of sustainable remediation, is conducted in various ways. Some approaches involve stakeholders directly in the evaluation or weighting of criteria, whereas other approaches only indirectly consider stakeholder preferences. MCA methods are very useful when comparing remediation alternatives, since they allow for a joint assessment of many types of indicators; however the available tools and methods differ substantially, for instance in their selection of indicators, approaches to stakeholder involvement and uncertainty analysis.

Aquatic Ecotoxicity Testing of Nanoparticles—The Quest To Disclose Nanoparticle Effects

The number of products on the market containing engineered nanoparticles (ENPs) has increased significantly, and concerns have been raised regarding their ecotoxicological effects. Environmental safety assessments as well as relevant and reliable ecotoxicological data are required for the safe and sustainable use of ENPs. Although the number of publications on the ecotoxicological effects and uptake of ENPs is rapidly expanding, the applicability of the reported data for hazard assessment is questionable. A major knowledge gap is whether nanoparticle effects occur when test organisms are exposed to ENPs in aquatic test systems. Filling this gap is not straightforward, because of the broad range of ENPs and the different behavior of ENPs compared to “ordinary” (dissolved) chemicals in the ecotoxicity test systems. The risk of generating false negatives, and false positives, in the currently used tests is high, and in most cases difficult to assess. This Review outlines some of the pitfalls in the aquatic toxicity testing of ENPs which may lead to misinterpretation of test results. Response types are also proposed to reveal potential nanoparticle effects in the aquatic test organisms.
Aquatic Ecotoxicity Testing of Nanoplastics (and microplastics) - Lessons learned from nanoecotoxicology

General information
State: Published
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Aquatic ecotoxicity testing of nanoplastics - lessons learned from nanoeocotoxicology

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Authors: Hartmann, N. B. (Intern), Skjolding, L. M. (Intern), Nolte, T. (Ekstern), Baun, A. (Intern)
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Aquatic toxicity testing for hazard identification of engineered nanoparticles
Within the last few decades, major advances in the field of nanotechnology have enabled production of engineered nanoparticles (ENPs) for various applications and consumer products already available on the market. ENPs may exhibit unique and novel properties compared to their bulk counterparts, which is often related to a high surface-to-volume ratio. These properties have also caused concern amongst scientists and regulators, who have called for timely identification of the potential adverse effects of ENPs to human health and the environment. Despite intensive research on the aquatic toxicity of ENPs, the applicability of the generated data for hazard identification purposes is generally impaired by poor
reproducibility and reliability of data, and limited understanding of the underlying effect mechanisms. Consequently, it has been questioned whether the standardized aquatic toxicity tests, developed for testing soluble compounds, are equally applicable for ENPs. The preconditions for aquatic toxicity tests include aqueous solubility of the chemical test compound and stability during incubation. These criteria are not met for ENPs, as they are suspended rather than dissolved in aqueous media. Moreover, ENPs undergo time-dependent transformation processes of agglomeration, dissolution, sedimentation, and interactions with organisms and their exudates. Together, these processes challenge the establishment of traditional concentration-response data by affecting both the exposure and the response axes. The actual exposure experienced by organisms may not be reflected by the ENP concentration in medium, commonly applied as the exposure metric, and the responses of organisms may result from various toxic and non-toxic mechanisms occurring simultaneously.

In this thesis, the challenges related to exposure control and response mechanisms in aquatic toxicity tests with ENPs are addressed through: 1) Exposure timing measures to minimize the transformation processes of ENPs during test incubation, and 2) Multi-dimensional approaches including investigations of other organisms responses than the traditionally applied, and determination of different exposure fractions such as the concentration of dissolved ions from ENPs and body burdens. Although these approaches are scientifically exploratory by nature, the aim is to generate data applicable for regulatory hazard identification of ENPs. The focus has been on the algal growth rate inhibition test and acute and chronic toxicity tests with crustaceans, all commonly applied in a regulatory context.

The exposure timing measures included aging of ENPs in test media prior to incubation, and/or shortened exposure duration. For algae, shorter exposure duration was obtained through the application of an acute 2h 14C-assimilation test. For daphnids, a short-term (1-3h) pulse exposure was applied, followed by transfer of the organisms to pure medium, where acute and chronic effects were monitored according to standard guidelines during 48h and 21 days respectively. These approaches assisted to minimize the ENP transformation during incubation, but also influenced the toxicity. While aging of ENPs may both increase and decrease toxicity, the shortened exposure mainly appeared to involve a risk of underestimating, or in worst case overlooking chronic effects in algae and daphnids. Thus, more sensitive endpoints may be relevant for algal tests with shortened exposure, such as oxidative stress, found to occur within few hours’ exposure to certain ENPs. The traditional endpoints of algal growth rate inhibition and daphnia immobility were found to be confounded by physical effects. As examples, the algal growth rate can be inhibited by ENPs physically obstructing the light available to the algae (shading), and the immobility of daphnids may partly result from ENPs adsorbed to these organisms’ exterior. In addition to different effect mechanisms, several exposure fractions are available to interact with the organisms, including ENPs adsorbed to or internalized into the organisms' cells, suspended ENPs and ions dissolved from the ENPs. Together, these various exposure fractions and the multiple effect mechanisms complicate the establishment of traditional concentration-response relationships that are based on a single response and exposure dose-metric. A multi-dimensional approach is therefore suggested for aquatic toxicity testing of ENPs for hazard identification purposes. This includes investigation of both physical and cellular effects in organisms in addition to the traditional endpoints. Also, the different exposure fractions of ENPs should be considered including the adsorbed and internalized fractions in organisms, as well as the dissolved and total concentrations in the medium. In practice it is neither unambiguous nor straightforward to determine the different exposure fractions and effect mechanisms, thus some consensus on the best available practices would be beneficial, as well as harmonization of testing approaches in a regulatory context. Ultimately, a multi-dimensional approach may assist to identify which organism responses and exposure fractions are related and improve our understanding of the concentration-response data generated from aquatic toxicity tests with ENPs.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Sørensen, S. N. (Intern), Baun, A. (Intern), Lützhøft, H. H. (Intern), Hansen, S. F. (Intern)
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Publication: Research › Ph.D. thesis – Annual report year: 2016
compared to “ordinary” (dissolved) chemicals in the ecotoxicity test systems. The risk of generating false negative, as well as false positive, results in the currently used tests is high, but in most cases difficult to assess. This literature review outlines some of the pitfalls in aquatic toxicity testing of ENPs which may lead to misinterpretation of test results. Furthermore, the review proposes response types to account for in order to reveal potential nanoparticle effects in the aquatic test organisms used for risk assessments of ENPs.

**General information**

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Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Skjolding, L. M. (Intern), Sørensen, S. N. (Intern), Hartmann, N. B. (Intern), Hjorth, R. (Intern), Hansen, S. F. (Intern), Baun, A. (Intern)
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Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 5.811 SNIP 2.307 CiteScore 10.84
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 5.702 SNIP 2.198 CiteScore 10.7
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ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 5.921 SNIP 2.303
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 5.571 SNIP 2.246
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BFI (2008): BFI-level 2
Scopus rating (2008): SJR 5.589 SNIP 2.153
Web of Science (2008): Indexed yes
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Assessing ecological competition for electron donor within a groundwater microbial community that contains organohalide-respiring bacteria

**General information**
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering
Authors: Murray, A. M. (Intern), Maillard, J. (Ekstern), Broholm, M. M. (Intern), Binning, P. J. (Intern), Holliger, C. (Ekstern)
Number of pages: 2
Publication date: 2016
Event: Abstract from MEWE and biofilms IWA specialist conference, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
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Assessing motility in environmental communities - a novel method

**General information**
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Geological Survey of Denmark and Greenland, Aarhus University
Authors: Scheel Krüger, U. (Ekstern), Badawi, N. (Ekstern), Aamand, J. (Ekstern), Nybroe, O. (Forskerdatabase), Smets, B. F. (Intern), Dechesne, A. (Intern)
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Assessment of Coastal and Urban Flooding Hazards Applying Extreme value Analysis and Multivariate Statistical techniques A Case study in Elwood, Australia

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Water Resources Engineering, Vrije Universiteit Amsterdam, DHI Denmark
Authors: Guimarães Nobre, G. (Ekstern), Ambjerg-Nielsen, K. (Intern), Rosbjerg, D. (Intern), Madsen, H. (Ekstern)
Number of pages: 1
Publication date: 2016
Conference: Vienna, Austria, 17/04/2016 - 17/04/2016
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Journal: Geophysical Research Abstracts
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ISSN (Print): 1607-7962
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ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2009): BFI-level 1
Original language: English
Electronic versions:
Assessment_of_Coastal_and_Urban_Flooding_Hazards_Applying_Extreme_value_Analysis_and_Multivariate_Statistical_techniques_A_Case_stude_in_Elwood_Australia.pdf
Source: PublicationPreSubmission
Source-ID: 124072615

Assessment of kitchen waste compost from Sisimiut for use as plant growth medium or landfill biocover

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Skadborg, M. (Ekstern), Nielsen, M. (Ekstern), Kirkelund, G. M. (Intern), Scheutz, C. (Intern)
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Book_of_Abstracts_Artek_Event_2016.pdf

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Byg Report R-340
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016
Assessment of The Most Sustainable "Management Scenario" For An Old Pesticide Dumpsite

Background and objectives
In the 1950's and early 60's several hundreds tons of chemical waste were deposited in a dumpsite located on the west coast of Denmark. In 1973 and again in 1981 the dumpsite was partly remediated by excavation of contaminated sand. However, more than 100 tons of organophosphorous insecticides (primarily ethyl-parathion) and other chemicals remained in the subsurface and posed a threat to the aquatic environment in the North Sea.

In 2006, the dumpsite was encapsulated to a depth of 14 meters by an iron sheet piling, to stop leaching of chemicals to the North Sea. The environmental authorities in Denmark have since then been working on developing remediation methods that can be used to clean-up the site. The overall objective for a future remediation (or management scenario) is to ensure that there is no risk to the aquatic environment.

Approach
Four remediation methods (management scenarios) were found suitable to fulfill the objective; (1) Excavation of the site followed by thermal soil treatment, (2) In situ alkaline hydrolysis, (3) In situ steam enhanced extraction and (4) Continued encapsulation of the site (no removal of contaminants). The cost varied from 33 mio. EURO (solution 1) to 0.13 mio. EURO/year (solution 4).

One management scenario had to be recommended to the decision-makers (the regional politicians) in the Central Denmark Region – so which one of the four solutions are the most sustainable?

In order to improve decision-making, a multi-criteria assessment method for comparing the sustainability of the remediation alternatives was developed and applied. The model considers cost and effect of remediation, but also time, environmental and societal impacts and involves stakeholders in the derivation of criteria weights.

Results
The use of the multi-criteria method provided insight into how the four management scenarios compare to each other in terms of remedial effect, cost, time use and external impacts to environment and society.

Surprisingly, the sustainability assessment showed that excavation and thermal treatment of the soil was the most sustainable solution, although it was by far more expensive and had the highest secondary effects on the environment.

The result of the sustainability assessment played an important part in the decision-making process when the politicians in Central Denmark Region decided on which management scenario to choose for the future.

The presentation will describe the four management scenarios, the sustainability assessment and how it was actually used in the political decision-making process in Denmark.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Region of Central Denmark
Authors: Bondgård, M. (Ekstern), Melvej, A. (Ekstern), Rüegg, K. (Ekstern), Hvidberg, B. (Ekstern), Fredborg, H. (Ekstern), Søndergaard, G. L. (Intern), Bjerg, P. L. (Intern), Binning, P. J. (Intern)
Number of pages: 1
Publication date: 2016
Event: Abstract from 10th International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
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Source: PublicationPreSubmission
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Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

Assimilation of CryoSat-2 altimetry to a hydrodynamic model of the Brahmaputra river

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, DHI Hørsholm, DHI Denmark
Authors: Schneider, R. (Intern), Nygaard Godiksen, P. (Ekstern), Moret, M. (Ekstern), Madsen, H. (Ekstern), Bauer-Gottwein, P. (Intern)
Number of pages: 1
Publication date: 2016
Conference: European Geosciences Union General Assembly 2016, Vienna, Austria, 17/04/2016 - 17/04/2016
Main Research Area: Technical/natural sciences
A suggested minimum data list for documenting experimental plant uptake studies

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Department of Management Engineering, Quantitative Sustainability Assessment, Norwegian Institute for Agricultural and Environmental Research
Authors: Trapp, S. (Intern), Doucette, W. (Ekstern), Fantke, P. (Intern), Eggen, T. (Ekstern)
Pages: 162-163
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Bedre adgang til næringsstoffer for økologer Rapport fra arbejdsgruppen

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Copenhagen, Aarhus University
Authors: Larsen, B. F. (Ekstern), Werther, I. (Ekstern), Magid, J. (Ekstern), Holdensen, L. (Ekstern), Askegaard, M. (Ekstern), Sørensen, P. (Ekstern), Kyed, S. (Ekstern), Tersbøl, M. (Ekstern), Sander Nielsen, B. (Ekstern), Scheutz, C. (Intern), Olesen, E. E. (Ekstern), Aagot Sckeri, S. (Ekstern)
Number of pages: 62
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Publication: Commissioned › Report – Annual report year: 2017
Behavior and chronic toxicity of two differently stabilized silver nanoparticles to Daphnia magna

While differences in silver nanoparticle (AgNP) colloidal stability, surface potential, or acute aquatic toxicity for differently stabilized AgNP have often been reported, these have rarely been studied in long-term ecotoxicity tests. In the current study, we investigated the chronic toxicity of AgNP to Daphnia magna over a 21-day period with two different stabilizers (citrate and detergent), representative for charge and sterical stabilizers, respectively. This was coupled with a series of short-term experiments, such as mass balance and uptake/depuration testing, to investigate the behavior of both types of AgNP during a typical media exchange period in the D. magna test for chronic toxicity. As expected, the sterically stabilized AgNP were more stable in the test medium, also in the presence of food; however, a higher uptake of silver after 24 h exposure of the charge stabilized AgNP was found compared to the detergent-stabilized AgNP (0.046 ± 0.006 μg Ag μg DW⁻¹ and 0.023 ± 0.005 μg Ag μg DW⁻¹, respectively). In accordance with this, the higher reproductive effects and mortality were found for the charge-stabilized than for the sterically-stabilized silver nanoparticles in 21-d tests for chronic toxicity. LOEC was 19.2 μg Ag L⁻¹ for both endpoints for citrate-coated AgNP and >27.5 μg Ag L⁻¹ (highest tested concentration for detergent-stabilized AgNP). This indicates a link between uptake and toxicity. The inclusion of additional short-term experiments on uptake and depuration is recommended when longer-term chronic experiments with nanoparticles are conducted.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, National Food Institute, University of Bremen
Authors: Sakka, Y. (Ekstern), Skjolding, L. M. (Intern), Mackevica, A. (Intern), Filser, J. (Ekstern), Baun, A. (Intern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.38 SJR 1.627 SNIP 1.382
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.624 SNIP 1.179 CiteScore 3.79
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.594 SNIP 1.324 CiteScore 3.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.891 SNIP 1.485 CiteScore 4.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.89 SNIP 1.489 CiteScore 3.83
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.019 SNIP 1.402 CiteScore 3.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
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Biochemical methane potential of kraft bleaching effluent and codigestion with other in-mill streams

A biochemical methane potential assay was conducted to investigate the anaerobic digestibility of bleaching effluent from hardwood kraft pulping and the potential of codigestion with other effluents from an integrated pulp and paper mill. Four in-mill streams were tested individually and in combination: total bleaching effluent, alkaline bleaching effluent, kraft evaporator condensate, and chemithermomechanical pulping effluent. The total bleaching effluent, consisting of the chlorine dioxide bleaching and alkaline bleaching effluents, exhibited the highest potential for organic matter degradation and methane generation. Chemical oxygen demand (COD) removal ranged from 57%-76%, and methane generation was 220-280 mL/g COD contained in the wastewater, depending on the degree of dilution. When codigestion was tested, the composite consisting of total bleaching effluent, chemithermomechanical pulping effluent, and kraft condensate was most efficient in terms of COD removal (51%) and methane generation (200 mL/g COD contained in the wastewater). The total
bleaching effluent is the largest contributor to the overall amount of wastewater at this mill; it contains relatively low concentrations of anaerobic inhibitors such as adsorbable organic halogens (36 mg/L), total sulfur (170 mg/L), and resin and fatty acids (3.2 mg/L). Therefore, the total bleaching effluent from hardwood kraft pulping may be considered for full-scale anaerobic wastewater treatment, either as a singular stream or as part of a composite stream including other in-mill effluents.

**General information**
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Fitamo, T. M. (Intern), Dahl, O. (Ekstern), Master, E. (Ekstern), Meyer, T. (Ekstern)
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Publication date: 2016
Main Research Area: Technical/natural sciences
Biodegradation of volatile hydrocarbons in five surface waters tested as composed mixtures in the μg/L range

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Birch, H. (Intern), Hammershøj, R. H. (Intern), Mayer, P. (Intern)
Pages: 119-119
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Biodiversity positively associates with biofilm thickness in Moving Bed Biofilm Reactors (MBBRs) – implications on micropollutant removal and nitrification

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Environmental Chemistry, Technical University of Denmark, AnoxKaldnes AB
Authors: Torresi, E. (Intern), Christensson, M. (Ekstern), Smets, B. F. (Intern), Fowler, S. J. (Ekstern), Polesel, F. (Intern), Andersen, H. R. (Intern), Plósz, B. G. (Intern)
Pages: 60-61
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Electronic versions:
MEWE2016_AbstractBooktorresi.pdf
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Biofilm Thickness Influences Biodiversity in Nitrifying MBBRs-Implications on Micropollutant Removal
In biofilm systems for wastewater treatment (e.g., moving bed biofilms reactors-MBBRs) biofilm thickness is typically not under direct control. Nevertheless, biofilm thickness is likely to have a profound effect on the microbial diversity and activity, as a result of diffusion limitation and thus substrate penetration in the biofilm. In this study, we investigated the impact of biofilm thickness on nitrification and on the removal of more than 20 organic micropollutants in laboratory-scale nitrifying MBBRs. We used novel carriers (Z-carriers, AnoxKaldnes) that allowed controlling biofilm thickness at 50, 200, 300, 400, and 500 μm. The impact of biofilm thickness on microbial community was assessed via 16S rRNA gene amplicon sequencing and ammonia monooxygenase (amoA) abundance quantification through quantitative PCR (qPCR). Results from batch experiments and microbial analysis showed that (i) the thickest biofilm (500 μm) presented the highest specific biotransformation rate constants (kbio, L g(-1) d(-1)) for 14 out of 22 micropollutants; (ii) biofilm thickness positively associated with biodiversity, which was suggested as the main factor for the observed enhancement of kbio; (iii) the thinnest biofilm (50 μm) exhibited the highest nitrification rate (gN d(-1) g(-1)), amoA gene abundance and kbio values for some of the most recalcitrant micropollutants (i.e., diclofenac and targeted sulfonamides). Although thin biofilms favored nitrification activity and the removal of some micropollutants, treatment systems based on thicker biofilms should
be considered to enhance the elimination of a broad spectrum of micropollutants.

**General information**

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Organisations: Department of Environmental Engineering, Water Technologies, Aarhus University, Veolia Water Technologies AB
Authors: Torresi, E. (Intern), Fowler, J. (Intern), Polesel, F. (Intern), Bester, K. (Ekstern), Andersen, H. R. (Intern), Smets, B. F. (Intern), Plösz, B. G. (Intern), Christensson, M. (Ekstern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.26 SJR 2.559 SNIP 1.902
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.546 SNIP 1.838 CiteScore 5.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.777 SNIP 2.003 CiteScore 5.5
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.952 SNIP 2.102 CiteScore 5.52
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.115 SNIP 2.043 CiteScore 5.17
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.18 SNIP 1.945 CiteScore 5.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.979 SNIP 1.726
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.86 SNIP 1.809
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.96 SNIP 1.935
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.774 SNIP 1.914
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.55 SNIP 1.893
Bioflocculation of green microalgae using activated sludge and potential for biogas production

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Residual Resource Engineering, Technical University of Denmark
Authors: Radovici, M. (Ekstern), Wágner, D. S. (Intern), Angelidaki, I. (Intern), Valverde Pérez, B. (Intern), Plósz, B. G. (Intern)
Number of pages: 1
Publication date: 2016
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Main Research Area: Technical/natural sciences
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Source: PublicationPreSubmission
Source-ID: 125031600
Publication: Research - peer-review › Poster – Annual report year: 2016

Bioflocculation of green microalgae using activated sludge and potential for biogas production

Macroalgae have the ability to assimilate and convert waste nutrients (N and P) into valuable biomass. In this context, they have been extensively studied for their bioremediation potential for integrated multi-trophic aquaculture (IMTA). With a global aquaculture production of 23.8 million tonnes in 2012, macroalgae are a valuable source of vitamins, minerals, lipids, protein, and dietary fibres. Macroalgae have been used as food since ancient times in Asian countries, while in Europe they have lately been introduced as healthy food. Moreover, recently macroalgae have been receiving increasing attention as sustainable feedstock for biorefinery. Nevertheless, macroalgae resources are still very little explored in western countries. The aim of this study was fulfilled by the investigation of the bioremediation potential of the macroalga Saccharina latissima cultivated at a reference site (control) and at an IMTA site during 12 months (May 2013-May 2014), and assessing the effect of cultivation site and harvest time. Moreover, a comprehensive chemical and nutritional characterization of the produced biomass was made, and its potential as food and/or feed discussed. Finally, S. latissima biomass was tested as feedstock for fermentation-based succinic acid production in a biorefinery approach. Maximum biomass yield over one growing season was achieved in August (1.08-1.51 kg fresh weight (FW) m-1 of cultivation line) and September (0.92-1.49 kg FW m-1). Biomass yield directly correlated with the nutrient removal which similarly peaked in August (5.02-7.02 g N m-1 and 0.86-1.23 g P m-1) and September (4.73-7.24 g N m-1 and 0.83-0.96 g P m-1). Moreover, both biomass yield and nutrient removal were higher in the IMTA site compared to the reference site in August (p<0.05). Additionally, macroalgal cultivation over two growing seasons enhanced the biomass yield and thus value, but not the bioremediation capacity. Harvest time had a significant impact in overall chemical composition, while cultivation site did not generally result in marked differences. The growth of epiphytic organisms from July to November makes the
biomass unsuitable for human consumption, thus biomass meant to be used as food should be harvested in May. Protein content increased significantly from 1.3% dry matter (DM) in May to 10.8% DM in November. Similarly, the maximum essential amino acid (EAA) score was found in November (68.9%). Thus, results suggest an apparent mismatch between harvest time for human consumption (May) and the highest nutritional value of the protein in the biomass (November). The growth of epiphytes did not change the amino acid content or EAA score. However, the protein content and composition did not comply with the requirements for standard protein ingredients for fish feed (i.e. fishmeal, soymeal). The lipid concentration varied from 0.62%–0.88% DM in July to 3.33%–3.35% DM in November (p<0.05). Polyunsaturated fatty acids (PUFA’s) made up more than half of the fatty acids with a maximum in July (52.3%–54.0% fatty acid methyl esters). This including the most appreciated health beneficial PUFA’s, eicosapentaenoic (EPA; 20:5n-3) and docosahexaenoic acid (DHA; 22:6n-3), but also arachidonic (ARA) and stearidonic acid (SDA). Season of harvest is important for the choice of lipid quantity and quality, but the macroalga provides better sources of EPA, DHA and long-chain (LC)-PUFA’s in general compared to traditional vegetables. Regarding safety regulations, however, the main conclusions on the mineral analyses showed that high concentrations of iodine (up to 5,001 mg kg-1 DM) in the biomass may be of concern for human consumption, while the concentrations of total arsenic (up to 63.3 mg kg-1 DM) may restrict utilization as ingredient for feed. Seasonal variations in the content of carbohydrates, and fermentable sugars, had a significant impact on the succinic acid yield and titer. A maximum succinic acid yield of 91.9% (g g-1 of total sugars) corresponding to 70.5% of the theoretical maximum yield was achieved; while succinic acid titer amounted up to 36.8 g L-1 with maximum productivity of 3.9 g L-1 h-1. The high content of total phenolic compounds in the macroalga (July-August: 5-1% DM), and high concentration of inorganic nutrients in the solid residue recovered after enzymatic hydrolysis, makes co-production of antioxidants (i.e. phenols) and fertilizer very attractive. This was demonstrated to have the potential to increase the cost-effectiveness of the biorefinery facility. This study gives comprehensive information of the bioremediation potential of S. latissima cultivated commercially in the inner Danish waters. Year-round data show that harvest time can be effectively used to optimize the bioremediation capacity, and the biomass yield and application/value. The macroalga can be a source of valuable proteins, specific amino acids and food; however, high concentrations of iodine and total arsenic may be of concern regarding food and feed safety regulations, respectively. On the other hand, S. latissima is a promising feedstock for fermentation-based succinic acid production with co-production of phenols, and fertilizers.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, National Food Institute, Research Group for Bioactives – Analysis and Application
Authors: Silva Marinho, G. (Intern), Angelidaki, I. (Intern), Holdt, S. L. (Intern)
Number of pages: 51
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Publisher: Technical University of Denmark, DTU Environment
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
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Publication: Research › Ph.D. thesis – Annual report year: 2016

Bringing modelling to life: current research in an introductory MSc modelling course

General information
State: Published
Authors: Binning, P. J. (Intern), Trapp, S. (Intern), Rolle, M. (Intern), Vezzaro, L. (Intern)
Number of pages: 2
Publication date: 2016
Event: Abstract from 5th DTU Biennial for Teaching and Learning, Lyngby, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Binning_UndervisningsBiennale_Abstract_3_.pdf
Source: PublicationPreSubmission
Source-ID: 127838368
Publication: Research › Conference abstract for conference – Annual report year: 2016

Can we enhance the biotransformation of pharmaceutical micropollutants by controlling biofilm thickness in MBBR?

General information
Challenges in microbial ecology: Building predictive understanding of community function and dynamics

The importance of microbial communities (MCs) cannot be overstated. MCs underpin the biogeochemical cycles of the earth's soil, oceans and the atmosphere, and perform ecosystem functions that impact plants, animals and humans. Yet our ability to predict and manage the function of these highly complex, dynamically changing communities is limited. Building predictive models that link MC composition to function is a key emerging challenge in microbial ecology. Here, we argue that addressing this challenge requires close coordination of experimental data collection and method development with mathematical model building. We discuss specific examples where model-experiment integration has already resulted in important insights into MC function and structure. We also highlight key research questions that still demand better integration of experiments and models. We argue that such integration is needed to achieve significant progress in our understanding of MC dynamics and function, and we make specific practical suggestions as to how this could be achieved.

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Organisations: Department of Environmental Engineering, Water Technologies
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Volume: 10
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Scopus rating (2017): SNIP 2.284 SJR 4.813 CiteScore 9.5
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 8.91 SJR 4.938 SNIP 2.248
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 6.385 SNIP 2.473 CiteScore 9.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 5.369 SNIP 2.288 CiteScore 8.42
Web of Science (2014): Indexed yes
Changes in Climate Extremes and Catastrophic Events in the Mongolian Plateau from 1951 to 2012

The spatiotemporal changes in 21 indices of extreme temperature and precipitation for the Mongolian Plateau from 1951 to 2012 were investigated on the basis of daily temperature and precipitation data from 70 meteorological stations. Changes in catastrophic events, such as droughts, floods, and snowstorms, were also investigated for the same period. The correlations between catastrophic events and the extreme indices were examined. The results show that the Mongolian Plateau experienced an asymmetric warming trend. Both the cold extremes and warm extremes showed greater warming at night than in the daytime. The spatial changes in significant trends showed a good homogeneity and consistency in Inner Mongolia. Changes in the precipitation extremes were not as obvious as those in the temperature extremes. The spatial distributions in changes of precipitation extremes were complex. A decreasing trend was shown for total precipitation from west to east as based on the spatial distribution of decadal trends. Drought was the most serious extreme disaster, and prolonged drought for longer than 3 yr occurred about every 7-11 yr. An increasing trend in the disaster area was apparent for flood events from 1951 to 2012. A decreasing trend was observed for the maximum depth of snowfall from 1951 to 2012, with a decreased average maximum depth of 10 mm from the 1990s.
Characterisation of source-separated organic waste for composting in Sisimiut, Greenland

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Characterisation of the biochemical methane potential (BMP) of individual material fractions in Danish source-separated organic household waste

This study is dedicated to characterising the chemical composition and biochemical methane potential (BMP) of individual material fractions in untreated Danish source-separated organic household waste (SSOHW). First, data on SSOHW in different countries, available in the literature, were evaluated and then, secondly, laboratory analyses for eight organic material fractions comprising Danish SSOHW were conducted. No data were found in the literature that fully covered the objectives of the present study. Based on laboratory analyses, all fractions were assigned according to their specific properties in relation to BMP, protein content, lipids, lignocellulose biofibres and easily degradable carbohydrates (carbohydrates other than lignocellulose biofibres). The three components in lignocellulose biofibres, i.e. lignin, cellulose and hemicellulose, were differentiated, and theoretical BMP (TBMP) and material degradability (BMP from laboratory incubation tests divided by TBMP) were expressed. Moreover, the degradability of lignocellulose biofibres (the share of volatile lignocellulose biofibre solids degraded in laboratory incubation tests) was calculated. Finally, BMP for average SSOHW composition in Denmark (untreated) was calculated, and the BMP contribution of the individual material fractions was then evaluated. Material fractions of the two general waste types, defined as "food waste" and "fibre-rich waste," were found to be anaerobically degradable with considerable BMP. Material degradability of material fractions such as vegetation waste, moulded fibres, animal straw, dirty paper and dirty cardboard, however, was constrained by lignin content. BMP for overall SSOHW (untreated) was 404mL CH4 per g VS, which might increase if the relative content of material fractions, such as animal and vegetable food waste, kitchen tissue and dirty paper in the waste, becomes larger.
Biochemical methane potential, Individual material fractions, Lignocellulose biofibres, Material degradability, Source-separated organic household waste

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Source-ID: 2292188818
Publication: Research - peer-review › Journal article – Annual report year: 2016

**Characteristic Rain Events – A tool to enhance amenity values in SUDS-design**

To overcome the challenge of designing good-looking open detention/retention areas in the urban landscape that can manage stormwater runoff from both the large, rare events and the frequent smaller events without looking empty and oversized a new approach referred to as Characteristic Rain Events (CRE) is proposed. The idea of the CRE is to demonstrate the water dynamics of a detention/retention area in a number of characteristic situations, in this way allowing the designer to work in a more tangible way with the design. Based on historical rain series single events are selected, representing the day-to-day domain, the design domain and the extreme domain as defined in the Three Point Approach (3PA). In this paper the ability of CRE to unfold the water dynamics of a detention/retention area is investigated by applying four CRE to a fictive rain garden including frequent, short event, a frequent long event, a seldom heavy event and a rare extreme
event, and comparing resulting numbers for time with standing water, water depth, retention volume, overflow volume etc. The CRE approach is concluded to hold potential for improving the design process and thus the final design of detention-retention areas.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, University of Copenhagen
Authors: Smit Andersen, J. (Ekstern), Lerer, S. M. (Intern), Sørup, H. J. D. (Intern), Backhaus, A. (Ekstern), Jensen, M. B. (Ekstern)
Number of pages: 4
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Place of publication: Lyon, France
Main Research Area: Technical/natural sciences
Conference: 9th International Conference on Planning and Technologies for Sustainable Urban Water Management (NOVATECH), Lyon, France, 28/06/2016 - 28/06/2016
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1D1P13_230AND.pdf
Source: PublicationPreSubmission
Source-ID: 124242819
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

Characterization of chlorinated solvent contamination in limestone using innovative FLUTE® technologies in combination with other methods in a line of evidence approach
Characterization of dense non-aqueous phase liquid (DNAPL) source zones in limestone aquifers/bedrock is essential to develop accurate site-specific conceptual models and perform risk assessment. Here innovative field methods were combined to improve determination of source zone architecture, hydrogeology and contaminant distribution. The FACT™ is a new technology and it was applied and tested at a contaminated site with a limestone aquifer, together with a number of existing methods including wire-line coring with core subsampling, FLUTE® transmissivity profiling and multilevel water sampling. Laboratory sorption studies were combined with a model of contaminant uptake on the FACT™ for data interpretation. Limestone aquifers were found particularly difficult to sample with existing methods because of core loss, particularly from soft zones in contact with chert beds. Water FLUTE™ multilevel groundwater sampling (under two flow conditions) and FACT™ sampling and analysis combined with FLUTE® transmissivity profiling and modeling were used to provide a line of evidence for the presence of DNAPL, dissolved and sorbed phase contamination in the limestone fractures and matrix. The combined methods were able to provide detailed vertical profiles of DNAPL and contaminant distributions, water flows and fracture zones in the aquifer and are therefore a powerful tool for site investigation. For the limestone aquifer the results indicate horizontal spreading in the upper crushed zone, vertical migration through fractures in the bryozoan limestone down to about 16–18 m depth with some horizontal migrations along horizontal fractures within the limestone. Documentation of the DNAPL source in the limestone aquifer was significantly improved by the use of FACT™ and Water FLUTE™ data.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, COWI A/S, FLUTE, Geosyntec Consultants Inc., Capital Region of Denmark, NIRAS A/S
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Publication date: 2016
Main Research Area: Technical/natural sciences

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Volume: 189
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
DNAPL architecture, Source zone, Fractured rock, Limestone aquifer, Site characterization, FLUTE, Chlorinated solvent

Electronic versions:
DNAPL_limestone_paper_Post_Print.pdf. Embargo ended: 07/04/2018

DOIs:
10.1016/j.jconhyd.2016.03.007
Characterization of membrane foulants at ambient temperature anaerobic membrane bioreactor treating low-strength industrial wastewater

The large volume of industrial low-strength wastewaters has a potential for biogas production through conventional anaerobic digestion (AD), limited though by the need of heating and concentrating of the wastewaters. The use of anaerobic membrane bioreactor (AnMBR) combining membrane filtration with anaerobic biological treatment at low temperature could not only reduce the operational cost of AD, but also alleviate environmental problems. However, at low temperature the AnMBR may suffer more fouling due to the increased extracellular polymeric substances production excreted by bacteria hampering the application of the process for the industrial wastewater treatment. In order to solve or reduce the fouling problem it is necessary to have a good insight into the processes that take place both on and in the membrane pores during filtration. Therefore, the objective of this study is to contribute to a better understanding of organic and biofouling in AnMBR. An AnMBR consisting of external PVDF membrane was operated at 25°C and fed with synthetic dairy wastewater. Intensity, morphology and composition of foulants were determined using Scanning Electron Microscopy coupled with X-ray Energy Dispersive Spectrometry (EDS), Fourier Transform Infrared Spectrometry (ATR-FTIR), Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES), Ion chromatography (IC), zeta potential, and adenosine triphosphate measurements. Based on membrane autopsies, it can be concluded that prevailing fouling is mainly of biological and organic origin. SEM observations demonstrated presence of numerous bacteria incorporated with the fouling layer composed of mainly proteins, carbohydrates and lipids as revealed by ATR-FTIR measurements. Furthermore the amounts of ions found by EDS & ICP-OES analysis do not support scaling layer formation.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Lund Institute of Technology, University of Maribor
Authors: Zarebska, A. (Intern), Kjerstadius, H. (Ekstern), Petrinic, I. (Ekstern), Buksek, H. (Ekstern), Korenak, J. (Ekstern), Jansen, J. L. C. (Ekstern), Hélix-Nielsen, C. (Intern)
Number of pages: 1
Publication date: 2016

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Main Research Area: Technical/natural sciences
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Anaerobic membrane bioreactor, Wastewater, Fouling
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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

Climatic controls on leaf litter decomposition across European forests and grasslands revealed by reciprocal litter transplantation experiments
Carbon (C) and nitrogen (N) cycling under future climate change is associated with large uncertainties in litter decomposition and the turnover of soil C and N. In addition, future conditions (especially altered precipitation regimes and warming) are expected to result in changes in vegetation composition, and accordingly in litter species and chemical composition, but it is unclear how such changes could potentially alter litter decomposition. Litter transplantation experiments were carried out across six European sites (four forests and two grasslands) spanning a large geographical and climatic gradient (5.6-11.4 degrees C in annual temperature 511-878mm in precipitation) to gain insight into the climatic controls on litter decomposition as well as the effect of litter origin and species. The decomposition k rates were overall higher in warmer and wetter sites than in colder and drier sites, and positively correlated with the litter total specific leaf area. Also, litter N content increased as less litter mass remained and decay went further. Surprisingly, this study demonstrates that climatic controls on litter decomposition are quantitatively more important than species or site of origin. Cumulative climatic variables, precipitation, soil water content and air temperature (ignoring days with air temperatures below zero degrees Celsius), were appropriate to predict the litter remaining mass during decomposition (M-r). M-r and cumulative air temperature were found to be the best predictors for litter carbon and nitrogen remaining during the decomposition. Using mean annual air temperature, precipitation, soil water content and litter total specific leaf area as parameters we were able to predict the annual decomposition rate (k) accurately.
Co-digestion of food and garden waste with mixed sludge from wastewater treatment in continuously stirred tank reactors

Co-digestions of urban organic waste were conducted to investigate the effect of the mixing ratio between sludge, food waste, grass clippings and green waste at different hydraulic retention times (HRTs). Compared to the digestion of 100% sludge, the methane yield increased by 48% and 35%, when co-digesting sludge with food waste, grass clippings and garden waste with a corresponding % VS of 10:67.5:15.75:6.75 (R1) and 10:45:31.5:13.5 (R2), respectively. The methane yield remained constant at around 425 and 385 NmL CH4/g VS in R1 and R2, respectively, when the reactors were operated at HRTs of 15, 20 and 30 days. However, the methane yield dropped significantly to 356 (R1) and 315 (R2) NmL CH4/g VS when reducing the HRT to 10 days, indicating that the process was stressed. Since the methane production rate improved significantly with decreasing HRT, the trade-off between yield and productivity was obtained at 15 days HRT.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Fitamo, T. M. (Intern), Boldrin, A. (Intern), Boe, K. (Intern), Angelidaki, I. (Intern), Scheutz, C. (Intern)
Pages: 245-254
Publication date: 2016
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Scopus rating (2017): SJR 2.029 SNIP 1.799 CiteScore 6.28
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Co-digestion of microalgae and activated sludge following a novel bioflocculation method

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Residual Resource Engineering, Technical University of Denmark
Authors: Wágner, D. S. (Intern), Radovici, M. (Ekstern), Angelidaki, I. (Intern), Valverde Perez, B. (Intern), Plösz, B. G. (Intern)
Number of pages: 1
Publication date: 2016
Event: Poster session presented at Young Algaeneers Symposium, 2016, Malta.
Main Research Area: Technical/natural sciences
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Anaerobic digestion, Urban organic waste, Sewage sludge, Hydraulic retention time, Biochemical methane potential

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2016_BT_Fitamo_Co_digestion_of_mixed_sludge_and_urban_waste_in_CSTR_Auto_archive.pdf. Embargo ended: 07/04/2018
DOIs:
10.1016/j.biortech.2016.01.085
Source: FindIt
Source-ID: 2291709226
Publication: Research - peer-review › Journal article – Annual report year: 2016
Combined Sewer Overflow pretreatment with chemical coagulation and a particle settler for improved peracetic acid disinfection

Full scale disinfection by peracetic acid (PAA) was achieved on Combined Sewer Overflow (CSO) water, which was pretreated physically by a fast settling-filtration unit. Disinfection of untreated CSO water using PAA was compared to treatment using a particle separator (HydroSeparator®) and additional coagulation with poly-aluminum-chloride. Disinfection for Enterococcus increased with the applied dose of PAA and additional improvement was achieved when it was preceded by chemical coagulation with 5 mg L⁻¹ poly-aluminum-chloride. When Enterococcus was reduced by treatment in the HydroSeparator, followed by PAA treatment during a CSO event, the treatment was sufficient to maintain microbial quality in the recipient water.
Combined use of meio- and macrobenthic indices to assess complex chemical impacts on a stream ecosystem

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Ecossa, Aarhus University, Bielefeld University
Authors: McKnight, U. S. (Intern), Sonne, A. T. (Intern), Rasmussen, J. J. (Ekstern), Traunspurger, W. (Ekstern), Höss, S. (Ekstern), Bjerg, P. L. (Intern)
Number of pages: 1
Publication date: 2016

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Main Research Area: Technical/natural sciences
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Combining Envisat and CryoSat-2 altimetry to inform hydrodynamic models
Decreasing availability of in-situ river monitoring data can be met with increasing availability and quality of satellite altimetry data over rivers. CryoSat-2 is an altimeter mission launched in 2010 by the European Space Agency (ESA). With its unique drifting orbit, common procedures of working with satellite altimetry data over rivers cannot be easily applied. This work presents a way of informing a hydrologic-hydrodynamic model of the Brahmaputra River with CryoSat-2 altimetry. For one, CryoSat-2 data with its high spatial resolution was used to calibrate water levels in the 1D hydrodynamic model. For the other, a data assimilation framework was developed and applied, showing promising results for assimilation experiments with real and synthetic CryoSat-2 data.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, National Space Institute, DHI Hørsholm, DHI Denmark
Authors: Schneider, R. (Intern), Nyagaard Godiksen, P. (Ekstern), Ridler, M. (Ekstern), Villadsen, H. (Intern), Madsen, H. (Ekstern), Bauer-Gottwein, P. (Intern)
Number of pages: 5
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Article number: 1407
Series: E S A - S P
Volume: SP-740
ISSN: 0379-6566
Main Research Area: Technical/natural sciences
Conference: ESA Living Planet Symposium 2016, Prague, Czech Republic, 09/05/2016 - 09/05/2016
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Combining Envisat and CryoSat-2 altimetry to inform hydrodynamic models

Remote sensing provides valuable data for parameterization and updating of hydrological models, for example water level measurements of inland water bodies from satellite radar altimeters. Many studies have used satellite altimetry data from repeat-orbit missions such as Envisat, ERS or Jason, or synthetic wide-swath altimetry data as expected from the SWOT mission. This study is one of the first hydrologic applications of altimetry data from a drifting orbit satellite mission, namely CryoSat-2. CryoSat-2 is equipped with the SIRAL instrument, a new type of radar altimeter similar to SRAL on Sentinel-3. CryoSat-2 SARIn level 2 data is used to improve a 1D hydrodynamic model of the Brahmaputra river basin in South Asia set up in the DHI MIKE 11 software. CryoSat-2 water levels were extracted over river masks derived from Landsat imagery. After discharge calibration, simulated water levels were fitted to the CryoSat-2 data: In a first step, the average simulated water levels along the river were calibrated to the CryoSat-2 data by adapting the hydrodynamic cross section datums. Subsequently the simulated water level amplitudes were fitted to those obtained from Envisat virtual station time series by adapting the cross section shapes.

The water level was only calibrated for the Brahmaputra in the Assam valley due to a lack of Envisat data further upstream. Despite the steep and rugged terrain in the upstream part of the Brahmaputra, the CryoSat-2 data was found usable after a Landsat river mask was applied. After calibration a hydrodynamic model with accurate spatio-temporal representation of water levels is obtained.

This is a prerequisite for real-time model updating by assimilation of CryoSat-2 altimetry or multi-mission data in general. For this task, a data assimilation framework has been developed and linked with the MIKE 11 model, enabling the integration of any kind of water level measurements. It is a flexible framework that can assimilate water level data which are arbitrarily distributed in time and space. Different types of error models and data assimilation methods can easily be used and tested. Furthermore, it is not only possible to update the water level of the hydrodynamic model, but also the states of the rainfall-runoff models providing the forcing of the hydrodynamic model. The setup has been used to assimilate CryoSat-2 observations over the Assam valley for the years 2010 to 2013, testing different data assimilation methods and model error representations. Performance improvement in terms of discharge forecast due to the assimilation of satellite altimetry data was then evaluated.

Combining Equilibrium Sampling with Non-Target Analysis of Hydrophobic Complex Mixtures in a Complex Matrix

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, University of Copenhagen
Authors: Sjøholm, K. K. (Forskerdatabase), Christensen, J. H. (Ekstern), Mayer, P. (Intern)
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**Community Structure in Methanogenic Enrichments Provides Insight into Syntrophic Interactions in Hydrocarbon-Impacted Environments**

The methanogenic biodegradation of crude oil involves the conversion of hydrocarbons to methanogenic substrates by syntrophic bacteria and subsequent methane production by methanogens. Assessing the metabolic roles played by various microbial species in syntrophic communities remains a challenge, but such information has important implications for bioremediation and microbial enhanced energy recovery technologies. Many factors such as changing environmental conditions or substrate variations can influence the composition and biodegradation capabilities of syntrophic microbial communities in hydrocarbon-impacted environments. In this study, a methanogenic crude oil-degrading enrichment culture was successively transferred onto the single long chain fatty acids palmitate or stearate followed by their parent alkanes, hexadecane or octadecane, respectively, in order to assess the impact of different substrates on microbial community composition and retention of hydrocarbon biodegradation genes. 16S rRNA gene sequencing showed that a reduction in substrate diversity resulted in a corresponding loss of microbial diversity, but that hydrocarbon biodegradation genes (such as assA/masD encoding alkylsuccinate synthase) could be retained within a community even in the absence of hydrocarbon substrates. Despite substrate-related diversity changes, all communities were dominated by hydrogenotrophic and acetotrophic methanogens along with bacteria including Clostridium sp., members of the Deltaproteobacteria, and a number of other phyla. Microbial co-occurrence network analysis revealed a dense network of interactions amongst syntrophic bacteria and methanogens that were maintained despite changes in the substrates for methanogenesis. Our results reveal the effect of substrate diversity loss on microbial community diversity, indicate that many syntrophic interactions are stable over time despite changes in substrate pressure, and show that syntrophic interactions amongst bacteria themselves are as important as interactions between bacteria and methanogens in complex methanogenic communities.

**General information**

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BFI (2014): BFI-level 1  
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ISI indexed (2013): ISI indexed no  
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Scopus rating (2011): SJR 0.642 SNIP 0.192
Comparative analysis of taxonomic, functional, and metabolic patterns of microbiomes from 14 full-scale biogas reactors by metagenomic sequencing and radioisotopic analysis

Background

Biogas production is a very complex process due to the high complexity in diversity and interactions of the microorganisms mediating it, and only limited and diffuse knowledge exists about the variation of taxonomic and functional patterns of microbiomes across different biogas reactors, and their relationships with the metabolic patterns. The present study used metagenomic sequencing and radioisotopic analysis to assess the taxonomic, functional, and metabolic patterns of microbiomes from 14 full-scale biogas reactors operated under various conditions treating either sludge or manure.

Results

The results from metagenomic analysis showed that the dominant methanogenic pathway revealed by radioisotopic analysis was not always correlated with the taxonomic and functional compositions. It was found by radioisotopic experiments that the aceticlastic methanogenic pathway was dominant, while metagenomics analysis showed higher relative abundance of hydrogenotrophic methanogens. Principal coordinates analysis showed the sludge-based samples were clearly distinct from the manure-based samples for both taxonomic and functional patterns, and canonical correspondence analysis showed that the both temperature and free ammonia were crucial environmental variables shaping the taxonomic and functional patterns. The study further the overall patterns of functional genes were strongly correlated with overall patterns of taxonomic composition across different biogas reactors.

Conclusions

The discrepancy between the metabolic patterns determined by metagenomic analysis and metabolic pathways determined by radioisotopic analysis was found. Besides, a clear correlation between taxonomic and functional patterns was demonstrated for biogas reactors, and also the environmental factors that shaping both taxonomic and functional genes patterns were identified.
Comparative measurement and quantitative risk assessment of alcohol consumption through wastewater-based epidemiology: An international study in 20 cities

Quantitative measurement of drug consumption biomarkers in wastewater can provide objective information on community drug use patterns and trends. This study presents the measurement of alcohol consumption in 20 cities across 11 countries through the use of wastewater-based epidemiology (WBE), and reports the application of these data for the risk assessment of alcohol on a population scale using the margin of exposure (MOE) approach. Raw 24-h composite wastewater samples were collected over a one-week period from 20 cities following a common protocol. For each sample a specific and stable alcohol consumption biomarker, ethyl sulfate (EtS) was determined by liquid chromatography coupled to tandem mass spectrometry. The EtS concentrations were used for estimation of per capita alcohol consumption in each city, which was further compared with international reports and applied for risk assessment by MOE. The average per capita consumption in 20 cities ranged between 6.4 and 44.3 L/day/1000 inhabitants. An increase in alcohol consumption during the weekend occurred in all cities, however the level of this increase was found to differ. In contrast to conventional data (sales statistics and interviews), WBE revealed geographical differences in the level and pattern of actual alcohol consumption at an inter-city level. All the sampled cities were in the “high risk” category (MOE.

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Authors: Ryu, Y. (Ekstern), Barceló, D. (Ekstern), Barron, L. P. (Ekstern), Bijlsma, L. (Ekstern), Castiglioni, S. (Ekstern), de Voogt, P. (Ekstern), Emke, E. (Ekstern), Hernández, F. (Ekstern), Lai, F. Y. (Ekstern), Lopes, A. (Ekstern), de Alda, M. L. (Ekstern), Mastroianni, N. (Ekstern), Munro, K. (Ekstern), O'Brien, J. (Ekstern), Ort, C. (Ekstern), Plósz, B. G. (Intern), Reid, M. J. (Ekstern), Yargeau, V. (Ekstern), Thomas, K. V. (Ekstern)
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Comparison of pharmaceutical, illicit drug, alcohol, nicotine and caffeine levels in wastewater with sale, seizure and consumption data for 8 European cities

BACKGROUND:
Monitoring the scale of pharmaceuticals, illicit and licit drugs consumption is important to assess the needs of law enforcement and public health, and provides more information about the different trends within different countries. Community drug use patterns are usually described by national surveys, sales and seizure data. Wastewater-based epidemiology (WBE) has been shown to be a reliable approach complementing such surveys.

METHOD:
This study aims to compare and correlate the consumption estimates of pharmaceuticals, illicit drugs, alcohol, nicotine and caffeine from wastewater analysis and other sources of information. Wastewater samples were collected in 2015 from 8 different European cities over a one week period, representing a population of approximately 5 million people. Published pharmaceutical sale, illicit drug seizure and alcohol, tobacco and caffeine use data were used for the comparison.

RESULTS:
High agreement was found between wastewater and other data sources for pharmaceuticals and cocaine, whereas amphetamines, alcohol and caffeine showed a moderate correlation. methamphetamine and 3,4-methylenedioxymethamphetamine (MDMA) and nicotine did not correlate with other sources of data. Most of the poor correlations were explained as part of the uncertainties related with the use estimates and were improved with other complementary sources of data.

CONCLUSIONS:
This work confirms the promising future of WBE as a complementary approach to obtain a more accurate picture of substance use situation within different communities. Our findings suggest further improvements to reduce the uncertainties associated with both sources of information in order to make the data more comparable.
Comparison of the organic waste management systems in the Danish-German border region using life cycle assessment (LCA)

This study assessed the management of the organic household waste in the Danish-German border region and points out major differences between the systems and their potential effects on the environment using life cycle assessment (LCA). The treatment of organic waste from households in the Danish-German border region is very different on each side of the border; the Danish region only uses incineration for the treatment of organic household waste while the German region includes combined biogas production and composting, mechanical and biological treatment (MBT) and incineration. Data on all parts of the organic waste treatment was collected including waste composition data and data from treatment facilities and their respective energy systems. Based on that the organic waste management systems in the border region were modelled using the EASETECH waste management LCA-model. The main output is a life cycle assessment showing large differences in the environmental performance of the two different regions with the Danish region performing better in 10 out of 14 impact categories. Furthermore, the importance of the substituted district heating systems was investigated showing an impact up to 34% of the entire system for one impact category and showing large difference between each heating system substituted, e.g. in "Global Warming" the impact was from -16 to -1.1 milli person equivalent/tonne treated waste from substitution of centralised hard coal and decentralised natural gas, respectively.

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Composition of municipal solid waste in Denmark

In response to continuous pressure on resources, and the requirement for secure and sustainable consumption, public authorities are pushing the efficient use of resources. Among other initiatives, the prevention, reduction and recycling of solid waste have been promoted. In this context, reliable data for the material and resource content of waste flows are crucial to establishing baselines, setting targets and tracking progress on waste prevention, reduction and recycling goals. Waste data are also a critical basis for the planning, development and environmental assessment of technologies and waste management. These data are obtained through the characterisation of waste material. In the absence of standardised and commonly accepted waste sampling and sorting procedures, various approaches have been employed, albeit they limit both the comparability and the applicability of results. Thus, waste sampling and sorting procedures, as well as a consistent and transparent waste-naming system, have been developed.

Classical statistics are applied increasingly when analysing waste data, in order to draw conclusions that underpin the development of waste legislation and policy. The existing statistical techniques ignore the inherent properties of waste data, which are "closed data," because the percentage or the mass of individual fractions are positive and add up to a constant. This constant constraint affects statistical analysis seriously and results in erroneous interpretations. Therefore, compositional analysis techniques have been introduced to analyse waste data more appropriately.

Waste was sampled directly from source, in order to attribute the waste data accurately to the geographical areas and types of household generating the waste. Sampling and contamination errors were minimised by avoiding sieving and the mass reduction of waste before manual sorting. Consequently, the waste was collected without compacting. Additionally, the entire sample was manually sorted into 10-50 waste fractions organised according to a three-level approach. This detailed waste fractions list facilitated the comparison of waste data with various objectives.

Analysis revealed that Danish residual household waste constitutes mainly food waste (42 – 45% mass per wet basis). Misplaced recyclable materials in residual waste bins, such as paper, board, glass, metal and plastic, amounted to 20% (mass per wet basis) of residual household waste. Moreover, special waste, such as hazardous waste, batteries and WEEE, was also misplaced in residual household bins, accounting for 0.4-0.8% of the total. Although the proportion of misplaced special waste was relatively small, these material fractions can have dire impacts on the environment when they are not disposed of appropriately.

Statistical analysis indicated that separating food waste residue from packaging during waste sorting was unnecessary, because this separation did not significantly influence overall waste composition, the percentage of food waste or packaging waste fractions. Furthermore, the difference in waste composition between municipalities was not significant. These results suggest that waste composition data obtained from one municipality could be applied to other municipalities in the same area (provided that municipalities share the same source segregation scheme), although socio-economic aspects between municipalities were not analysed.

Food waste consists of avoidable and unavoidable food waste. Here, "avoidable" food waste is defined as food that could be eaten but instead was thrown away regardless of the reason, whereas “unavoidable” food waste is food that would not be edible under normal circumstances (e.g. bones, banana peel, etc.). Food waste was estimated at 183 kg per household per year (86 kg per person per year), of which 103 kg per household (48 kg per person) per year was avoidable food waste and 80 kg per household (38 kg per person) per year was unavoidable food waste. These food waste fractions occurred in most of Danish households, which suggests that initiatives to reduce avoidable food waste should be combined with policies that promote the efficient treatment of unavoidable food waste, to ensure plant nutrient and resource recovery.

The mass of avoidable food waste discarded per household increased in line with household size. However, there was no statistical evidence that a household containing one person throws away more avoidable food waste per person than households containing more than one person. This suggests that campaigns and initiatives targeting food waste reduction should particularly aim at households containing more than one person.

Additionally, the mass of avoidable and unavoidable food waste per household and per person discarded in Danish houses was significantly influenced neither by periodic variation nor by geographical variations.

Waste analysis from kitchens in office areas showed that food waste generation amounted to 23 kg per employee per year, of which 20 kg per employee was source-segregated. This suggests that only 11% of food waste was misplaced in residual waste, which itself amounted to 10 kg per employee per year and consisted of 29% paper, 23% plastic and 24% misplaced food waste. Thus, sorting efficiency was estimated at 89% of food waste, accompanied by extremely high purity (99%). These results indicate that the 60% recycling target formulated by the Danish Government for food waste generated by the service sector should be achievable.

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Composition of waste materials and recyclables

As the valorization of waste has become a main objective of modern waste management a variety of waste technologies were developed and the complexity of management systems increased. Maximizing environmental benefits in one part of the system may lead to burdens in another. Environmentally sound decisions in waste planning thus require a holistic and systematic assessment of environmental impacts of different waste management options. Such assessment requires reliable information on the physical and chemical waste properties to model the flows of waste materials and substances throughout the entire waste management system.

The aim of this PhD project was to improve the understanding of factors influencing the quality of waste composition data during waste characterization and application in the environmental assessment of waste management systems. Reviewing existing waste characterization studies revealed that a large variety of waste characterization approaches and analytical methods has been employed. The most frequently used approach was the chemical analysis of directly sampled waste materials which offers the highest flexibility for waste characterization studies. Direct waste analysis involves several steps to prepare the samples mechanically and/or chemically for final analysis. Not all sample preparation methods are equally well suited for specific waste characterization purposes. The correctness of results and practical feasibility of sample preparation was strongly affected by the material type of the sample and the physico-chemical parameter to be analyzed. For example, studies examining mechanical sample preparation methods suggest that plastic fractions are especially prone to de-mixing effects and that differing mechanical properties within a sample (e.g. plastic and metal) can lead to biased results. In the experimental part of this PhD project the milling of plastics and metals was especially challenging and alternative methods for preparation and analysis should be investigated. Furthermore, chemical sample preparation by means of acid digestion was found to severely affect the element content resulting from chemical analysis. Although the suitability of standardized HF-containing methods can be generally confirmed, these methods led to considerable underestimations of the element content for some combinations of element and waste material. Appropriate selection of acid digestion methods thus needs to take the waste material and the elements to be analyzed into account. The results obtained during this PhD project provides information on the performance for six relevant acid mixtures for nine different waste material fractions and 64 elements and can support the selection of appropriate acid digestion method for future waste characterization studies and the comparison of data across existing studies.

A consistent dataset for 73 physico-chemical parameters in 49 residual and 24 source-segregated Danish household waste fractions was obtained and is now available for future modelling and assessment of waste management systems. The analyzed fractions were selected based on material properties with relevance for potential recycling processes. The physico-chemical analysis revealed chemical differences between residual and source-segregated samples for several fractions. The results for parameters associated with organic matter confirmed the idea of cross-contaminated recyclables in residual waste, whereas the results for heavy metals and trace elements were more complex. For many fractions rather high metal contents were found to be intrinsic properties of the recyclables. For example, the Sb content in PET packaging was 250-270 mg/kgTS. In some cases metal contents in source-segregated fractions were higher than in the respective fractions from residual waste. Rare earth elements (RRE) were quantified in all analyzed material fractions and considerably high concentrations (e.g. the Ce content in ceramics was 72 mg/kgTS) were associated with mineral and soil-like materials. This “natural background” concentrations need to be considered when concluding on the origin of RRE which are typically associated with electronic/hazardous waste.

In general the use of primary physico-chemical waste characterization data for the environmental assessment of waste management systems is always preferable because many factors such as fraction definition and sampling point can be controlled. Anyhow, value ranges (as opposed to single values) should be considered due to the possibility of systematic bias (e.g. resulting from specific characterization methods) and “natural” variation. Commonly reported measurement uncertainties are not suitable to capture such effects. Thus secondary data should be considered when deriving uncertainty ranges and more research is necessary to quantify systematic effects of different characterization methods. Considering the extensive time and costs related to physico-chemical waste characterization it is likely that environmental assessment of waste management systems will continue to draw on secondary data from literature. For some parameters the values reported in literature were found to differ significantly. The wide range of values in literature for physico-chemical properties of individual waste materials were shown to severely affect the results of the life cycle assessment (LCA) of waste management systems, although the parameters had relatively low sensitivity. This emphasizes that sensitivity alone is not an appropriate indicator to identify critical parameters for LCA modelling. Using the literature value ranges for complete uncertainty analysis physico-chemical parameters contributed substantially to the output uncertainty of the modelling results and were in many cases more important than technology and scenario specific parameters. By selecting well-fitting data from literature the input value ranges could be potentially narrowed. Suggestions for physico-chemical data selection for environmental assessment and related uncertainty analysis are presented. At this point, however, low data availability and the large variety of used waste characterization methods limit the quantification and ranking of influencing factors via statistical data analysis of literature data. Nevertheless, it was found that the regional context of the data origin appeared to be less or equally important than other potential influencing factors (such as e.g.
analytical methods, waste management system, natural variation, etc.). To consider the influence of such factors on secondary data but also primary data, LCA of waste management systems should always include a systematic uncertainty analysis for physico-chemical waste properties which needs to be based on both sensitivity and realistic uncertainty ranges for the individual physico-chemical parameters.
Concurrent elevation of CO\(_2\), O\(_3\) and temperature severely affects oil quality and quantity in rapeseed

Plant oil is an essential dietary and bio-energy resource. Despite this, the effects of climate change on plant oil quality remain to be elucidated. The present study is the first to show changes in oil quality and quantity of four rapeseed cultivars in climate scenarios with elevated [CO\(_2\)], [O\(_3\)] and temperature (T) combined and as single factors. The combination of environmental factors resembled IPCC’s ‘business as usual’ emission scenario predicted for late this century. Generally, the climate scenarios reduced the average amounts of the six fatty acids (FAs) analysed, though in some treatments single FAs remained unchanged or even increased. Most reduced was the FA essential for human nutrition, C18:3-ω3, which decreased by 39% and 45% in the combined scenarios with elevated [CO\(_2\)]+T+[O\(_3\)] and [CO\(_2\)]+T, respectively. Average oil content decreased 3–17%. When [CO\(_2\)] and T were elevated concurrently, the seed biomass was reduced by half, doubling the losses in FAs and oil content. This corresponded to a 58% reduction in the oil yield per hectare, and C18:3-ω3 decreased by 77%. Furthermore, the polyunsaturated FAs were significantly decreased. The results indicate undesirable consequences for production and health benefits of rapeseed oil with future climate change. The results also showed strong interactive effects of CO\(_2\), T and O\(_3\) on oil quality, demonstrating why prediction of climate effects requires experiments with combined factors and should not be based on extrapolation from single factor experiments.

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ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 2.619 SNIP 1.929 CiteScore 5.47
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.631 SNIP 1.865 CiteScore 5.19
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Contamination Sources in Kangerlussuaq, Greenland

General information
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Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Davidsen, S. (Intern), Kirstein, J. K. (Intern), Jensen, P. E. (Intern)
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Publisher: Arctic Technology Centre, DTU Technical University of Denmark
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Main Research Area: Technical/natural sciences
Control banding tools for occupational exposure assessment of nanomaterials - Ready for use in a regulatory context?
The development, production and application of engineered nanomaterials are becoming more and more widespread. Because researchers, developers and industrial workers are the first in line to be exposed to potentially hazardous nanomaterials, appropriate occupational exposure assessment is a key area of concern. Therefore, a number of Control Banding (CB)-based tools have been developed in order to assess and manage the potential risks associated with occupational exposure to nanomaterials. In this paper we provide a comparative analysis of different nanomaterial-specific types of control-banding/risk prioritization tools (the Control Banding Nanotool, IVAM Technical Guidance, Stoffenmanager Nano, ANSES CB Tool, NanoSafer, and the Precautionary Matrix) in order to evaluate their use-domains; types, extent, use and availability of input parameters; their output format; and finally their potential use and maturity in regard to meeting the minimum requirements for occupational exposure assessment under REACH and the conceptual source-transmission-receptor model by Schneider et al. (2011). This was done through an analysis including a literature review and use of the tools. It was found that the tools were developed for different purposes, with different application domains and inclusion criteria. The exposure assessments and derived risk levels are based on different concepts and assumptions and outputs in different formats. The use of requested input parameters for exposure assessment differ greatly among the tools. Therefore, direct inter-comparison and combination of the different models into a larger holistic framework is not immediately possible. Harmonization of input parameters and output could allow establishment of an exposure assessment framework with different levels of information requirements.
The controller is tested on a benchmark simulation model describing the production of N₂O during both AOB denitrification and HB denitrification. Comparisons between simulation results of open-loop and closed-loop have revealed the potential of the controller to significantly reduce the amount of N₂O emitted (approximately 35%). On the other side, this reduction of N₂O was accompanied by an increase in the aeration costs. Moreover, a plant performance evaluation under dynamic disturbances shows that the effluent quality is compromised due to higher requirements of organic carbon by denitrifying heterotrophs. The controller can therefore be considered effective for the reduction of N₂O production by AOB but would need to be coupled with a secondary control strategy ensuring a complete oxidation of the nitrogen oxides by heterotrophs to have a good effluent quality.

Control structure design for resource recovery using the enhanced biological phosphorus removal and recovery (EBP2R) activated sludge process

Nowadays, wastewater is considered as a set of resources to be recovered rather than a mixture of pollutants that should be removed. Many resource recovery schemes have been proposed, involving the use of novel technologies whose controllability is poorly studied. In this paper, we present a control structure for the novel enhanced biological phosphorus removal and recovery (EBP2R) process, which is currently under development. The aim of the EBP2R is to maximize phosphorus recovery through optimal green micro-algal cultivation, which is achieved by controlling the nitrogen to phosphorus ratio (N-to-P ratio) fed to the algae. Process control structures are developed for a sequencing batch reactor (SBR) and a continuous flow reactor system (CFS). Results, obtained using the Benchmark Simulation Model No. 1 (BSM1) dynamic input disturbance time series, suggest that the SBR can maintain a stable N-to-P ratio in the effluent (16.9 ± 0.07) and can recover about 72% of the influent phosphorus. The phosphorus recovered by the CFS is limited by the influent nitrogen (65% of the influent phosphorus load). Using the CFS configuration, the effluent N-to-P ratio cannot be effectively controlled (16.45 ± 2.48). Therefore, it is concluded that the SBR is the most effective reactor configuration for the EBP2R process. Importantly, the designed control structures rely on control loops that do not require chemical dosing for nutrient management, thereby reducing the environmental footprint of the EBP2R process. The proposed control strategies can be applied to other phosphorus recovery schemes where short sludge age EBPR systems play an important role.
Copper deficiency can limit nitrification in biological rapid sand filters for drinking water production
Incomplete nitrification in biological filters during drinking water treatment is problematic, as it compromises drinking water quality. Nitrification problems can be caused by a lack of nutrients for the nitrifying microorganisms. Since copper is an important element in one of the essential enzymes in nitrification, we investigated the effect of copper dosing on nitrification in different biological rapid sand filters treating groundwater. A lab-scale column assay with filter material from...
a water works demonstrated that addition of a trace metal mixture, including copper, increased ammonium removal compared to a control without addition. Subsequently, another water works was investigated in full-scale, where copper influent concentrations were below 0.05 μg Cu L-1 and nitrification was incomplete. Copper dosing of less than 5 μg Cu L-1 to a full-scale filter stimulated ammonium removal within one day, and doubled the filter's removal from 0.22 to 0.46 g NH4-N m-3 filter material h-1 within 20 days. The location of ammonium and nitrite oxidation shifted upwards in the filter, with an almost 14-fold increase in ammonium removal rate in the filter's top 10 cm, within 57 days of dosing. To study the persistence of the stimulation, copper was dosed to another filter at the water works for 42 days. After dosing was stopped, nitrification remained complete for at least 238 days. Filter effluent concentrations of up to 1.3 μg Cu L-1 confirmed that copper fully penetrated the filters, and determination of copper content on filter media revealed a buildup of copper during dosing. The amount of copper stored on filter material gradually decreased after dosing stopped; however at a slower rate than it accumulated. Continuous detection of copper in the filter effluent confirmed a release of copper to the bulk phase. Overall, copper dosing to poorly performing biological rapid sand filters increased ammonium removal rates significantly, achieving effluent concentrations of below 0.01 mg NH4-N L-1, and had a long-term effect on nitrification performance.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Krüger A/S
Authors: Wagner, F. B. (Intern), Nielsen, P. B. (Ekstern), Boe-Hansen, R. (Ekstern), Albrechtsen, H. (Intern)
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Scopus rating (2016): CiteScore 7.49 SJR 2.663 SNIP 2.563
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BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.946 SNIP 2.702 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.862 SNIP 2.355 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.592 SNIP 2.192
Web of Science (2010): Indexed yes
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Copper dosing stimulates nitrification in full-scale biological drinking water filters

**General information**
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Krüger A/S
Authors: Wagner, F. B. (Intern), Borch Nielsen, P. (Ekstern), Boe-Hansen, R. (Ekstern), Albrechtsen, H. (Intern)
Number of pages: 1
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Copper dosing to biological rapid sand filters increases nitrifier activity and abundance

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Organisations: Department of Environmental Engineering, Urban Water Systems, Krüger A/S
Authors: Wagner, F. B. (Intern), Borch Nielsen, P. (Ekstern), Boe-Hansen, R. (Ekstern), Albrechtsen, H. (Intern)
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Publication date: 2016

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Cross-validation of equilibrium sampling and non-equilibrium passive sampling methods in PCB contaminated sediments

**Title:** Cross-validation of equilibrium sampling and non-equilibrium passive sampling methods in PCB contaminated sediments

**Authors:** Wang, A. (Ekstern), Nørgaard Schmidt, S. (Intern), Bridges, T. S. (Ekstern), Gidley, P. (Ekstern), Lotufo, G. (Ekstern), Ruiz, C. (Ekstern), Kennedy, A. (Ekstern), Rogers, N. (Ekstern), Ghosh, U. (Ekstern), Burgess, R. (Ekstern), Fernandez, L. (Ekstern), Mayer, P. (Intern)

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CryoSat-2 radar altimetry for monitoring surface water in China

**Title:** CryoSat-2 radar altimetry for monitoring surface water in China

**Authors:** Jiang, L. (Intern), Bauer-Gottwein, P. (Intern), Nielsen, K. (Intern), Andersen, O. B. (Intern)

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**Publication:** Research - peer-review › Conference abstract for conference – Annual report year: 2016
Cultivation of microalgae in industrial wastewaters

Microalgae production for the purpose of clearing wastewater has been researched for at least half a century. Such systems have a dual benefit: first, they prevent nutrients from entering water bodies and causing eutrophication; second, they transform sunlight and carbon dioxide into a biomass that has many potential uses. Unfortunately, the current high costs of cultivation have limited the development and exploitation of such systems, resulting in only a few full-scale algae wastewater treatment installations and a small industry based mostly around food and pigments. This thesis contributes to a growing body of knowledge with the aim to make algae cultivation viable for the production of sustainable products.

Specific contributions include: improvement in the methods of screening the growth potential of different microalgae species; identification of an industrial wastewater that allows good algae growth; knowledge about the mixotrophic utilization of chemical energy present in organic waste; demonstration of a method to optimize efficiency of culture growth and nutrient removal; and biochemical characterization of the produced biomass.

When designing algae cultivation, one challenge is that there are many potential combinations which must empirically screened. Tens of thousands of microalgae species have been identified so far and there are numerous waste-streams that potentially could be of interest. A screening system was developed using the microplate as cultivation vessel and measurement cuvette. Fluorescence was demonstrated to be an order of magnitude more sensitive than optical density for detecting biomass growth, which increased the length of time in which exponential growth was observable from hours to days. This enabled growth rate-light intensity (µ-I) curves to be measured in microplates which were found to be equivalent to those obtained in typical lab-scale photobioreactors. As µ-I curves are the key biological input to an already existing model, it was validated that low density microplate cultivations can be used to make predictions about industrially relevant autotrophic cultivation.

When algae are grown within a wastewater treatment plant, the use of the chemical energy stored in the organic carbon dissolved in the wastewater could also be a useful option. Conventional aerobic sewage treatment expends much energy in breaking down the biomass to CO2. However, various anaerobic treatment methods would result in effluent containing dissolved organic molecules suitable for algae species that have the ability to grow as mixo- or heterotrophs. Chlorella sorokiniana was cultivated in a lab scale photobioreactor under daily light dark cycles and various timing strategies were tested for adding acetate at concentrations that can be obtained in waste streams of 1 – 2 g L-1. The results showed that the fastest growth occurred when adding the acetate at night (cyclic autotrophy/heterotrophy). However adding the acetate during the day (mixotrophy) also improved growth compared to autotrophic controls.

Industrial wastewater was used as cultivation medium of Chlorella sorokiniana. The culture was able to grow at high rates up to a density of 4 g L-1. The deceleration-stat technique was used to create a series of pseudo-steady states to give information about the expected results of continuous cultivation of microalgae in the selected wastewater. At light intensities of 2100 and 200 µmol photon m-2 s-1 the algae grew at a rate of over 5 and 1.67 g L-1day-1, respectively. The corresponding removal rates of nitrogen were 238 and 93 mg L-1day-1 and 40 and 19 mg L-1day-1 for phosphorous. Ammonium removal varied from below 40% to 99%, while phosphate removal was always nearly total. When the biomass was characterized, it was found that fertilizer value N and P content increased with growth rate. For animal feed, the amino acid content was about 40% of biomass. The content of the nutritionally important α-Linoleic fatty acid increased when light intensity and dilution rate were higher. Valuable pigments lutein, carotene and other carotenoids were higher in low-light conditions.

The results from this thesis demonstrate that industrial wastewater can be a suitable replacement for algae cultivation medium. The screening method developed will reduce the cost of identifying the best conditions to test at lab scale. The D-stat method offers a way to identify the best conditions for biomass production and nutrient removal. Various options for heterotrophic and mixotrophic utilization of waste organic carbon in effluents are identified. Further advances in microalgae cultivation and processing will be needed for the production of sustainable products from wastewater in the future.
Current uses of nanomaterials in biocidal products and treated articles in the EU

Nanomaterials (NMs) are currently being used for a wide variety of products, and a number of them are utilized as biocides due to their antimicrobial or antifungal properties. Little is known to what extent these biocides are available on the market as consumer products. In the EU, the Biocidal Product Regulation (BPR) lays out a list of requirements that manufactureres of biocidal products have to comply with before they can place their products on the market. It is not entirely clear which commercially available articles in the EU have been treated with or incorporate NMs to provide biocidal properties to the product. To obtain an insight into what biocidal products are on the EU market, we used The Nanodatabase (nanodb.dk) for analyzing which NMs are being used and what product categories they represent. In this paper, we address the issue of the current uses of NMs in biocidal products and discuss how they are currently regulated under the BPR. Even though the BPR already entails nanospecific provisions, correct labelling of biocidal products containing NMs is virtually non-existent. By using The Nanodatabase, it was possible to identify 88 biocidal products containing NMs available on the EU market, none of which had the specific labelling required by the BPR. The analysis of biocidal products pinpoints the challenges and limitations for obtaining a reasonable overview of the current uses of NMs in biocidal products as defined in the BPR.

Deeper insight into the structure of the anaerobic digestion microbial community; the biogas microbiome database is expanded with 157 new genomes

This research aimed to better characterize the biogas microbiome by means of high throughput metagenomic sequencing and to elucidate the core microbial consortia existing in biogas reactors independently from the operational conditions. Assembly of shotgun reads followed by an established binning strategy resulted in the highest, up to now, extraction of microbial genomes involved in biogas producing systems. From the 236 extracted genome bins, it was remarkably found that the vast majority of them could only be characterized at high taxonomic levels. This result confirms that the biogas microbiome is comprised by a consortium of unknown species. A comparative analysis between the genome bins of the current study and those extracted from a previous metagenomic assembly demonstrated a similar phylogenetic
distribution of the main taxa. Finally, this analysis led to the identification of a subset of common microbes that could be considered as the core essential group in biogas production.

**General information**

- **State:** Published
- **Organisations:** Department of Environmental Engineering, Residual Resource Engineering, University of Padua
- **Authors:** Treu, L. (Intern), Kougias, P. (Intern), Campanaro, S. (Ekstern), Bassani, I. (Intern), Angelidaki, I. (Intern)
- **Pages:** 260-266
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  - BFI (2015): BFI-level 2
  - Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
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  - Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
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  - Web of Science (2011): Indexed yes
  - BFI (2010): BFI-level 2
  - Scopus rating (2010): SJR 2.089 SNIP 2.344
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  - BFI (2009): BFI-level 2
  - Scopus rating (2009): SJR 1.915 SNIP 2.236
  - Web of Science (2009): Indexed yes
  - BFI (2008): BFI-level 2
  - Scopus rating (2008): SJR 1.736 SNIP 2.74
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  - Scopus rating (2007): SJR 1.403 SNIP 2.396
  - Web of Science (2007): Indexed yes
  - Scopus rating (2006): SJR 1.314 SNIP 2.003
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Four main processes are considered to drive microbial community assembly: selection, drift, dispersal and speciation. These processes occur simultaneously, but the extent to which each process contributes to community assembly is unclear in natural communities. We exposed a high-throughput flow-through biofilm system to continuous immigration from a tap water metacommunity while applying different nitrite surface loading rates. After 63 days of operation, we extracted biofilms and analyzed the community composition via Illumina MiSeq targeting the 16S rRNA gene. Previous studies have shown that Nitrospira is the dominant nitrite oxidizing genus in low nitrite environments. Hence, we postulated that by elevating the nitrite surface loading we would select for NOB with lower nitrite affinity than Nitrospira. We observed different dominant NOB species under different loading rates. While in the metacommunity, Nitrotoga and Nitrospira were found at near equal abundances, in the biofilm community, elevated nitrite loading strongly selected for Nitrotoga over Nitrospira. The biofilms were also significantly different in their alpha-diversity (p<0.001) and beta-diversity, and the evenness and richness of the biofilm community decreased significantly (p=0.004) compared to the metacommunity. These observations indicate that the selection towards Nitrotoga and Nitrospira dominated community assembly under different nitrite loadings. Lastly, we compared our observations of community composition with that predicted by neutral community assembly model. The predictions did not match the community structure observed in the biofilms (p=0.31), providing further evidence of the importance of selection during community assembly.
Depth investigation of rapid sand filters for drinking water production reveals strong stratification in nitrification biokinetic behavior

The biokinetic behavior of NH4 + removal was investigated at different depths of a rapid sand filter treating groundwater for drinking water preparation. Filter materials from the top, middle and bottom layers of a full-scale filter were exposed to various controlled NH4 + loadings in a continuous-flow lab-scale assay. NH4 + removal capacity, estimated from short term loading up-shifts, was at least 10 times higher in the top than in the middle and bottom filter layers, consistent with the stratification of Ammonium Oxidizing Bacteria (AOB). AOB density increased consistently with the NH4 + removal rate, indicating their primarily role in nitrification under the imposed experimental conditions. The maximum AOB cell specific NH4 + removal rate observed at the bottom was at least 3 times lower compared to the top and middle layers. Additionally, a significant up-shift capacity (4.6 and 3.5 times) was displayed from the top and middle layers, but not from the bottom layer at increased loading conditions. Hence, AOB with different physiological responses were active at the different depths. The biokinetic analysis predicted that despite the low NH4 + removal capacity at the bottom layer, the entire filter is able to cope with a 4-fold instantaneous loading increase without compromising the effluent NH4 +. Ultimately, this filter up-shift capacity was limited by the density of AOB and their biokinetic behavior, both of which were strongly stratified.
Both UV treatment and ozonation are used to reduce different types of disinfection byproducts (DBP) in swimming pools. UV treatment is most common as it is particularly efficient in removing the repulsive chlorine like smelling chloramines (combined chlorine). UV treatment of a pool water increased chlorine reactivity and formation of chlor-organic DBP such as trihalomethanes. Based on the similar selective reactivity of ozone and chlorine we hypothesized that the created reactivity towards chlorine by UV treatment of dissolved organic matter in pool water might also be expressed as an increased reactivity towards ozone and that ozonation might saturate the chlorine reactivity created by UV treatment and mitigate the increased DBP formation. By experimentally treating pool water samples, we found that UV treatment makes pool water highly reactive to ozone. The created reactivity towards chlorine decreases dose dependently with ozone dosage prior to contact with chlorine. Furthermore, the kinetics of ozone in UV treated pool water changed drastically from...
a half-life in excess of 20 min to complete consumption in less than 2 min. We discovered that ozonation in UV treated pool water induced formation of some DBPs that are not commonly reported in pool water where trichloronitromethane is noteworthy as it is genotoxic. Therefore, we performed repeated treatment experiments consisting of combined UV/ozone treatment interchanged with chlorination for 24 h the genotoxicity created during the ozone treatment was removed by the UV treatments. Based on the experimental results, a treatment system is proposed with a UV system placed in a side stream to the recirculation flow followed by an ozone dosing point and a small reaction chamber with a volume that allow 1-2 min reaction time before returning to the main recirculation flow. This side-stream UV/ozone treatment will improve the swimming pool water quality.

Developing Fast and Reliable Flood Models
State-of-the-art flood modelling in urban areas are based on distributed physically based models. However, their usage is impeded by high computational demands and numerical instabilities, which make calculations both difficult and time consuming. To address these challenges we develop and test a cheaper-to-run surrogate model, which aims to emulate the response of an original model. The surrogate model is set up by lumping the original model into compartments. These are confined areas in which the volume is modelled by surrogates. We develop two types of surrogates: (i) The drainage system is modelled by response surface surrogates, which are empirical data driven models. These are trained using the volume-discharge relations by piecewise linear functions. (ii) The surface flooding is modelled by lower-fidelity physically based surrogates, which are based on surface depressions and flow paths. A surrogate model is set up for a case study area in Aarhus, Denmark, to replace a MIKE FLOOD model. The drainage surrogates are able to reproduce the MIKE URBAN results for a set of rain inputs. The coupled drainage-surface surrogate model lacks details in the surface description which reduces its overall accuracy. The model shows no instability, hence larger time steps can be applied, which reduces the computational time by more than a factor 1400. In conclusion, surrogate models show great potential for usage in urban water modelling.

Development of an early warning system for water supply networks based on automated ATP monitoring

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Tatari, K. (Intern), Hansen, C. (Ekstern), Rasmussen, A. (Ekstern), Ryan, T. (Ekstern), Desmuillez, M. (Ekstern), Albrechtsen, H. (Intern)
Development of solid supports for electrochemical study of biomimetic membrane systems

Biomimetic membranes are model membrane systems used as an experimental tool to study fundamental cellular membrane physics and functionality of reconstituted membrane proteins. By exploiting the properties of biomimetic membranes resembling the functions of biological membranes, it is possible to construct biosensors for high-throughput screening of potential drug candidates. Among a variety of membrane model systems used for biomimetic approach, lipid bilayers in the form of black lipid membranes (BLMs) and lipo-polymersomes (vesicle structures composed of lipids and polymers), both with reconstituted membrane spanning proteins, are attractive tools. However, BLMs suffer from intrinsic fragility, therefore, requiring techniques to increase their robustness and stability. This PhD thesis presents strategies to construct solid supports for electrochemical studies of two biomimetic membrane systems, BLMs and protein-loaded lipopolymersomes.

The solid support for BLMs was constructed as a reusable device comprising an ethylene tetrafluoroethylene (ETFE) aperture array supported by an in situ polymerized hydrogel covalently attached to both the ETFE and a gold electrode microchip. The hydrogel facilitated BLM formation without the need of manual painting and increased membrane stability in comparison with freestanding membranes. The functionality of the hydrogel supported BLMs (hsBLMs) were demonstrated by electrochemical impedance spectroscopic (EIS) characterization of incorporated ion transporter valinomycin. The presented work also includes a comprehensive EIS analysis and cryological scanning electron microscopic (cryo-SEM) imaging of hydrogels formulated in various molar ratios (1:100; 1:200; 1:400) of the cross-linker poly(ethylene glycol)dimethacrylate (PEGDMA) and 2-hydroxyethylmethacrylate (HEMA) monomers.

Lipo-polymersomes have proved to be suitable for reconstitution of a model G-protein coupled receptor (GPCR) - bacteriorhodopsin (bRh). The bRh-loaded lipo-polymersomes were interfaced to gold electrodes using two different strategies, layer-by-layer deposited polyelectrolyte cushion directly on a gold electrode microchip and on a polyethersulfone (PES) support grafted by in situ polymerized hydrogel. Both strategies proved to be suitable for immobilization of functional bRh loaded lipo-polymersomes. Amperometric monitoring showed that the PES membrane support facilitated recording of a steady-state photocurrent while only a transient photocurrent peak was recorded on the polyelectrolyte cushion without a PES membrane.

This PhD thesis also comprises the design and fabrication process of a modular microfluidic system with automated fluid delivery (micropumps and valves), providing a possibility for future applications of biomimetic membranes in the form of hsBLMs and polymersomes.

This thesis presents both strategies for formulation robust biomimetic membrane systems and devices, which could be developed further to construct biosensor technology for high-throughput screening of drug candidates.

General information
State: Published
Organisations: Department of Micro- and Nanotechnology, Bioanalytics, Department of Environmental Engineering, Water Technologies
Authors: Mech-Dorosz, A. (Intern), Heiskanen, A. (Intern), Emnéus, J. (Intern), Hélix-Nielsen, C. (Intern)
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Diffusion, Coulombic interactions and multicomponent ionic transport of charged species in saturated porous media

Diffusion and compound-specific mixing significantly affect conservative and reactive transport in groundwater at different scales, not only under diffusion-dominated regimes but also under advection-dominated flow through conditions [1]. When dissolved species are charged, besides the magnitude of their aqueous diffusion coefficients also the electrostatic interactions significantly affect solute displacement. We investigated electrostatic interactions between ionic species under flow-through conditions resulting in multicomponent ionic dispersion: the dispersive fluxes of the different ions in the pore water are cross-coupled due to the effects of Coulombic interactions. Such effects are illustrated in flow-through experiments in saturated porous media. Simple strong electrolytes (i.e., salts and strong acid solutions) were selected as tracers and their transport was studied under different advection-dominated conditions in homogeneous and heterogeneous porous media [2-3]. The model-based interpretation of the experimental results is challenging since it requires a multicomponent ionic formulation with an accurate description of local hydrodynamic dispersion and explicitly accounting for the cross-coupling of dispersive fluxes due to the Coulombic interactions between the ions in the pore water.
Diffusive-dispersive mass transfer in the capillary fringe: Impact of water table fluctuations and heterogeneities

Diffusive–dispersive mass transfer in the capillary fringe is important for many groundwater quality issues such as transfer of volatile compounds into (and out of) the groundwater, the supply of oxygen for aerobic degradation of hydrocarbons as well as for precipitation of minerals (e.g. iron hydroxides). 2D-laboratory scale experiments were used to investigate the transfer of oxygen into groundwater under non-reactive and reactive conditions, at steady state and with water table fluctuations. Results show that transfer of oxygen is limited by transverse dispersion in the capillary fringe and the dispersion coefficients are the same as below the water table. Water table fluctuations cause temporarily increased fluxes of oxygen into groundwater during draining conditions and entrapped air after water table rise. High-permeability inclusions in the capillary fringe enhance mass transfer of oxygen to the underlying anoxic groundwater by increased dispersion due to flow focusing and by significant air trapping in the coarse material inclusions.

Disentangling ecosystem stressors along a river continuum covering a pollution gradient

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Aarhus University, Bielefeld University
Authors: McKnight, U. S. (Intern), Sonne, A. T. (Intern), Rasmussen, J. J. (Ekstern), Traunspurger, W. (Ekstern), Höss, S. (Ekstern), Bjerg, P. L. (Intern)
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Disentangling ecosystem stressors along a river continuum covering a pollution gradient

General information
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Organisations: Department of Environmental Engineering, Water Resources Engineering, Ecossa, Aarhus University, Bielefeld University
Authors: McKnight, U. S. (Intern), Sonne, A. T. (Intern), Rasmussen, J. J. (Ekstern), Traunspurger, W. (Ekstern), Höss, S. (Ekstern), Bjerg, P. L. (Intern)
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Activities:
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Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Does reactor staging influence microbial structure and functions in biofilm systems? The case of pre-denitrifying MBBRs
To date, a number of treatment technologies and configurations have been tested to improve the elimination of conventional and trace (e.g., pharmaceutical residues) pollutants via biological wastewater treatment. Bioreactor staging and the moving bed biofilm reactor (MBBR) technology have emerged as promising bioengineered solutions (Plósz et al., 2010) for this purpose. In this study, we combined the two solutions and investigated microbial functions (heterotrophic denitrification, pharmaceutical removal) and structure of the microbial community in staged MBBRs for pre-denitrification. A three-stage MBBR system (S1+S2+S3), fed with pre-clarified wastewater, was operated at laboratory-scale with (i) controlled biomass exposure to organic substrate (COD); and (ii) enhanced the physical retention of biomass, thus inducing adaptation to different substrate exposure conditions. During long-term operation (~500 days) of the three-stage MBBR under continuous-flow conditions, biofilm samples were collected to assess the temporal evolution of the microbial structure in terms of functional gene abundance and biodiversity. A set of batch experiments (day 471) was performed to assess denitrification and pharmaceutical removal in each MBBR, following prolonged biofilm exposure to specific COD availability.
Results from batch experiments showed declining denitrification potential and pharmaceutical biotransformation rate constants (k_{bio}, L gTS^{-1} d^{-1}) from MBBR S1 (exposed to highest COD availability) to S3 (exposed to lowest availability). These findings indicate that the exposure to tiered substrate availability influenced the capacity of utilizing a different range of carbon sources in each MBBR, thus impacting denitrification and pharmaceutical biotransformation. Preliminary analysis on the microbial community based on qPCR (quantitative polymerase chain reaction) showed differences in the abundance of genes (nirS, nirK, nosZ) encoding for denitrifying enzymes in the three staged MBBRs. Further microbial characterization through 16sRNA sequencing (Illumina) is currently under investigation to determine whether differences in microbial functions should be associated to differences in the microbial diversity in the three MBBRs.

General information
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Organisations: Department of Environmental Engineering, Water Technologies, Aarhus University, AnoxKaldnes AB
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Main Research Area: Technical/natural sciences
Moving bed biofilm reactors, Reactor staging, Pharmaceuticals, Denitrification, qPCR, DNA sequencing
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Downscaling future precipitation extremes to urban hydrology scales using a spatio-temporal Neyman–Scott weather generator

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Ecossa, Aarhus University, Bielefeld University
Authors: McKnight, U. S. (Intern), Sonne, A. T. (Intern), Rasmussen, J. J. (Ekstern), Traunspurger, W. (Ekstern), Höss, S. (Ekstern), Bjerg, P. L. (Intern)
Number of pages: 1
Publication date: 2016
Event: Abstract from SETAC Europe 26th Annual Meeting, Nantes, France.
Main Research Area: Technical/natural sciences
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Downscaling future precipitation extremes to urban hydrology scales using a spatio-temporal Neyman–Scott weather generator

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Aarhus University, AnoxKaldnes AB
Number of pages: 1
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Main Research Area: Technical/natural sciences
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Electronic versions:
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Source: PublicationPreSubmission
Source-ID: 126600876
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

Downscaling future precipitation extremes to urban hydrology scales using a spatio-temporal Neyman–Scott weather generator
Drivers of flood damage on event level

Flood risk is dynamic and influenced by many processes related to hazard, exposure and vulnerability. Flood damage increased significantly over the past decades, however, resulting overall economic loss per event is an aggregated indicator and it is difficult to attribute causes to this increasing trend. Much has been learned about damaging processes during floods at the micro-scale, e.g. building level. However, little is known about the main factors determining the amount of flood damage on event level. Thus, we analyse and compare paired flood events, i.e. consecutive, similar damaging floods that occurred in the same area. In analogy to ‘Paired catchment studies’ - a well-established method in hydrology to understand how changes in land use affect streamflow – we will investigate how and why resulting flood damage in a region differed between the first and second consecutive flood events. One example are the 2002 and 2013 floods in the Elbe and Danube catchments in Germany. The 2002 flood caused the highest economic damage (EUR 11600 million) due to a natural hazard event in Germany. Damage was so high due to extreme flood hazard triggered by extreme precipitation and a high number of resulting dyke breaches. Additionally, exposure hotspots like the city of Dresden at the Elbe river and some smaller municipalities at the river Mulde were severely impacted. However, affected parties and authorities learned from the extreme flood in 2002, and many governmental flood risk programs and initiatives were launched. Considerable improvements since 2002 occurred on many levels that deal with flood risk reduction and disaster response, in particular in 1) increased flood prevention by improved spatial planning, 2) an increased number of property-level mitigation measures, 3) more effective early warning and improved coordination of disaster response and 4) a more targeted maintenance of flood defence systems and their deliberate relocation. Thus, despite higher hydrological severity damage due to the 2013 flood was significantly lower than in 2002. In our international comparative paired event study we investigate under which circumstances similar or contrasting processes occurred and hope to identify common key processes which determine flood damage on event level.
Dynamic bioconversion mathematical modelling and simulation of urban organic waste co-digestion in continuously stirred tank reactor

The application of anaerobic digestion (AD) as process technology is increasing worldwide: the production of biogas, a versatile form of renewable energy, from biomass and organic waste materials allows mitigating greenhouse gas emission from the energy and transportation sectors while treating waste. However, the successful operation of AD processes is challenged by economic and technological issues. To overcome these barriers, mathematical modelling of the bioconversion process can provide support to develop strategies for controlling and optimizing the AD process. The objective of this study was to apply a dynamic mathematical model to simulate the co-digestion of different urban organic wastes (UOW). The modelling was based on experimental activities, during which two reactors (R1, R2) were operated at hydraulic retention times (HRT) of 30, 20, 15, 10 days, in thermophilic conditions (55 °C). Sludge, food waste, grass clippings, garden waste were co-digested with VS-based mixing ratios of 10:67.5:15.75:6.75 and 10:45:31.5:13.5 in R1 and R2 respectively. The BioModel (Angelidaki et al., 1999) was then employed with minor modifications of model parameters. The model outputs were validated with experimental results using AD of mixed sludge as single substrate and UOW as co-substrate. The process parameters values were reasonably predicted by the model, showing good correlation with the measured data. Identification of optimal scenarios for co-digestion of UOW, with changing HRT and feedstock compositions, was performed with multi-parameter pareto optimization. The results of the optimization demonstrated that tradeoff between productivity, methane yield and stable process operation should be taken into consideration.

Dynamic functional characterization and phylogenetic changes due to Long Chain Fatty Acids pulses in biogas reactors

The process stability of biogas plants is often deteriorated by the accumulation of Long Chain Fatty Acids (LCFA). The microbial community shifts due to LCFA disturbances have been poorly understood as the molecular techniques used...
were not able to identify the genome characteristics of uncultured microorganisms, and additionally, the presence of limited number of reference genomes in public databases prevented the comprehension of specific functional roles characterizing these microorganisms. The present study is the first research which deciphers by means of high throughput shotgun sequencing the dynamics of the microbial community during an inhibitory shock load induced by single pulses of unsaturated LCFA at two different concentrations (i.e. 2g/L-reactor and 3g/L-reactor). The metagenomic analysis showed that only the microbes associated with LCFA degradation could encode proteins related to “chemotaxis” and “flagellar assembly”, which promoted the ability to move towards the LCFA sources so as to degrade them. Moreover, the syntrophic interactions found between Syntrophomonas sp. together with Methanosarcina sp. were possibly assigned to the menaquinone-electron transfer. Finally, it was proven that a previously exposed to LCFA inoculum is more efficient in the degradation process of LCFA due to the specialization of the microbial consortium.

**General information**

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padova
Authors: Kougias, P. (Intern), Treu, L. (Intern), Campanaro, S. (Ekstern), Zhu, X. (Intern), Angelidaki, I. (Intern)
Number of pages: 10
Publication date: 2016
Main Research Area: Technical/natural sciences

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Volume: 6
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BFI (2017): BFI-level 1
Scopus rating (2017): SJR 1.533 SNIP 1.245 CiteScore 4.36
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.692 SNIP 1.354
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.034 SNIP 1.597 CiteScore 5.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.163 SNIP 1.554 CiteScore 4.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.998 SNIP 1.57 CiteScore 4.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.531 SNIP 0.962 CiteScore 2.44
ISI indexed (2012): ISI indexed yes
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10.1038/srep28810
Links:
http://www.nature.com/articles/srep28810
Source: FindIt
Source-ID: 2306156066
Publication: Research - peer-review › Journal article – Annual report year: 2016
Dynamic gauge adjustment of high-resolution X-band radar data for convective rain storms: Model-based evaluation against measured combined sewer overflow

Numerous studies have shown that radar rainfall estimates need to be adjusted against rain gauge measurements in order to be useful for hydrological modelling. In the current study we investigate if adjustment can improve radar rainfall estimates to the point where they can be used for modelling overflows from urban drainage systems, and we furthermore investigate the importance of the aggregation period of the adjustment scheme. This is done by continuously adjusting X-band radar data based on the previous 5–30 min of rain data recorded by multiple rain gauges and propagating the rainfall estimates through a hydraulic urban drainage model. The model is built entirely from physical data, without any calibration, to avoid bias towards any specific type of rainfall estimate. The performance is assessed by comparing measured and modelled water levels at a weir downstream of a highly impermeable, well defined, 64 ha urban catchment, for nine overflow generating rain events. The dynamically adjusted radar data perform best when the aggregation period is as small as 10–20 min, in which case it performs much better than static adjusted radar data and data from rain gauges situated 2–3 km away.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Krüger A/S
Authors: Borup, M. (Intern), Grum, M. (Ekstern), Linde, J. J. (Ekstern), Mikkelsen, P. S. (Intern)
Number of pages: 13
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Scopus rating (2017): SNIP 1.71 SJR 1.832 CiteScore 4.06
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 1.813 SNIP 1.772
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.686 SNIP 1.761 CiteScore 3.54
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.667 SNIP 1.993 CiteScore 3.45
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.714 SNIP 1.974 CiteScore 3.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.914 SNIP 1.994 CiteScore 3.38
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.742 SNIP 1.833 CiteScore 3.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.786 SNIP 1.712
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.017 SNIP 1.849
Dynamics of N₂O production pathways in a full-scale activated sludge system analysed by ¹⁵N/¹⁸O dual isotope labelling

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, University of Southern Denmark, Max Planck Institute
Authors: Ma, C. (Ekstern), Jensen, M. M. (Intern), Smets, B. F. (Intern), Lavik, G. (Ekstern), Thamdrup, B. (Ekstern)
Pages: 82-83
Publication date: 2016

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Main Research Area: Technical/natural sciences
Conference: MEWE and biofilms IWA specialist conference, Copenhagen, Denmark, 04/09/2016 - 04/09/2016
Electronic versions:
MEWE2016_AbstractBookma.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Dynamic tracer dispersion method: A tool for measuring the total methane emission from individual Danish landfills

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, FORCE Technology
Authors: Mønster, J. (Intern), Fuglsang, K. (Ekstern), Scheutz, C. (Intern)
Number of pages: 2
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Event: Abstract from Conference and Exhibition on Emissions Monitoring 2016 (CEM), Lissabon, Spain.
Main Research Area: Technical/natural sciences
Dynamic tracer dispersion method: A tool for measuring the total methane emission from individual Danish landfills

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering, FORCE Technology
Authors: Mønster, J. (Intern), Fuglsang, K. (Ekstern), Scheutz, C. (Intern)
Number of pages: 18
Publication date: 2016

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Original language: English
Place of publication: Kgs. Lyngby
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Publication: Research › Sound/Visual production (digital) – Annual report year: 2016

Ecological patterns, diversity and core taxa of microbial communities in groundwater-fed rapid gravity filters

Here, we document microbial communities in rapid gravity filtration units, specifically serial rapid sand filters (RSFs), termed prefilters (PFs) and after-filters (AFs), fed with anoxic groundwaters low in organic carbon to prepare potable waters. A comprehensive 16S rRNA-based amplicon sequencing survey revealed a core RSF microbiome comprising few bacterial taxa (29–30 genera) dominated by Nitrospirae, Proteobacteria and Acidobacteria, with a strikingly high abundance (75–87±18%) across five examined waterworks in Denmark. Lineages within the Nitrospira genus consistently comprised the second most and most abundant fraction in PFs (27±23%) and AFs (45.2±23%), respectively, and were far more abundant than typical proteobacterial ammonium-oxidizing bacteria, suggesting a physiology beyond nitrite oxidation for Nitrospira. Within the core taxa, sequences closely related to types with ability to oxidize ammonium, nitrite, iron, manganese and methane as primary growth substrate were identified and dominated in both PFs (73.6±6%) and AFs (61.4±21%), suggesting their functional importance. Surprisingly, operational taxonomic unit richness correlated strongly and positively with sampling location in the drinking water treatment plant (from PFs to AFs), and a weaker negative correlation held for evenness. Significant spatial heterogeneity in microbial community composition was detected in both PFs and AFs, and was higher in the AFs. This is the first comprehensive documentation of microbial community diversity in RSFs treating oligotrophic groundwaters. We have identified patterns of local spatial heterogeneity and dispersal, documented surprising energy–diversity relationships, observed a large and diverse Nitrospira fraction and established a core RSF microbiome.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Urban Water Systems, University of Copenhagen
Authors: Gülay, A. (Intern), Musovic, S. (Intern), Albrechtsen, H. (Intern), Al-Soud, W. A. (Ekstern), Sørensen, S. J. (Ekstern), Smets, B. F. (Intern)
Pages: 2209-2222
Publication date: 2016
Main Research Area: Technical/natural sciences
DNA and RNA SIP reveal ammonium and nitrite oxidizers in groundwater fed biofilters
DNA and RNA SIP reveal nitrifiers in groundwater fed biofilters

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Publication: Research - peer-review › Journal article – Annual report year: 2016

Ecological patterns of nitrifiers in the urban water cycle

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Urban Water Systems
Authors: Diwan, V. (Intern), Dechesne, A. (Intern), Smets, B. F. (Intern), Albrechtsen, H. (Intern)
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Title of host publication: The Danish Microbiological Society Annual Congress 2016 : Programme & Abstracts
Effect of climate change on stormwater runoff characteristics and treatment efficiencies of stormwater retention ponds; a case study from Denmark using TSS and Cu as indicator pollutants. SpringerPlus, 5:1984, 1-12.

This study investigated the potential effect of climate changes on stormwater pollution runoff characteristics and the treatment efficiency of a stormwater retention pond in a 95 ha catchment in Denmark. An integrated dynamic stormwater runoff quality and treatment model was used to simulate two scenarios: one representing the current climate and another representing a future climate scenario with increased intensity of extreme rainfall events and longer dry weather periods. 100-year long high-resolution rainfall time series downscaled from regional climate model projections were used as input. The collected data showed that total suspended solids (TSS) and total copper (Cu) concentrations in stormwater runoff were related to flow, rainfall intensity and antecedent dry period. Extreme peak intensities resulted in high particulate concentrations and high loads but did not affect dissolved Cu concentrations. The future climate simulations showed an increased frequency of higher flows and increased total concentrations discharged from the catchment. The effect on the outlet from the pond was an increase in the total concentrations (TSS and Cu), whereas no major effect was observed on dissolved Cu concentrations. Similar results are expected for other particle bound pollutants including metals and slowly biodegradable organic substances such as PAH. Acute toxicity impacts to downstream surface waters seem to be only slightly affected. A minor increase in yearly loads of sediments and particle-bound pollutants is expected, mainly caused by large events disrupting the settling process. This may be important to consider for the many stormwater retention ponds existing in Denmark and across the world.
Effect of ozonation of swimming pool water on formation of volatile disinfection by-products - A laboratory study

Ozonation experiments were performed using unchlorinated tap water used for filling municipal swimming pools, actual pool water and pool water polluted by addition of fresh tap water and artificial body fluid to evaluate ozone kinetics and water quality effects on formation of volatile disinfection byproducts during subsequent chlorination.

The ozone reaction was observed to behave according to first order kinetics. For tap water half-life was 4 min whilst polluted and unpolluted pool water exhibited half-life of 8 and 11 min, respectively. When ozonation dosage was repeated half-life of ozone was approximated 17-19 min in all samples.

Subsequent chlorination revealed ozone removed reactivity of dissolved organic carbon toward chlorine for tap and polluted pool water, decreasing formation rate of trihalomethanes (TTHM). In pool water higher rates of TTHM formation was observed after the initial ozone dosage, however this decreased with subsequent treatments. For tap and polluted pool water, ozone reacted directly with the pollutants resulting in a short ozone half-life, removing reactivity towards chlorine oxidation and preventing TTHM production. Conversely for pool water samples, due to the long half-life of ozone, the molecule decomposed to hydroxyl radicals. These in turn reacted with aqueous organic matter increasing chlorine reactivity and rates of TTHM formation. Formation of other non-regulated volatile byproducts (e.g. dichloracetonitrile, trichloropropanone and trichloronitromethane) was observed to increase in pool water with ozone treatment. Thus, ozonation dosage regimes should be designed such that ozone mostly oxidizes fresh pollutants before chlorine is able to react with it.

General information
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Authors: Hansen, K. M. S. (Intern), Spiliotopoulou, A. (Intern), Cheema, W. A. (Intern), Andersen, H. R. (Intern)
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BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.34
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 5.68
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.92
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 4.59
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.92
ISI indexed (2012): ISI indexed yes
Effects of anti-androgens cyproterone acetate, linuron, vinclozolin, and p,p'-DDE on the reproductive organs of the copepod Acartia tonsa

The study was performed to detect the effects of anti-androgenic compounds on the reproduction. In this paper alterations observed in the marine calanoid copepod Acartia tonsa exposed to environmental concentrations of cyproterone acetate (CPA), Linuron (LIN), vinclozolin (VIN), and 1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene (p,p'-DDE) for 21 days covering a full life cycle are described. Histological alterations were studied with a focus on reproductive organs, gonad and accessory sexual glands. Exposure to ≥1.2 µg L⁻¹ CPA caused degeneration of spermatocytes and deformation of the spermatophore in males. In a single male exposed to 33 µg L⁻¹ CPA, an ovotestis was observed. In CPA exposed females, enhancement of oogenesis, increase in apoptosis and a decrease in proliferation occurred. Exposure of males to ≥12 µg L⁻¹ LIN caused degenerative effects in spermatogonia, spermatocytes and spermatids, and at 4.7 µg L⁻¹ LIN, the spermatophore wall displayed an irregular formation. In LIN exposed females, no such structural alterations were found; however, the proliferation index was reduced at 29 µg L⁻¹ LIN. At an exposure concentration of ≥100 µg L⁻¹ VIN, distinct areas in male gonad were stimulated, whereas others displayed a disturbed spermatogenesis and a deformed spermatophore wall. In VIN exposed female A. tonsa, no effects were observed. Male A. tonsa exposed to p,p'-DDE displayed an impairment of spermatogenesis in all stages with increased degrees of apoptosis. In p,p'-DDE-exposed females, a statistical significant increase of the proliferation index and an intensification of oogenesis were observed at 0.0088 µg L⁻¹.

General information
State: Published
Organisations: Department of Environmental Engineering, Laboratory for Aquatic Research and Comparative Pathology, University of Ioannina, University of Milan
Authors: Watermann, B. T. (Ekstern), Albanis, T. A. (Ekstern), Galassi, S. (Ekstern), Gnass, K. (Ekstern), Kusk, K. O. (Intern), Sakkas, V. A. (Ekstern), Wollenberger, L. (Intern)
Number of pages: 10
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Publication date: 2016
Main Research Area: Technical/natural sciences

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Effects of gasification biochar on plant-available water capacity and plant growth in two contrasting soil types

Abstract Gasification biochar (GB) contains recalcitrant carbon that can contribute to soil carbon sequestration and soil quality improvement. However, the impact of GB on plant-available water capacity (AWC) and plant growth in diverse soil types still needs to be explored. A pot experiment with spring barley (Hordeum vulgare L.) was conducted to investigate the effect of soil amendment by 1% straw and wood gasification biochar (SGB and WGB), respectively, on AWC and plant growth responses under two levels of water supply in a temperate sandy loam and a coarse sandy subsoil. In the sandy
loam, the reduced water regime significantly affected plant growth and water consumption, whereas the effect was less pronounced in the coarse sand. Irrespective of the soil type, both GBs increased AWC by 17–42%, with the highest absolute effect in the coarse sand. The addition of SGB to coarse sand led to a substantial increase in plant biomass under both water regimes: shoot growth by 40–165% and root growth by 50–57%. However, no positive effects were achieved by the addition of WGB. In the sandy loam, soil application of GB had no or negative effects on plant growth. Our results suggest that SGB has considerable potential for enhancing crop productivity in coarse sandy soils by increasing soil water retention and improving root development.
Effektiv bionedbrydning af lægemidler i spildevand ved biofilmbaseret teknologi

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Organisations: Department of Environmental Engineering, Water Technologies, Teknologisk Institut, Krüger A/S, Aarhus University, Det Nye Universitetshospital
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Main Research Area: Technical/natural sciences

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Links:
https://issuu.com/spildevandsteknisktidsskrift/docs/stt2-2016_web/31
Source: PublicationPreSubmission
Source-ID: 123812178
Publication: Research - peer-review › Journal article – Annual report year: 2016

Efficiency of stormwater control measures for combined sewer retrofitting under varying rain conditions: Quantifying the Three Points Approach (3PA)

We present a method to assess and communicate the efficiency of stormwater control measures for retrofitting existing urban areas. The tool extends the Three Points Approach to quantitatively distinguish three rainfall domains: (A) rainwater resource utilisation, (B) urban stormwater drainage pipe design, and (C) pluvial flood mitigation. Methods for calculating efficiencies are defined recognizing that rainfall is both a valuable resource and a potential problem. Efficiencies are quantified in relation to rainfall volume, supplied potable water volume and volume of wastewater treated. A case study from Denmark is used to illustrate how the efficiency varies between the rainfall domains. The method provides a means for communicating some important quantitative aspects of stormwater control measures among engineers, planners and decision makers working with management of water resources, stormwater drainage and flood risks.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Sørup, H. J. D. (Intern), Lerer, S. M. (Intern), Arnbjerg-Nielsen, K. (Intern), Mikkelsen, P. S. (Intern), Rygaard, M. (Intern)
Pages: 19-26
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Environmental Science & Policy
Volume: 63
Energy footprints in the urban water cycle

General information
State: Published
Energy recovery from water and food sector residual resources

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Department of Chemical and Biochemical Engineering, CHEC Research Centre
Pages: 64-72
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Enhanced performance of a biomimetic membrane for Na2CO3 crystallization in the scenario of CO2 capture

Membrane assisted crystallization (MACr) offers an innovative platform for crystallizing Na2CO3, allowing its reuse after CO2 capture from flue gases by an alkaline solution (i.e., NaOH). In this study, the biomimetic aquaporin Inside™ membrane AIM60 was employed to enhance water removal, facilitating Na2CO3 crystallization. The water channel in the active layer, comprising aquaporin proteins, and the strong wettability of membrane substrate assist a better performance. For instance, the water flux of AIM60 membrane for concentrating a 1.89mol/L Na2CO3 solution (osmotic pressure of 94.8bar) in forward osmosis (FO) mode was 6.62Lm²h⁻¹ and 3.25Lm²h⁻¹ in pressure retarded osmosis (PRO) mode when a 5.13mol/L NaCl solution (osmotic pressure of 304.9bar) was employed as the draw solution. This demonstrates that the AIM60 FO membrane outperformed the previously reported dense reverse osmosis membrane (0.21Lm²h⁻¹ in FO mode and 0.16Lm²h⁻¹ in PRO mode) and a porous hydrophobic hollow fiber membrane (0.08Lm²h⁻¹) under the same operating conditions. Crystallization utilizing the AIM60 membrane in an osmotic crystallizer was achieved without noticeable membrane scaling or degradation. Furthermore, a proper control of the supersaturation level induces crystallization of Na2CO3·10H2O crystals with a purity of 99.94%. Hence, the aquaporin Inside™ FO membrane may be a promising alternative to existing methods for Na2CO3 crystallization for its application in a CO2 capture scenario.

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Environmental assessment of biowaste management in the Danish-German border region

The treatment of organic waste from households has gained significant interest in recent years. Each country in the EU and the rest of the world treat their organic waste in many different ways, and Denmark and Germany are no exemption in this regard. The treatment of household organic waste in these two countries has taken a very different turn in the last
century. Denmark has been incinerating organic household waste as part of a residual waste policy for more than a century, but it has only attempted biological treatment to a limited extent. Germany, on the other hand, has focused intensely on source separation followed by biological treatment and a mixture of incineration and mechanical and biological treatment for any organic matter remaining in residual waste. In recent years, Denmark has increased its focus on moving away from incineration and increasing material recycling, both on its own initiative and also incentivised by the EU’s 50% recycling target for 2020. This focus includes recycling organic waste from households as well as dry recyclable waste fractions.

This PhD project was carried out as a cross-border partnership with five waste management companies, three located in Denmark and two in Germany, all with the wish to increase the source separation and treatment of organic household waste. The current practice in the Danish border region does not include source separation, and all organic household waste is incinerated as part of the residual waste. The German region already has a well-established source separation system, but it wants to increase its efficiency.

The main aim of this Ph.D. thesis was to compare current organic waste management systems across the Danish-German border with future scenarios intended for the treatment of organic waste using LCA. The outcome of the project was a recommendation to waste management companies through life cycle assessment and experimental work at a biological treatment plant.

A major part of the PhD study was collecting data on all aspects of the waste management chain. Waste generation through to collection, transportation, treatment and final disposal were analysed. The most detailed analysis took place at a combined biogas and composting plant, where solid and liquid samples were taken and air emissions measured through whole-site fugitive emissions. The assessments were done by using a combination of material flow analysis, substance flow analysis, life cycle inventories and life cycle assessments, using the EASETECH modelling software.

The life cycle assessment assessed the management of organic household waste in the Danish-German border region. The main output was a life cycle assessment showing large differences in the environmental performance of the two different regions, with the Danish region performing better in most impact categories. Furthermore, the importance of the energy systems was investigated, showing that a large influence on the results was the surrounding energy system. Besides comparing the two regions' current performances to each other, they were compared to four future scenarios featuring increased source separation and different biological treatments. In this case the life cycle assessment was used as a planning tool for a future waste management system where environmental hotspots could be identified for both current and possible future systems. In all cases, the results showed that local conditions can play a major role in where the system can be improved, and conclusions made on an overall level (all five waste management companies together) can lead to suboptimal decisions; it is therefore important to look at each waste management company individually. Major differences in environmental performance were seen when changing from incineration or mechanical and biological treatment to biological treatment, such as increased savings of phosphorous and increased loadings of ammonia. Most important for the environmental performance of the biological treatment facilities were high biogas production and low fugitive methane, nitrous oxide and ammonia emissions.

Fugitive emissions measured at a combined biogas and composting plant were very significant and led to a turnaround in the environmental performance of the plant, going from a saving in greenhouse gas potential to a loading when including the measured emissions and applying the life cycle assessment principles.

Ultimately, increasing the source separation of organic household waste for the five waste management companies is a viable option, if the focus of the companies is on flexible fuel (biogas), compost production and subsequent resource savings. However, the picture is not clear, as the current waste management system (mainly incineration) is already working well, and in some cases it outperforms the biological treatment option.

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Environmental impacts of flood control measures in climate change adaptation strategies
Because of climatic changes, large investments are needed to keep flood risk at an acceptable level in urban areas. Increasing dimensions of underground sewer systems and retention basins are increasingly supplemented with multi-functional approaches, aimed at managing water locally and/or route it on the surface without harming assets. When evaluating different adaptation approaches, a cost assessment is typically carried out, while environmental impacts usually are not considered. To close this gap, a Life Cycle Assessment (LCA) based method is developed, which allows to quantify environmental impacts of different storm water management strategies. It is tested with two different adaptation
strategies for the Nørrebro catchment in Copenhagen, Denmark: A Cloudburst Management Plan (CMP), which uses a multi-functional approach and combines green infrastructure with subsurface pipes, and a Subsurface scenario (SSA), which uses only pipes and underground retention basins. To ensure comparability, flood safety levels for different rain events are defined, which have to be met in both scenarios. The environmental impacts are calculated for eight different categories, including climate change, resource depletion, eutrophication and acidification. The case study shows significantly lower impacts for the multi-functional, green infrastructure CMP, compared to the SSA. Among the installations, those measures which are installed to ensure no water on the surface during rain events with a return period of 10 years and handling small events with a return period of up to 0.2 years cause by far the largest share of the total environmental impacts in both scenarios (up to 96% for the CMP, and up to 84% for the SSA. In contrast, measures aimed at handling extreme events with a return period of up to 100 years only contribute up to 4% of the environmental impacts for the CMP and less than 1% for the SSA. Our method helps explain how the handling of everyday events and extreme rain events affect the environmental sustainability of climate change adaptation and it enables cities to consider the environmental sustainability of climate change adaptation solutions in the planning process.

**General information**

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Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Management Engineering, Quantitative Sustainability Assessment
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**Environmental implications of the use of agro-industrial residues for biorefineries: application of a deterministic model for indirect land-use changes**

Biorefining agro-industrial biomass residues for bioenergy production represents an opportunity for both sustainable energy supply and greenhouse gas (GHG) emissions mitigation. Yet, is bioenergy the most sustainable use for these residues? To assess the importance of the alternative use of these residues, a consequential life-cycle assessment (LCA) of 32 energy-focused biorefinery scenarios was performed based on eight selected agro-industrial residues and four conversion pathways (two involving bioethanol and two biogas). To specifically address indirect land-use changes (iLUC) induced by the competing feed/food sector, a deterministic iLUC model, addressing global impacts, was developed. A dedicated biochemical model was developed to establish detailed mass, energy, and substance balances for each biomass conversion pathway, as input to the LCA. The results demonstrated that even for residual biomass, environmental savings from fossil fuel displacement can be completely out-balanced by iLUC, depending on the feed value of the biomass residues. This was the case of industrial residues brewer's grain, beet residues, potato pulp, and whey. Overall, the GHGs from iLUC impacts were quantified to 4.1 t CO2 eq.ha-1 demanded y-1 corresponding to 1.2-1.5 t CO2 t-1 dry biomass used for energy. Only bioenergy from straw and wild grass was shown to perform better than the alternative use, as no competition with the feed sector was involved. Biogas for heat-and-power production was the best performing pathway, in a short-term context. Focusing on transport fuels, bioethanol was generally preferable to biomethane considering conventional biogas upgrading technologies. Based on the results, agro-industrial residues cannot be considered burden-free simply because they are a residual biomass and careful accounting of alternative utilization is a pre-requisite to assess the sustainability of a given use. In this endeavor, the iLUC factors and biochemical model proposed herein can be used as templates and directly applied to any bioenergy consequential study involving demand for arable land.

**General information**

State: Published
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Environmental life cycle assessment of urban storm water management

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Environmental Phosphorus Recovery Based on Molecular Bioscavengers: From Quantum Mechanics to Continuum Physics
Phosphorus is a ubiquitous element of all known life and as such it is found throughout numerous key molecules related to various cellular functions. The supply of phosphorus is tightly linked to global food security, since phosphorus is used to produce agricultural fertilizers, without which it would not be possible to feed the world population. Sadly, the current supply of phosphorus is based on the gradual depletion of limited fossil reserves, and some estimates predict that within 15-25 years we will consume more phosphorus than we can produce. There is therefore a strong international pressure to develop sustainable phosphorus practices as well as new technologies for phosphorus recovery. Nature has spent billions of years refining proteins that interact with phosphates. This has inspired the present work where the overall ambitions are: to facilitate the development of a recovery technology based on biological phosphorus scavengers, to examine fundamental molecular system aspects relevant for such a technology, and to motivate the use of computational techniques throughout an iterative design process of such a technology. A wide spectrum of computational...
Environmental risk assessment and management of engineered nanomaterials - The role of ecotoxicity testing

In 2004, the first article on ecotoxicity of engineered nanomaterials (ENMs) was published, subsequently giving birth to the field of nanotoxicology. Today, approximately a thousand peer-reviewed articles have been published on the topic albeit many challenges remain within the field. Central to these is the continued examination of the applicability of ecotoxicity testing to encompass the testing of particles, as the tests originally are developed for dissolved chemicals. Furthermore, the ability of such testing to inform environmental risk assessment and environmental risk management, including the applicability of these concepts, has been questioned.

The present thesis provides an overview of the challenges facing ecotoxicity testing of ENMs and investigates whether we can rely on such testing to inform risk assessment and eventually management of the potential environmental risk of ENMs.

Although the Organisation for Economic Co-operation and Development (OECD) launched a seven year long testing programme around the use of standardized OECD test guidelines (TGs) for ENMs, which concluded that the TGs are generally applicable to ENMs, this thesis argues that it is not possible to offer any conclusions based on their analysis. Efforts within nanotoxicology are focused on modifying existing TGs to improve the stability and dispersion of suspended ENMs, although it is paramount to acknowledge that the underlying assumption of the dissolved nature of the test compound is violated. Furthermore, several dilemmas - so called-double binds - should also be acknowledged as they dictate the limitations of standardization and therefore also its ability to guide risk assessment.

The paradigm of conducting in vivo animal toxicity testing and extrapolating the data to either humans or the environment is gradually being replaced with a focus on in silico and in vitro studies with an even greater need for and reliance on extrapolation. However, in this thesis it is argued that within ecotoxicity, whole organism models remain at the foundation of environmental risk assessment, and as such, they are likely to remain in use for nanotoxicology. Indeed, the use of more complex in vivo systems such as microcosms and mesocosms are recommended to enable and validate current risk assessment practices. But just as envisioned in human toxicology, an integrated approach must be pursued to reap the benefits of simplified as well as more complex testing systems, each fit for purpose for different tasks.

It is concluded that it is not possible to conduct environmental risk assessment of ENMs with a satisfactory level of certainty, primarily due to knowledge gaps and the uncertainty imbedded in current ecotoxicity data. Albeit with time better data will be available, it is important that tools encompassing uncertainty are utilized to facilitate decision-support. As the risk constituted by ENMs cannot be quantified, the use, need and ability of risk management options to encompass the potential risk are similarly challenged. This should invoke a precautionary stance on the use of ENMs.

Within the field of nanotoxicology the concept of creating ‘safety by design’ has received much attention, arguably both due to these risk assessment and management issues, but also in spite of them. Instead of focusing on managing complexity and uncertainty, the rise of ‘safety by design’ indicates that the field is going towards a more deterministic approach with a misplaced promise to solve these management issues scientifically.

Finally, identifying risky ENMs and safer alternatives through alternatives assessment should be encouraged. Importantly, in doing so we will also be forced to look at risk in combination with benefits, as addressing risk in isolation rarely leaves room for resolving societal issues.
Environmental risk assessment of chemicals and nanomaterials — The best foundation for regulatory decision-making?

Environmental risk assessment (ERA) is often considered as the most transparent, objective and reliable decision-making tool for informing the risk management of chemicals and nanomaterials. ERAs are based on the assumption that it is possible to provide accurate estimates of hazard and exposure and, subsequently, to quantify risk. In this paper we argue that since the quantification of risk is dominated by uncertainties, ERAs do not provide a transparent or an objective foundation for decision-making and they should therefore not be considered as a "holy grail" for informing risk management. We build this thesis on the analysis of two case studies (of nonylphenol and nanomaterials) as well as a historical analysis in which we address the scientific foundation for ERAs. The analyses show that ERAs do not properly address all aspects of actual risk, such as the mixture effect and the environmentally realistic risk from nanomaterials. Uncertainties have been recognised for decades, and assessment factors are used to compensate for the lack of realism in ERAs. The assessment factors' values were pragmatically determined, thus lowering the scientific accuracy of the ERAs. Furthermore, the default choice of standard assay for assessing a hazard might not always be the most biologically relevant, so we therefore argue that an ERA should be viewed as a pragmatic decision-making tool among several, and it should not have a special status for informing risk management. In relation to other relevant decision-making tools we discuss the use of chemical alternative assessments (CAAs) and the precautionary principle.
Environmental risk assessment of poorly soluble substances: Improved tools for assessing biodegradation, (de)sorption, and modeling

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Equilibrium sampling in a semi in situ pot experiment to measure freely dissolved concentrations of hydrophobic organic compounds

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Organisations: Department of Environmental Engineering, Environmental Chemistry
Authors: Bartolome, N. (Ekstern), Hilber, I. (Ekstern), Schulin, R. (Ekstern), Mayer, P. (Intern), Witt, G. (Ekstern), Bucheli, T. (Ekstern)
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Establishing bio-mitigation systems at landfills for reducing greenhouse gas emission – State-of-the-art

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Estimating mass discharge of contaminant plumes downstream of landfills: Benefits of geophysics

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Estimation of long-term environmental inventory factors associated with land application of sewage sludge
Land application of sewage sludge has a number of advantages over other alternatives, but is also associated with environmental impacts. To make proper assessments of different sludge treatments, it is crucial to have reliable estimates of emissions after the application of different sludge types. However, because of the complexity of the agricultural production system, it is difficult to estimate emissions consistently under different conditions. In the current paper, a mechanistic agro-ecosystem model was calibrated to be able to simulate different sludge types stabilized using different techniques. Subsequently, 100 year model simulations were used to provide emission factors as well as harvest and carbon sequestration factors (collectively called environmental inventory factors) under a variety of environmental conditions. Environmental inventory factors were calculated under both high crop response conditions (i.e. when nitrogen was limiting) and low crop response conditions (i.e. when nitrogen was not limiting). The average high response nitrogen harvest factor over the tested environmental conditions was ranging from 0.06 to 0.30 for the different sludge types included. This means that if an additional 1 kg of nitrogen is applied with sludge, between 0.06 and 0.30 kg additional nitrogen is harvested. This is considerably lower than for mineral fertilizer with an average value of 0.63. The low response harvest factors were considerably lower, ranging from 0.03 to 0.13. The emission factor for nitrous oxide nitrogen was ranging from 0.024 to 0.034, consistently being higher under high response conditions. For nitrogen leaching to the groundwater, the high response emission factor ranged from 0.20 to 0.50 for the different sludge types while the low response were slightly higher ranging from 0.18 to 0.55. The average carbon sequestration factor across the different environmental conditions ranged from 0.03 to 0.05 for the different sludge types. In conclusion, the approach using an agro-ecosystem model to estimate inventory factors associated with land application of sludge under varying conditions proved very powerful and would have been virtually impossible by experimental means.

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Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Copenhagen
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Estimation of marginal costs at existing waste treatment facilities

This investigation aims at providing an improved basis for assessing economic consequences of alternative Solid Waste Management (SWM) strategies for existing waste facilities. A bottom-up methodology was developed to determine marginal costs in existing facilities due to changes in the SWM system, based on the determination of average costs in such waste facilities as function of key facility and waste compositional parameters. The applicability of the method was demonstrated through a case study including two existing Waste-to-Energy (WtE) facilities, one with co-generation of heat and power (CHP) and another with only power generation (Power), affected by diversion strategies of five waste fractions (fibres, plastic, metals, organics and glass), named "target fractions". The study assumed three possible responses to waste diversion in the WtE facilities: (i) biomass was added to maintain a constant thermal load, (ii) Refused-Derived-Fuel (RDF) was included to maintain a constant thermal load, or (iii) no reaction occurred resulting in a reduced waste throughput without full utilization of the facility capacity. Results demonstrated that marginal costs of diversion from WtE were up to eleven times larger than average costs and dependent on the response in the WtE plant. Marginal cost of diversion were between 39 and 287€Mg⁻¹ target fraction when biomass was added in a CHP (from 34 to 303€Mg⁻¹ target fraction in the only Power case), between -2 and 300€Mg⁻¹ target fraction when RDF was added in a CHP (from -2 to 294€Mg⁻¹ target fraction in the only Power case) and between 40 and 303€Mg⁻¹ target fraction when no reaction happened in a CHP (from 35 to 296€Mg⁻¹ target fraction in the only Power case). Although average costs at WtE facilities were highly influenced by energy selling prices, marginal costs were not (provided a response was initiated at the WtE to keep constant the utilized thermal capacity). Failing to systematically address and include costs in existing waste facilities in decision-making may unintendedly lead to higher overall costs at societal level. To avoid misleading conclusions, economic assessment of alternative SWM solutions should not only consider potential costs associated with alternative treatment but also include marginal costs associated with existing facilities.

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Ethical aspects of life cycle assessments of diets

Since the turn of the century a growing chorus of researchers has been espousing reduced meat and dairy intake as a partial strategy to transition towards a sustainable food system. Many of these studies have been predicated on a life-cycle assessment (LCA) methodology and though transparent in communicating their work within that framework, it has largely gone unmentioned that LCA involves a number of choices by the assessor and LCA methodology developers that are ultimately subjective. This study uses a consequential LCA of the average Danish diet in comparison to model vegetarian and vegan diets, leveraging the cultural perspectives afforded by the ReCiPe methodology, as starting point to explore the ways that subjectivity influences the LCA process and to test the robustness of the results against these different viewpoints. Mirroring earlier studies, we find vegetarian and vegan diets generally perform better environmentally compared to a standard Danish diet, but that there was minimal difference between the two no-meat options. Results were resilient to varying cultural perspectives applied in the model. LCA methodology, though loaded with value judgments, remains a dependable tool for assessing environmental dietary performance, but is less suited for estimating environmental pressures that are highly dependent on local conditions (e.g. chemical toxicity).
EU Regulation of Nanobiocides: Challenges in Implementing the Biocidal Product Regulation (BPR)

The Biocidal Products Regulation (BPR) contains several provisions for nanomaterials (NMs) and is the first regulation in the European Union to require specific testing and risk assessment for the NM form of a biocidal substance as a part of the information requirements. Ecotoxicological data are one of the pillars of the information requirements in the BPR, but there are currently no standard test guidelines for the ecotoxicity testing of NMs. The overall objective of this work was to investigate the implications of the introduction of nano-specific testing requirements in the BPR and to explore how these might be fulfilled in the case of copper oxide nanoparticles. While there is information and data available in the open literature that could be used to fulfill the BPR information requirements, most of the studies do not take the Organisation for Economic Co-operation and Development’s nanospecific test guidelines into consideration. This makes it difficult for companies as well as regulators to fulfill the BPR information requirements for nanomaterials. In order to enable a nanospecific risk assessment, best practices need to be developed regarding stock suspension preparation and characterization, exposure suspensions preparation, and for conducting ecotoxicological test.
Evaluating robustness of a diesel-degrading bacterial consortium isolated from contaminated soil

It is not known whether diesel-degrading bacterial communities are structurally and functionally robust when exposed to different hydrocarbon types. Here, we exposed a diesel-degrading consortium to model either alkanes, cycloalkanes or aromatic hydrocarbons as carbon sources to study its structural resistance. The structural resistance was low, with changes in relative abundances of up to four orders of magnitude, depending on hydrocarbon type and bacterial taxon. This low resistance is explained by the presence of hydrocarbon-degrading specialists in the consortium and differences in growth kinetics on individual hydrocarbons. However, despite this low resistance, structural and functional resilience were high, as verified by re-exposing the hydrocarbon-perturbed consortium to diesel fuel. The high resilience is either due to the short exposure time, insufficient for permanent changes in consortium structure and function, or the ability of some consortium members to be maintained during exposure on degradation intermediates produced by other members. Thus, the consortium is expected to cope with short-term exposures to narrow carbon feeds, while maintaining its structural and functional integrity, which remains an advantage over biodegradation approaches using single species cultures.

General information
State: Published
Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, Department of Environmental Engineering, Water Technologies, Poznan University of Technology, Poznan University Of Life Sciences, Polish Academy of Sciences
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Scopus rating (2012): SJR 0.784 SNIP 0.85 CiteScore 2.12
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
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Scopus rating (2011): SJR 0.947 SNIP 0.955 CiteScore 2.13
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Scopus rating (2010): SJR 0.896 SNIP 1.027
Evaluating Sorting and Reuse Potentials for Household Waste in Sisimiut, Greenland

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Residual Resource Engineering, Environmental Chemistry, Technical University of Denmark
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Publisher: Arctic Technology Centre, DTU Technical University of Denmark
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Evaluation of a membrane bioreactor system as post-treatment waste water treatment for better removal of micropollutants

Organic micropollutants such as pharmaceuticals are persistent pollutants that are only partially degraded in waste water treatment plants (WWTPs). In this study, a membrane bioreactor (MBR) system was used as a polishing step on a full-scale WWTP, and its ability to remove micropollutants was examined together with the development and stability of the microbial community. Two stages of operation were studied during a period of 9 months, one with (S1) and one without (S2) the addition of exogenous organic micropollutants. Ibuprofen and naproxen had the highest degradation rates with values of 248 μg/gVSS·h and 71 μg/gVSS·h, whereas diclofenac was a more persistent OMP (7.28 μg/gVSS·h). Mineralization of 14C-labeled organic micropollutants' in batch kinetic experiments indicates that higher removal rates (~0.6 mg/mgSS·h) with a short lag phase can be obtained when artificial addition of organic micropollutants was
performed. Similar microbial populations dominated S1 and S2, despite the independent operations. Hydrogenophaga, Nitrospira, p55-a5, the actinobacterial Tetrassphaera, Propionicimonas, Fodinicola, and Candidatus Microthrix were the most abundant groups in the polishing MBR. Finally, potential microbial candidates for ibuprofen and naproxen degradation are proposed.

**General information**
State: Published
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Scopus rating (2015): SJR 2.665 SNIP 2.482 CiteScore 6.63
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BFI (2011): BFI-level 2
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Web of Science (2011): Indexed yes
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BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.319 SNIP 2.224
Web of Science (2009): Indexed yes
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Scopus rating (2008): SJR 2.073 SNIP 2.178
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.94 SNIP 2.184
Web of Science (2007): Indexed yes
Evaluation of a new pulping technology for pre-treating source-separated organic household waste prior to anaerobic digestion

A new technology for pre-treating source-separated organic household waste prior to anaerobic digestion was assessed, and its performance was compared to existing alternative pre-treatment technologies. This pre-treatment technology is based on waste pulping with water, using a specially developed screw mechanism. The pre-treatment technology rejects more than 95% (wet weight) of non-biodegradable impurities in waste collected from households and generates biopulp ready for anaerobic digestion. Overall, 84-99% of biodegradable material (on a dry weight basis) in the waste was recovered in the biopulp. The biochemical methane potential for the biopulp was 469±7mL CH4/g ash-free mass. Moreover, all Danish and European Union requirements regarding the content of hazardous substances in biomass intended for land application were fulfilled. Compared to other pre-treatment alternatives, the screw-pulping technology showed higher biodegradable material recovery, lower electricity consumption and comparable water consumption. The higher material recovery achieved with the technology was associated with greater transfer of nutrients (N and P), carbon (total and biogenic) but also heavy metals (except Pb) to the produced biomass. The data generated in this study could be used for the environmental assessment of the technology and thus help in selecting the best pre-treatment technology for source separated organic household waste.

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Evaluation of Maximum a Posteriori Estimation as Data Assimilation Method for Forecasting Infiltration-Inflow Affected Urban Runoff with Radar Rainfall Input
High quality on-line flow forecasts are useful for real-time operation of urban drainage systems and wastewater treatment plants. This requires computationally efficient models, which are continuously updated with observed data to provide good initial conditions for the forecasts. This paper presents a way of updating conceptual rainfall-runoff models using Maximum a Posteriori estimation to determine the most likely parameter constellation at the current point in time. This is done by combining information from prior parameter distributions and the model goodness of fit over a predefined period of time that precedes the forecast. The method is illustrated for an urban catchment, where flow forecasts of 0–4 h are generated by applying a lumped linear reservoir model with three cascading reservoirs. Radar rainfall observations are used as input to the model. The effects of different prior standard deviations and lengths of the auto-calibration period on the resulting flow forecast performance are evaluated. We were able to demonstrate that, if properly tuned, the method leads to a significant increase in forecasting performance compared to a model without continuous auto-calibration. Delayed responses and erratic behaviour in the parameter variations are, however, observed and the choice of prior distributions and length of auto-calibration period is not straightforward.
Evaluation of minerals and vitamins in the Danish cultivated sugar kelp
Seaweeds are known for their nutraceutical applications, but also the ability to accumulate e.g. very high iodine concentrations and toxic heavy metals. In this study, cultivated Saccharina latissima (sugar kelp) harvested year-round was analysed for minerals (incl. heavy metals) and vitamins (vit A and E) to evaluate the nutritional value, possible risks and harvest time for optimized value and application. Rope cultivated sugar kelp was sampled both in close proximity to a blue mussel and fish farm (IMTA) and in a reference/control site, both outside Horsens fjord in Denmark, and freeze dried and stored frozen for further analyses. Sugar kelp biomass was sampled (n=3) at 2 m depth in 2013-2014. Surprisingly high concentrations of K and Ca (up to more than 100 and 150 g/kg DW, respectively) were found, along with other trace metals: Cr, Fe, Mn, Co, Cu, Na, Zn, and Se. Undesirable elements such as Pb, Hg, and inorganic As were below legislative threshold values for edible seaweed in France and food supplements in EU, whereas Cd concentrations in some seasons were above the French limits. However, a 70 kg person would need an intake of 0.77-2.0 kg DW of sugar kelp to reach the provisional tolerable weekly intake limit set for Cd. The iodine was found in so high levels (up to 5 g/kg) that this will be the limiting element for intake of sugar kelp. Moreover, the concentrations of total As found from September to March were above the EU regulatory levels for feed ingredients (40 mg/kg DW. Pb and Cd concentrations were below threshold values. The vitamin E (alpha-tocopherol) concentrations (6-25 mg/kg DW) were similar to what is found in broccoli. Generally the year-round variations were due season, and not between the two locations (reference and IMTA), so harvest time is important for optimized use, and may be conflicting with highest yields of sugar kelp. High concentrations of iodine and total As may be of concern regarding food and feed regulations, respectively.

General information
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Experimental investigation of transverse mixing in porous media under helical flow conditions
Plume dilution and transverse mixing can be considerably enhanced by helical flow occurring in three-dimensional heterogeneous anisotropic porous media. In this study, we perform tracer experiments in a fully three-dimensional flow-through chamber to investigate the effects of helical flow on plume spiraling and deformation, as well as on its dilution. Porous media were packed in angled stripes of materials with different grain sizes to create blocks with macroscopically anisotropic hydraulic conductivity, which caused helical flows. Steady-state transport experiments were carried out by continuously injecting dye tracers at different inlet ports. High-resolution measurements of concentration and flow rates were performed at 49 outlet ports. These measurements allowed quantifying the spreading and dilution of the solute plumes at the outlet cross section. Direct evidence of plume spiraling and visual proof of helical flow was obtained by freezing and slicing the porous media at different cross sections and observing the dye-tracer distribution. We simulated flow and transport to interpret our experimental observations and investigate the effects of helical flow on mixing-controlled reactive transport. The simulation results were evaluated using metrics of reactive mixing such as the critical dilution index and the length of continuously injected steady-state plumes. The results show considerable reaction enhancement, quantified by the remarkable decrease of reactive plume lengths (up to four times) in helical flows compared to analogous scenarios in uniform flows.

General information
State: Published
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Experiments and inverse modeling to plant uptake and degradation of eight emerging organic contaminants

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Authors: Hurtado, C. (Ekstern), Trapp, S. (Intern), Bayona, J. (Ekstern)
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Explanatory analysis of the relationship between atmospheric circulation and occurrence of flood generating events in a coastal city

The aim of this study is to enhance the understanding of the occurrence of flood generating events in urban areas by analyzing the relationship between large-scale atmospheric circulation and extreme precipitation events, extreme sea water level events and their simultaneous occurrence, respectively. To describe the atmospheric circulation we used the Lamb circulation type (LCT) classification and re-grouped it into Lamb circulation classes (LCC). The daily LCCs/LCTs were connected with rare precipitation and water level events in Aarhus, a Danish coastal city. Westerly and cyclonic LCCs (W, C, SW, and NW) showed a significantly high occurrence of extreme precipitation. Similarly, for extreme water level events westerly LCCs (W and SW) showed a significantly high occurrence. Significantly low occurrence of extreme precipitation and water level events was obtained in easterly LCCs (NE, E, and SE). For concurrent events significantly high occurrence was obtained in LCC W. We assessed the change in LCC occurrence frequency in the future based on two regional climate models (RCMs). The projections indicate that the westerly directions in LCCs are expected to increase in the future. Consequently, simultaneous occurrence of extreme water level and precipitation events is expected to increase in the future as a result of change in LCC frequencies. The RCM projections for LCC frequencies are uncertain because the representation of current LCCs is poor; a large number of days cannot be classified and the frequencies of the days that can be classified differ from the observed time series. This article is protected by copyright. All rights reserved.

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Scopus rating (2015): SJR 1.371 SNIP 1.19 CiteScore 2.67
In the present study, alginate extraction from the brown seaweed Sargassum muticum was studied using single factor analysis. Response Surface Methodology-Central Composite Rotatary design (RSM-CCRD) was performed to reduce and optimize extraction temperature, alkali concentration, and consumption of solvent. Different interaction effect of three extraction factors of temperature (60–100 °C), alkali (1–5 %), and aqueous ethanol (70–100 %) were studied to reduce residual waste. The result showed that the optimum extraction yield (13.57 %) was obtained with 86 °C temperature, 3 % alkali, and 93 % ethanol. A second order polynomial equation using multiple regression analysis was developed, and the predicted extraction yield showed a high coefficient of determination (R²=0.98) with the experimental alginate yield. The functionality of extracted alginate and residual supernatant left over after extraction were evaluated for total polyphenols and its antioxidant capacity. The extracted alginate was further characterized using fluorescence spectrophotometer and nuclear magnetic resonance spectroscopy. The 1H NMR data revealed that extracted alginate has an M/G ratio of 1.08 and η<1.
Fate of cocaine drug biomarkers in sewer system: the role of suspended solids in biotransformation and sorption

Biochemical processes determining the fate of micropollutants in wastewater are not limited to treatment plants (WWTPs), occurring also in sewer systems after discharge by excretion. In-sewer processes are associated mainly to the presence of biofilm attached on pipelines and suspended solids in raw sewage. Among existing micropollutants, in-sewer fate assessment is specifically relevant to illicit drugs, impacting the calculation of consumption levels in catchments according to the wastewater-based epidemiology approach (Zuccato et al., 2005). However, there is still a knowledge gap on the fate of illicit drugs in sewer systems. This study aims at assessing the role of suspended solids on the biotransformation and sorption in raw sewage of eight illicit drug biomarkers (cocaine, heroin, methadone, mephedrone, ketamine, methamphetamine, MDMA and THC and their urinary metabolites).

Separate sets of batch experiments were performed to assess biotransformation and sorption of illicit drugs under aerobic and anaerobic conditions, prevailing in sewer systems. Biotransformation experiments were started by spiking a mixture of standards in methanol to batch reactors (final concentration of 10 μg L⁻¹). Nine samples (240 ml) were taken over 48 h. Immediately after collection, samples were spiked with deuterated standards (final concentration 360 ngL⁻¹) and stored at -20°C. Control experiments were also performed using mineral water under same experimental conditions of biotransformation experiments. Sorption experiments were performed according to the same procedure and with inactivation of biomass using sodium azide (0.05% v/v). Sample preparation and analysis consisted of solid phase extraction (SPE) with Oasis HLB cartridges followed by liquid chromatography coupled to high resolution mass spectrometry. The Activated Sludge Model for Xenobiotics (ASM-X) (Plósz et al., 2013) was used to simulate biotransformation and sorption of spiked chemicals. Monte Carlo method employing Latin Hypercube Sampling (LHS) of parameter space was used to estimate first-order abiotic (kₐbiotic, d⁻¹) and pseudo-first-order biotransformation rate constants (k₏, L g⁻¹ d⁻¹), with root mean square normalized error as objective function. Sorption coefficients (Kd) were calculated from the decrease of aqueous concentrations during experiments.

Experimental and modelling results are illustrated in Figure 1 and Table 1, which summarize experimental results and estimated parameter values for cocaine (COC) and its major metabolites benzoylcegonine (BE), ecgonine-methyl-ester (EME) and cocaethylene (CE). Our results suggest the formation of BE from COC and CE. COC transformation to CE and EME was assumed negligible (Plósz et al., 2013; Bisceglia and Lippa, 2014). A comparison of results from different experiments showed that abiotic transformation was overall prevalent under both redox conditions. Under anaerobic condition, in particular, transformation was almost completely associated to abiotic processes. Biotransformation rate constants (kₖbio) could not be estimated and should be considered negligible. These evidences are in agreement with earlier studies illustrating that chemical hydrolysis plays a major role in the transformation of cocaine biomarkers (Bisceglia and Lippa 2014). In addition, limited sorption for EME (Kd=0.7 L g⁻¹) and BE (Kd=0.1 L g⁻¹) and no sorption for COC and CE were observed.
Field scale interaction and nutrient exchange between surface water and shallow groundwater in the Baiyang Lake region, North China Plain

Fertilizer input for agricultural food production, as well as the discharge of domestic and industrial water pollutants, increases pressures on locally scarce and vulnerable water resources in the North China Plain. In order to: (a) understand pollutant exchange between surface water and groundwater, (b) quantify nutrient loadings, and (c) identify major nutrient removal pathways by using qualitative and quantitative methods, including the geochemical model PHREEQC, a one-year study at a wheat (Triticum aestivum L.) and maize (Zea mays L.) double cropping system in the Baiyang Lake area in Hebei Province, China, was undertaken. The study showed a high influence of low-quality surface water on the shallow aquifer. Major inflowing pollutants into the aquifer were ammonium and nitrate via inflow from the adjacent Fu River (up to 29.8mg/L NH4-N and 6.8mg/L NO3-N), as well as nitrate via vertical transport from the field surface (up to 134.8mg/L NO3-N in soil water). Results from a conceptual model show an excess nitrogen input of about 320kg/ha/a. Nevertheless, both nitrogen species were only detected at low concentrations in shallow groundwater, averaging at 3.6mg/L NH4-N and 1.8mg/L NO3-N. Measurement results supported by PHREEQC-modeling indicated cation exchange, denitrification, and anaerobic ammonium oxidation coupled with partial denitrification as major nitrogen removal pathways. Despite the current removal capacity, the excessive nitrogen fertilization may pose a future threat to groundwater quality. Surface water quality improvements are therefore recommended in conjunction with simultaneous monitoring of nitrate in the aquifer, and reduced agricultural N-inputs should be considered.
Background

Plant breeding is crucial in creating organic crop production systems that can better cope with interacting stresses such as pests and diseases (especially seed-borne diseases), weeds and the increasingly erratic and unpredictable variation in climate and weather. In this context, COBRA aimed to support and develop organic plant breeding and seed production with a focus on increasing the use and potential of plant material with high genetic diversity in cereals (wheat and barley) and grain legumes (pea and faba bean), through coordinating, linking and expanding existing breeding and research. Although systems based on high, within-crop diversity have shown promising results in organic systems and are now subject to intensive research, their benefits cannot be exploited currently, due to agronomic, regulatory and other hurdles. Also, it is currently unclear which plant breeding approaches, high diversity or otherwise, are most efficient to breed varieties for organic agriculture. To help these aims, COBRA's work was arranged into a management workpackage to coordinate the work and the following five sub-programmes:

(1) To improve methods ensuring seed quality and health

Progress was made in handling individual seeds in terms of their actual and potential resistance to seed-borne disease. One of the most important problems, bunt of wheat, was advanced considerably in terms of the 'gene for gene' interaction between host and pathogen and in observing the performance of the, currently, most effective resistance genes. Wheat populations, grown over two generations, did not change in their response to bunt. In barley, progress was made in identifying and confirming known and novel resistances to a range of the most important seed-borne diseases. Benign sprays were confirmed as potentially useful for Ascochyta blight control in peas.

(2) To determine the potential to increase resilience, adaptability, and overall performance in organic systems by using crop diversity at various levels

Valuable progress was made in confirming, expanding and understanding the resilience of the performance of composite cross populations of wheat. A wide range of molecular markers were identified in barley which will help in selecting genotypes adapted to expected future changes in climate and weather. Progress was also made with organic trials of grain legumes. The early 6 of 54 development stages of composite cross populations in the field is now better understood...
in relation to nutrient use efficiency.

(3) To improve breeding efficiency and to develop novel breeding methods to enhance and maintain crop diversity
A range of different technologies has been improved for selecting within composite cross populations using NIR
spectrometry, colour markers and molecular markers; many of these are non-destructive. Of more immediate value, new
composite cross populations involving winter and spring wheat genotypes and including bunt resistant genotypes have
now been made. Progress has also been made with bulk breeding of peas, although single genotypes may still be
preferred for cropping applications.

(4) To identify and remove structural barriers to organic plant breeding and seed production
It was important to bring together interested individuals and groups from different European countries to cover available
experience and discuss further developments. Most importantly, this was also done directly in consultation with DGSanco,
and booklets on the discussions and findings were published and distributed.

(5) To improve networking and dissemination in organic plant breeding
COBRA successfully established and utilised its website, produced regular newsletters and undertook training and farm
days throughout the life of the project to raise the awareness of the project and to also communicate and discuss the finds
and outcomes of the work undertaken by its various partners.

Conclusion.
COBRA's strength is its focus on coordinating, linking and expanding ongoing organic breeding activities in cereals and
grain legumes across Europe, drawing together experts from previously separated areas.

General information
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Organisations: Department of Chemical and Biochemical Engineering, Rise National Laboratory for Sustainable Energy,
Department of Environmental Engineering, The Organic Research Centre (ORC), Aegean Agricultural Research Institute
(AARI), Agrologica, L'Associazione Italiana per l'Agricoltura Biologica (AIAB), University of Natural Resources and Life
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University of Munich, Seges Knowledge Centre for Agriculture, Bayerische Landesanstalt für Landwirtschaft, University
of Udiyne, University of Maribor, Universiteit Gent, Oikos - Organic Norway, Forschungsinstitut fur Biologischen Landbau ,
Graminor, Estonian Crop Research Institute , Organic Seed Producers, State Prieval Plant Breeding Institute , State
Stende Cereal Breeding Institute , Hungarian Academy of Sciences, Saatzucht Donau GesmbH & CoKG, Nordic Genetic
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(Ekstern), Walker, R. (Ekstern), Andersen, O. (Ekstern), Bertholdsson, N. (Ekstern), Bagger Jørgensen, R. (Intern),
Baresel, P. (Ekstern), Pedersen, T. M. (Forskerdatabase), Killermann, B. (Ekstern), Miceli, F. (Ekstern), Bavec, F.
(Ekstern), Haselaer, G. (Ekstern), Andersen, R. (Ekstern), Messmer, M. (Ekstern), Reitan, L. (Ekstern), Tamm, I. (Ekstern)
, Wyartt, R. (Ekstern), Legzdina, L. (Ekstern), Bleidere, M. (Ekstern), Bedö, Z. (Ekstern), Loeschenberger, F. (Ekstern),
Rasmussen, M. (Ekstern), Nuijten, E. (Ekstern), Döring, T. (Ekstern)
Number of pages: 54
Publication date: 2016

Flood risk assessment as an integral part of urban planning

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Monash University, DHI Water and
Environment
Authors: Löwe, R. (Intern), Urich, C. (Ekstern), Sto Domingo, N. (Ekstern), Mark, O. (Ekstern), Deletic, A. (Ekstern),
Ambjerg-Nielsen, K. (Intern)
Number of pages: 1
Publication date: 2016
Event: Poster session presented at World Water Congress & Exhibition 2016, Brisbaneaus, Australia.
Flux behaviour under different operational conditions in osmosis process
The transport of water molecules across a semi-permeable membrane is driven by the osmotic pressure difference between feed and draw solution. Two different operational modes can be distinguished, namely FO mode when the active membrane layer is facing the wastewater (feed), and PRO mode when the active membrane layer is facing draw solution. Osmosis process can be affected by several factors, such as operating conditions (temperature and cross flow velocity), feed and draw solution properties, and membrane characteristics. These factors can significantly contribute to the efficiency of the process itself. In order to implement the osmosis process on an industrial scale, process economy need to be taken into consideration, as well as the desired final product quality. Membrane performance can be evaluated based on the water permeability and the selectivity of the membrane. The permeability coefficient \( A \) defined as the water flux through the membrane will be experimentally determined. Likewise selectivity of the membrane \( B \) will be measured, which will tell us about membrane retention properties of certain substances dissolved in feed solution. The aim of the study is to determine water flux and reverse salt flux through the semi-permeable membrane at FO and PRO modes using two types of membranes and using three different draw solutions (NaCl, MgCl\(_2\), and CaCl\(_2\)). The process efficiency at different conditions will be assessed based on physical and chemical analysis such as pH, conductivity, and total dissolved solids. Taken together our results can contribute understanding of the how performance of asymmetric FO membranes can be enhanced by feed and draw properties, membrane characteristics and operational conditions.
Household food waste, Avoidable food waste, Unavoidable food waste, Food waste generation, Bootstrap and confidence interval
Fordele og ulemper ved forskellige blødgøringsteknologier på vandværket

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Albrechtsen, H. (Intern)
Number of pages: 23
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Publication information
Media of output: Powerpoint
Original language: Danish
Place of publication: Kgs. Lyngby
Publisher: Technical University of Denmark, DTU Environment
Main Research Area: Technical/natural sciences
Electronic versions:
16_Albrightsen_DVF_Bl_dg_ring_Roskilde_pnt_20161108.pdf
Publication: Research › Sound/Visual production (digital) – Annual report year: 2016

Forudgående og efterfølgende monitering af grund- og overfladevand

General information
State: Published
Authors: Bjerg, P. L. (Intern), Johnsen, A. R. (Ekstern), Jessen Rasmussen, J. (Ekstern), Jensen, P. N. (Ekstern)
Pages: 99-101
Publication date: 2016

Host publication information
Title of host publication: Videnskabelig uddrag om skifergas relateret til en dansk kontekst : DTU, GEUS, DCE
Publisher: Aarhus Universitet, GEUS og Danmarks Tekniske Universitet
Chapter: 4.2.13
Main Research Area: Technical/natural sciences
Forureningsundersøgelser i kalkmagasiner: metoder til karakterisering af forureningsfordeling

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Region Hovedstaden
Authors: Fjordbøge, A. S. (Intern), Broholm, M. M. (Intern), Mosthaf, K. (Intern), Janniche, G. S. (Intern), Binning, P. J. (Intern), Bjerg, P. L. (Intern), Skov, B. H. (Intern), Kerr, D. J. (Ekstern)
Number of pages: 2
Pages: 15-16
Publication date: 2016

Host publication information
Title of host publication: ATV - Jord og Grundvand 2016 : Abstractsamling
Place of publication: Kgs. Lyngby
Publisher: ATV Jord og Grundvand
Main Research Area: Technical/natural sciences
Conference: 07/03/2016 - 07/03/2016
Electronic versions:
1_2_3_Mette_Broholm.pdf
Publication: Research - peer-review » Conference abstract in proceedings – Annual report year: 2016

Forward osmosis treatment of effluents from anaerobic digestion: correlation between membrane performance and biogas potential

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Residual Resource Engineering, Technical University of Denmark
Authors: Schneider, C. (Intern), Sathyadev Rajmohana, R. (Ekstern), Tsapekos, P. (Intern), Angelidaki, I. (Intern), Zarebska, A. (Intern), Helix-Nielsen, C. (Intern)
Pages: 514-518
Publication date: 2016

Host publication information
Title of host publication: Conference handbook 9th international membrane science & technology conference
Place of publication: Adelaide, Australia
Main Research Area: Technical/natural sciences
Conference: 9th International Membrane Science & Technology Conference, Adelaide, Australia, 05/12/2016 - 05/12/2016
Publication: Research - peer-review » Conference abstract in proceedings – Annual report year: 2016

Fremstilling af et højværdisubstrat til biogasproduktion ved sampulpning af have/parkaffald og kildesorteret organisk dagrenovation vha. Ecogiteknologien

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, BF Larsen, KomTek Miljø
Authors: Møller, J. (Intern), Naroznova, I. (Intern), Scheutz, C. (Intern), Foged Larsen, B. (Ekstern), Peter Jensen, J. (Ekstern)
Number of pages: 122
Publication date: 2016

Publication information
Place of publication: København K
Publisher: Miljøstyrelsen
ISBN (Electronic): 978-87-93529-28-1
Original language: Danish
Main Research Area: Technical/natural sciences
Electronic versions:
Full scale amendment of a contaminated wood impregnation site with iron water treatment residues

Iron water treatment residues (Fe-WTR) are a by-product of the treatment of drinking water with high concentration of iron oxides and potential for arsenic sorption. This paper aims at applying Fe-WTR to a contaminated site, measuring the reduction in contaminant leaching, and discussing the design of delivery and mixing strategy for soil stabilization at field scale and present a cost-effective method of soil mixing by common contractor machinery. Soil contaminated by As, Cr, and Cu at an abandoned wood impregnation site was amended with 0.22% (dw) Fe-WTR. To evaluate the full scale amendment a 100 m² test site and a control site (without amendment) were monitored for 14 months. Also soil analysis of Fe to evaluate the degree of soil and Fe-WTR mixing was done. Stabilization with Fe-WTR had a significant effect on leachable contaminants, reducing pore water As by 93%, Cu by 91% and Cr by 95% in the upper samplers. Dosage and mixing of Fe-WTR in the soil proved to be difficult in the deeper part of the field, and pore water concentrations of arsenic was generally higher. Despite water logged conditions no increase in dissolved iron or arsenic was observed in the amended soil. Our field scale amendment of contaminated soil was overall successful in decreasing leaching of As, Cr and Cu. With minor improvements in the mixing and delivery strategy, this stabilization method is suggested for use in cases, where leaching of Cu, Cr and As constitutes a risk for groundwater and freshwater.

General information

State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Nielsen, S. S. (Intern), Kjeldsen, P. (Intern), Jakobsen, R. (Intern)
Pages: 1-10
Publication date: 2016
Main Research Area: Technical/natural sciences

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Journal: Frontiers of Environmental Science & Engineering
Volume: 10
Issue number: 4
Article number: 03
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.732 SJR 0.672 CiteScore 2.08
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.84 SJR 0.608 SNIP 0.724
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.552 SNIP 0.636 CiteScore 1.49
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.578 SNIP 0.789 CiteScore 1.36
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.419 SNIP 0.807
Scopus rating (2012): SJR 0.418 SNIP 0.571
Scopus rating (2011): SJR 0.336 SNIP 0.386
Scopus rating (2010): SJR 0.311 SNIP 0.282
Scopus rating (2009): SJR 0.172 SNIP 0.211
Scopus rating (2008): SJR 0.122 SNIP 0.164
Original language: English
Environment, Environment, general, SC7, Field experiment, Iron oxide, Arsenic, Stabilization, Wood preservation sites
Electronic versions: FESE_Kjeldsen_accepted_version_with_figures.pdf. Embargo ended: 28/04/2017
Functional traits of urban trees: Air pollution mitigation potential

In an increasingly urbanized world, air pollution mitigation is considered one of most important issues in city planning. Urban trees help to improve air quality by facilitating widespread deposition of various gases and particles through the provision of large surface areas as well as through their influence on microclimate and air turbulence. However, many of these trees produce wind-dispersed pollen (a known allergen) and emit a range of gaseous substances that take part in photochemical reactions - all of which can negatively affect air quality. The degree to which these air-quality impacts are manifested depends on species-specific tree properties: that is, their "traits". We summarize and discuss the current knowledge on how such traits affect urban air pollution. We also present aggregated traits of some of the most common tree species in Europe, which can be used as a decision-support tool for city planning and for improving urban air-quality models.
Gap-filling of dry weather flow rate and water quality measurements in urban catchments by a time series modelling approach

Flow rate and water quality dry weather time series in combined sewer systems might contain an important amount of missing data due to several reasons, such as failures related to the operation of the sensor or additional contributions during rainfall events. Therefore, the approach hereby proposed seeks to evaluate the potential of the Singular Spectrum Analysis (SSA), a time-series modelling/gap-filling method, to complete dry weather time series. The SSA method is tested by reconstructing 1000 artificial discontinuous time series, randomly generated from real flow rate and total suspended solids (TSS) online measurements (year 2007, 2 minutes time-step, combined system, Ecully, Lyon, France). Results show up the potential of the method to fill gaps longer than 0.5 days, especially between 0.5 days and 1 day (mean NSE > 0.6) in the flow rate time series. TSS results still perform very poorly. Further analysis at different temporal scales might be needed.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, University of Lyon
Authors: Sandoval, S. (Ekstern), Vezzaro, L. (Intern), Bertrand-Krajewski, J. (Ekstern)
Number of pages: 4
Publication date: 2016

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Title of host publication: Proceedings of 9th International Conference on Planning and Technologies for Sustainable Urban Water Management
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Conference: 9th International Conference on Planning and Technologies for Sustainable Urban Water Management (NOVATECH), Lyon, France, 28/06/2016 - 28/06/2016
Data validation, Dry weather, Gap filling, Metrology, Online monitoring, Time series
Electronic versions: 2C44_262SAN.pdf
Source: PublicationPreSubmission
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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

Generation of organic waste from institutions in Denmark: case study of the Technical University of Denmark
As a response to the growing pressure on the supply chains, developing a resource-efficient circular economy will be fundamental to satisfy the future demands for material resources. In this context, the Danish Government, in 2013, launched its Resource Strategy Plan, mandating that, by 2018 at least 60% of organic waste – that cannot be prevented or reduced – generated by service sector, should be source-segregated and collected separately. In order to establish the baseline of the current situation, and to allow for any evaluation of performance against target indicators, data on solid waste generation and composition are required.

The overall aim of this study was to quantify the potential for source-segregated organic waste as well as mixed waste from institution.

This study was carried at the Department of Environmental Engineering at Technical University of Denmark. In the course of this study, two plastic waste bins of 60 L each were placed in the kitchens: organic waste bins and mixed waste bins. Organic waste and mixed waste from these kitchens were collected and weighed separately, on a daily basis, during 133 working days (29 weeks). However, waste was not sampled during weekends and public holidays, when the offices were officially closed. Furthermore, the composition of source-segregated organic waste was analysed to investigate its purity. During the sampling period, the number of employees coming to work at the department was recorded. These data were used to investigate any relationship between mass of discarded waste (source-segregated organic and mixed waste) and the number of employee coming to work at the department.

The result showed that 20 to 60 days (e.g. working days) should be considered to obtain reliable data when sampling
waste from an institution.

We found a significant correlation between mass of source-segregated organic waste and the number of employees coming to work at the department (0.70 with 95% HDI 0.6 and 0.78). Similarly, there was a significant correlation between mixed waste and number of employees (0.49 with 95% HDI 0.3 and 0.62).

The generate rates of source-segregated organic waste amounted to 23 ± 5 kg/employee/year, of which 20 ± 5 kg/employee/year was source-segregated, with a considerably high purity of 99%. Mixed waste amounted to 10 ± 5 kg/employee/year.

These results show that source-segregated organic waste from institutions offers promising potential. They also suggest that recycling target for source-segregated organic waste might be achievable with reasonable logistical ease in institution areas.

**General information**

State: Published

Organisations: Department of Environmental Engineering, Residual Resource Engineering

Authors: Edjabou, M. E. (Intern), Boldrin, A. (Intern), Scheutz, C. (Intern), Astrup, T. F. (Intern)

Number of pages: 6

Publication date: 2016


Main Research Area: Technical/natural sciences

Electronic versions:

Paper_Crete_2016.pdf

Source: PublicationPreSubmission

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**Generation of synthetic influent data to perform (micro)pollutant wastewater treatment modelling studies**

The use of process models to simulate the fate of micropollutants in wastewater treatment plants is constantly growing. However, due to the high workload and cost of measuring campaigns, many simulation studies lack sufficiently long time series representing realistic wastewater influent dynamics. In this paper, the feasibility of the Benchmark Simulation Model No. 2 (BSM2) influent generator is tested to create realistic dynamic influent (micro)pollutant disturbance scenarios. The presented set of models is adjusted to describe the occurrence of three pharmaceutical compounds and one of each of its metabolites with samples taken every 2-4h: the anti-inflammatory drug ibuprofen (IBU), the antibiotic sulfamethoxazole (SMX) and the psychoactive carbamazepine (CMZ). Information about type of excretion and total consumption rates forms the basis for creating the data-defined profiles used to generate the dynamic time series. In addition, the traditional influent characteristics such as flow rate, ammonium, particulate chemical oxygen demand and temperature are also modelled using the same framework with high frequency data. The calibration is performed semi-automatically with two different methods depending on data availability. The 'traditional' variables are calibrated with the Bootstrap method while the pharmaceutical loads are estimated with a least squares approach. The simulation results demonstrate that the BSM2 influent generator can describe the dynamics of both traditional variables and pharmaceuticals. Lastly, the study is complemented with: 1) the generation of longer time series for IBU following the same catchment principles; 2) the study of the impact of in-sewer SMX biotransformation when estimating the average daily load; and, 3) a critical discussion of the results, and the future opportunities of the presented approach balancing model structure/calibration procedure complexity versus predictive capabilities.

**General information**

State: Published

Organisations: Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, Department of Environmental Engineering, Water Technologies, University of Girona, Lund University

Authors: Snip, L. (Intern), Flores Alsina, X. (Intern), Aymerich, I. (Ekstern), Rodríguez-Mozaz, S. (Ekstern), Barceló, D. (Ekstern), Plösz, B. G. (Intern), Corominas, L. I. (Ekstern), Rodríguez-Roda, I. (Ekstern), Jeppsson, U. (Ekstern), Gernaey, K. (Intern)

Number of pages: 13

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Main Research Area: Technical/natural sciences

**Publication information**

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BFI (2018): BFI-level 2

Web of Science (2018): Indexed yes

BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.546 SNIP 1.65 CiteScore 4.98
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.09 SJR 1.652 SNIP 1.856
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.653 SNIP 1.648 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.635 SNIP 1.843 CiteScore 4.2
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.527 SNIP 1.745 CiteScore 3.73
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.749 SNIP 1.82 CiteScore 3.7
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.802 SNIP 1.676 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.651 SNIP 1.506
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.576 SNIP 1.6
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.461 SNIP 1.489
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.393 SNIP 1.473
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.512 SNIP 1.586
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.439 SNIP 1.509
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.126 SNIP 1.299
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.156 SNIP 1.35
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.175 SNIP 1.359
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.054 SNIP 1.076
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.916 SNIP 1.051
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.897 SNIP 0.934
Original language: English
BSM2 influent generator, Calibration, Micropollutant occurrence, Trace chemicals, Xenobiotics
DOIs:
10.1016/j.scitotenv.2016.05.012
Source: FindIt
Source-ID: 2306001846
GHG emission factors for bioelectricity, biomethane, and bioethanol quantified for 24 biomass substrates with consequential life-cycle assessment

Greenhouse gas (GHG) emission savings from biofuels dramatically depend upon the source of energy displaced and the effects induced outside the energy sector, for instance land-use changes (LUC). Using consequential life-cycle assessment and including LUC effects, this study provides GHG emission factors (EFs) for bioelectricity, biomethane, and bioethanol produced from twenty-four biomasses (from dedicated crops to residues of different origin) under a fossil and a non-fossil energy system. Accounting for numerous variations in the pathways, a total of 554 GHG EFs were quantified. The results showed that, important GHG savings were obtained with residues and seaweed, both under fossil and non-fossil energy systems. For high-yield perennial crops (e.g. willow and Miscanthus), GHG savings were achieved only under fossil energy systems. Biofuels from annual crops and residues that are today used in the feed sector should be discouraged, as LUC GHG emissions exceeded any GHG savings from displacing conventional energy sources. (C) 2016 Elsevier Ltd. All rights reserved.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Southern Denmark
Authors: Tonini, D. (Intern), Hamelin, L. (Ekstern), Alvarado-Morales, M. (Intern), Astrup, T. F. (Intern)
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Publication date: 2016
Main Research Area: Technical/natural sciences
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.334 SNIP 2.461 CiteScore 5.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.308 SNIP 2.507 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.089 SNIP 2.344
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.915 SNIP 2.236
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.736 SNIP 2.74
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.403 SNIP 2.396
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.314 SNIP 2.003
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.278 SNIP 1.98
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.19 SNIP 1.655
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.942 SNIP 1.665
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.908 SNIP 1.294
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.537 SNIP 1.2
Scopus rating (2000): SJR 0.653 SNIP 1.023
Scopus rating (1999): SJR 0.659 SNIP 1.033

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Publication: Research - peer-review › Journal article – Annual report year: 2016

GISMOWA - GIS assisted monitoring of drinking water quality

General information
Global warming potential of material fractions occurring in source-separated organic household waste treated by anaerobic digestion or incineration under different framework conditions

This study compared the environmental profiles of anaerobic digestion (AD) and incineration, in relation to global warming potential (GWP), for treating individual material fractions that may occur in source-separated organic household waste (SSOHW). Different framework conditions representative for the European Union member countries were considered. For AD, biogas utilisation with a biogas engine was considered and two potential situations investigated – biogas combustion with (1) combined heat and power production (CHP) and (2) electricity production only. For incineration, four technology options currently available in Europe were covered: (1) an average incinerator with CHP production, (2) an average incinerator with mainly electricity production, (3) an average incinerator with mainly heat production and (4) a state-of-the art incinerator with CHP working at high energy recovery efficiencies. The study was performed using a life cycle assessment in its consequential approach. Furthermore, the role of waste-sorting guidelines (defined by the material fractions allowed for SSOHW) in relation to GWP of treating overall SSOHW with AD was investigated. A case-study of treating 1 tonne of SSOHW under framework conditions in Denmark was conducted. Under the given assumptions, vegetable food waste was the only material fraction which was always better for AD compared to incineration. For animal food waste, kitchen tissue, vegetation waste and dirty paper, AD utilisation was better unless it was compared to a highly efficient incinerator. Material fractions such as moulded fibres and dirty cardboard were attractive for AD, albeit only when AD with CHP and incineration with mainly heat production were compared. Animal straw, in contrast, was always better to incinerate. Considering the total amounts of individual material fractions in waste generated within households in Denmark, food waste (both animal and vegetable derived) and kitchen tissue are the main material fractions allowing GWP mitigation with AD when it is compared to incineration. The inclusion of other material fractions in SSOHW sorting guidelines may be considered of less importance.
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.456 SNIP 2.059 CiteScore 4.94
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.407 SNIP 2.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.732 SNIP 2.263 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.763 SNIP 2.49 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.815 SNIP 2.413 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.59 SNIP 2.18 CiteScore 2.91
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.694 SNIP 2.071 CiteScore 2.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.553 SNIP 1.821
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.519 SNIP 1.919
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.375 SNIP 2.145
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.998 SNIP 1.785
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.021 SNIP 1.819
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.065 SNIP 1.653
Scopus rating (2004): SJR 1.271 SNIP 1.911
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.853 SNIP 1.234
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.498 SNIP 0.903
Scopus rating (2001): SJR 0.45 SNIP 0.731
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.328 SNIP 0.444
Scopus rating (1999): SJR 0.26 SNIP 0.541
GlobWetland Africa: Implementing Sustainable Earth Observation Based Wetland Monitoring Capacity in Africa and Beyond

Lack of data, appropriate information and challenges in human and institutional capacity put a serious constraint on effective monitoring and management of wetlands in Africa. Conventional data are often lacking in time or space, of poor quality or available at locations that are not necessarily representative for wetlands. Therefore, the Ramsar secretariat, the global coordinating body of the Ramsar Convention on Wetlands, has long recommended making more use of new and innovative technologies, such as those offered by remote sensing. Yet, access to suitable remote sensing data for monitoring wetlands in Africa has also traditionally been constrained either because of high costs or, especially in Equatorial Africa, owing to frequent cloud cover. To meet these challenges the European Space Agency has launched GlobWetland Africa as a major initiative to facilitate the exploitation of satellite observations for the conservation, wiseuse and effective management of wetlands in Africa and to provide African stakeholders with the necessary EO methods and tools to better fulfill their commitments and obligations towards the Ramsar Convention on Wetlands.

The main objective of GlobWetland Africa (GW-A) is to provide the major actors involved in the implementation of the Ramsar Convention of Wetlands in Africa with EO methods and tools to better assess the conditions of wetlands under their areas of jurisdiction/study, and to better monitor their trends over time. To this end, an open source wetland observing system, referred to as the GW-A Toolbox, will be developed, implemented and validated for a series of geo-information products over a number of representative pilot sites in North, West, Central and East Africa. The GW-A toolbox unifies proven and stable open source software into a single graphical user interface that will enable the users to: [i] access and exploit Sentinel data and other relevant contributing missions e.g. ERS, ENVISAT, Landsat and ALOS; [ii] operationally map, assess and inventorize wetlands through a number of dedicated wetland information products and indicators needed for effective wetland management and decision support; [iii] receive a freely available, open, flexible and modifiable framework for easy establishment of new wetland observatories, for easy integration in existing observatory infrastructures and for easy adaptation to new requirements, e.g. changes in management processes.

Grain protein concentration and harvestable protein under future climate conditions. A study of 108 spring barley accessions

In the present study a set of 108 spring barley (H. vulgare L.) accessions were cultivated under predicted future levels of temperature and [CO2] as single factors and in combination (IPCC, ARS, RCP8.5). Across all genotypes, elevated [CO2] (700 ppm day/night) slightly decreased protein concentration by 5%, while elevated temperature (+5 °C day/night) substantially increased protein concentration by 29%. The combined treatment increased protein concentration across accessions by 8%. This was an increase less than predicted from strictly additive effects of the individual treatments. Despite the increase in grain protein concentration, the decrease in grain yield at combined elevated temperature and elevated [CO2] resulted in 23% less harvestable protein. There was variation in the response of the 108 accessions, which might be exploited to at least maintain if not increase harvestable grain protein under future climate change conditions.
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<td>Journal: Journal of Experimental Botany</td>
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Harvesting microalgae using activated sludge can decrease polymer dosing and enhance methane production via co-digestion in a bacterial-microalgal process

Third generation biofuels, e.g. biofuels production from algal biomass, have gained attention due to increased interest on global renewable energy. However, crop-based biofuels compete with food production and should be avoided. Microalgal cultivation for biofuel production offers an alternative to crops and can become economically viable when combined with the use of used water resources. Besides nutrients and water, harvesting microalgal biomass represents one of the major costs related to biofuel production and thus efficient and cheap solutions are needed. In bacterial-algal systems, there is the potential to produce energy by co-digesting the two types of biomass. We present an innovative approach to recover microalgal biomass via a two-step flocculation using bacterial biomass after the destabilisation of microalgae with conventional cationic polymer. A short solids retention time (SRT) enhanced biological phosphorus removal (EBPR) system was combined with microalgal cultivation. Two different bacterial biomass removal strategies were assessed whereby bacterial biomass was collected from the solid-liquid separation after the anaerobic phase and after the aerobic phase. Microalgal recovery was tested by jar tests where three different chemical coagulants in coagulation-flocculation tests (AlCl₃, PDADMAC and Greenfloc 120) were assessed. Furthermore, jar tests were conducted to assess the microalgal biomass recovery by a two-step flocculation method, involving chemical coagulants in the first step and bacterial biomass used in the second step to enhance the flocculation. Up to 97% of the microalgal biomass was recovered using 16 mg polymer/g algae and 0.1 g algae/g bacterial biomass. Moreover, the energy recovery by the short-SRT EBPR system combined with microalgal cultivation was assessed via biomethane potential tests. Up to 560 ± 24 mL CH₄/gVS methane yield was obtained by co-digesting bacterial biomass collected after the anaerobic phase and microalgal biomass. The energy recovery in terms of methane production obtained in the short-SRT EBPR system is about 40% of the influent chemical energy.
High-frequency Observations of the Isotopic Composition of Soil, Stem and Root Respiration in a Danish Beech Forest

General information
State: Published
Organisations: Department of Environmental Engineering, Atmospheric Environment
Authors: Brændholt, A. (Intern), Larsen, K. S. (Intern), Ibrom, A. (Intern), Pilegaard, K. (Intern)
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High-resolution rainfall time series for future climate

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis
Authors: Sørup, H. J. D. (Intern), Georgiadis, S. (Intern), Gregersen, I. B. (Intern), Arnbjerg-Nielsen, K. (Intern)
How active ingredient localisation in plant tissues determines the targeted pest spectrum of different chemistries

BACKGROUND:
The efficacies of four commercial insecticides and of two research compounds were tested against aphids (Aphis craccivora and Myzus persicae), whiteflies (Bemisia tabaci) and red-spotted spider mites (Tetranychus urticae) in intrinsic (oral administration), curative (direct contact spray) and translaminar (arthropods infested on untreated leaf underside) assays. With a new translaminar model, the transport across the leaf cuticle and tissues and the electrochemical distribution of test compounds in cellular compartments and apoplast were calculated.

RESULTS:
The comparison of both information sets revealed that the intracellular localisation of active ingredients determines the performance of test compounds against different target pests because of different feeding behaviours: mites feed on mesophyll, and aphids and whiteflies mostly in the vascular system. Polar compounds have a slow adsorption into leaf cells and thus a favourable distribution into apoplast and xylem sap. Slightly lipophilic bases get trapped in vacuoles, which is a less suited place to control hemipteran pests but appropriate to control mites. Non-favourable cellular localisation led to a strong reduction in translaminar efficacy against phloem feeders.

CONCLUSION:
Prediction and optimisation of intracellular localisation of pesticides add valuable new information for targeted bioavailability and can indicate directions for improved pesticide design. © 2015 Society of Chemical Industry.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Syngenta Crop Protection
Authors: Buchholz, A. (Ekstern), Trapp, S. (Intern)
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Scopus rating (2017): SNIP 1.659 SJR 1.336 CiteScore 3.37
Web of Science (2017): Indexed Yes
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Scopus rating (2016): SJR 1.207 SNIP 1.4 CiteScore 2.96
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
How can we make Fickian dispersion models useful in practice?

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, Stanford University
Authors: Harry Lee, J. (Ekstern), Rolle, M. (Intern), Kitanidis, P. (Ekstern)
Number of pages: 1
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Main Research Area: Technical/natural sciences
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Pesticide design, Intracellular localisation, Vacuole trapping, Translaminar, Aphide, Whitefly, Mites
Electronic versions:
ms_Translaminar_leaf_model_Feb2015.pdf

How can we make Fickian dispersion models useful in practice?
How important is drinking water exposure for the risks of engineered nanoparticles to consumers?

This study explored the potential for engineered nanoparticles (ENPs) to contaminate the UK drinking water supplies and established the significance of the drinking water exposure route compared to other routes of human exposure. A review of the occurrence and quantities of ENPs in different product types on the UK market as well as release scenarios, their possible fate and behaviour in raw water and during drinking water treatment was performed. Based on the available data, all the ENPs which are likely to reach water sources were identified and categorized. Worst case concentrations of ENPs in raw water and treated drinking water, using a simple exposure model, were estimated and then qualitatively compared to available estimates for human exposure through other routes. A range of metal, metal oxide and organic-based ENPs were identified that have the potential to contaminate drinking waters. Worst case predicted concentrations in drinking waters were in the low- to sub-µg/l range and more realistic estimates were tens of ng/l or less. For the majority of product types, human exposure via drinking water was predicted to be less important than exposure via other routes. The exceptions were some clothing materials, paints and coatings and cleaning products containing Ag, Al, TiO2, Fe2O3 ENPs and carbon-based materials.

General information
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Organisations: Department of Environmental Engineering, Environmental Chemistry, Arizona State University, Institute of Occupational Medicine, The Food and Environment Research Agency, University of York
Authors: Tiede, K. (Ekstern), Hansen, S. F. (Intern), Westerhoff, P. (Ekstern), Fern, G. J. (Ekstern), Hankin, S. M. (Ekstern), Aitken, R. J. (Ekstern), Chaudhry, Q. (Ekstern), Boxall, A. B. (Ekstern)
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Scopus rating (2015): CiteScore 7.14
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Scopus rating (2014): CiteScore 5.92
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Scopus rating (2012): CiteScore 6.49
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 4.77
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How molecular internal-geometric parameters affect PB-PEO polymersome size in aqueous solution

Amphiphilic polybutadiene polyethylene oxide (PB-PEO) is one of the best known chemistries to form stable vesicular morphologies, stated as polymersomes, in aqueous environment. Mimicking cell membranes, these structures self-assemble in an “amphiphilic window” determined by 0.15 < f < 0.35 where f is the ratio between the hydrophilic block volume and the entire diblock volume. However the polymersome size distribution also depends on molecular weight (Mn) and in order to gain insight on how f and Mn together determine polymersome size, we prepared PB-PEO diblock copolymers with different block lengths and analyzed vesicle morphology via Dynamic light scattering (DLS) and Freeze-fracture transmission electron microscopy (FF-TEM). We found three main regimes: high f / low Mn with polymersomes of mixed diameter, high f / high Mn with mainly large polymersomes and low f, with mainly small polymersomes. In the first region, the polymersomes are highly polydisperse. There is a tendency towards increased diameter with increasing f and Mn. Taken together our findings can help to identify how polymersome self-assembly can be controlled to achieve size distribution specificity alleviating the need for subsequent tuning of size via extrusion. This can pave the way for cost-effective upscaling of polymersome production for biomedical and biomimetic applications.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Engineering, Department of Micro- and Nanotechnology, Self-Organized Nanoporous Materials, Amphiphilic Polymers in Biological Sensing, Aquaporin A/S, University of Copenhagen
Authors: Habel, J. O. E. (Intern), Ogbonna, A. (Ekstern), Larsen, N. (Ekstern), Schulte, L. (Intern), Almdal, K. (Intern), Hélix-Nielsen, C. (Intern)
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Scopus rating (2014): SJR 1.503 SNIP 1.412 CiteScore 3.91
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BFI (2013): BFI-level 1
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ISI indexed (2013): ISI indexed yes
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How much biochar does gasification energy need to be carbon neutral?

Indirect land use changes (iLUC) from bioenergy emerge whenever an energy crop is planted in arable land. Due to their overarching magnitude from a life-cycle perspective, they have been repeatedly recommended to be included in bioenergy's greenhouse gas (GHG) accountings, despite their challenging quantification and inherent uncertainties. Marginal or abandoned lands have been often quoted as the solution to avoid these undesired effects from bioenergy. However, land abandonment and marginalization is to a large extent a socio-economic process, and thus heavily depends on specific, constantly changing socio-political context and economic circumstances in place. We suggest a carbon negative bioenergy system that compensates for potential iLUC emissions and losses in soil organic carbon (SOC). A consequential life cycle assessment on willow bioenergy has been performed, distinguishing marginal and arable land scenarios. Specific soil types and their estimated SOC changes have been considered [9], as well as iLUC emissions for the arable case. Taking the study case of a willow plantation combined with a medium-scale gasification plant in Denmark, we illustrate the biochar needed from the process in order to remain carbon neutral. The time scopes assessed are 20 and 100 years and it is assumed a fossil fuel (FF) free Denmark beyond 2050 as targeted by government (no FF displacement occurs after 2050). Results show that willow on marginal land remains carbon negative (4% biochar fraction) for the short term, while as much as 31.8% of biochar (or 0.95 Mg C ha⁻¹ yr⁻¹) would be necessary in 100 years to be carbon neutral (taking natural vegetation as reference baseline). As for arable land willow, a biochar fraction of 34.1% (or 2.32 Mg C ha⁻¹ yr⁻¹) would be necessary in the short term to compensate for iLUC emissions, while a 4% would suffice to make it carbon negative in the long term, as iLUC "dilutes" over 100 years. To achieve such high biochar fractions (>10%), lower process temperatures are needed, which affect negatively the long-term stability of biochar. This can put at risk the claimed GWP reduction benefits. This study did not consider impacts on other environmental aspects as ecosystem services and biodiversity, which are deemed to be rather important and significant for iLUC.

General information
State: Published
Organisations: Department of Environmental Engineering, Atmospheric Environment, Department of Management Engineering, Quantitative Sustainability Assessment
How preparation and modification parameters affect PB-PEO polymersome properties in aqueous solution

The effect of formation and modification methods on the physical properties of polymersomes is critical for their use in applications relying on their ability to mimic functional properties of biological membranes. In this study, we compared two formation methods for polymersomes made from polybutadiene-polyethylene oxide diblock copolymers: detergent-mediated film rehydration (DFR) and solvent evaporation (SE). DFR-prepared polymersomes showed a three times higher permeability compared to SE-prepared polymersomes as revealed by stopped-flow light scattering. SE-prepared polymersomes broke down faster to structures <50 nm diameter when processed with extrusion, which was more pronounced at 5 mg mL\(^{-1}\), compared to 10, 20, and 25 mg mL\(^{-1}\). Our results indicate that the bilayer of SE-prepared polymersomes has a lower apparent fluidity. We also investigated the role of n-octyl-β-d-glucopyranoside (OG), a detergent typically used for reconstitution of membrane proteins into lipid bilayers. Specifically, we compared dialysis and biobeads for OG removal to investigate the influence of these methods on bilayer conformation and polymer rearrangement following detergent removal. There was no significant difference found between method, temperature, or time within each method. Our findings provide insight on how biocompatible polymersome production affects the physical properties of the resulting polymersomes.

General information
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Organisations: Department of Environmental Engineering, Department of Micro- and Nanotechnology, Amphiphilic Polymers in Biological Sensing, Water Technologies, Aquaporin A/S, University of Copenhagen
Authors: Habel, J. E. O. (Intern), Ogbonna, A. (Ekstern), Larsen, N. (Ekstern), Krabbe, S. (Ekstern), Almdal, K. (Intern), Helix-Nielsen, C. (Intern)
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Scopus rating (2014): SJR 1.503 SNIP 1.412 CiteScore 3.91
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BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.185 SNIP 1.3 CiteScore 3
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How to Determine the Environmental Exposure of PAHs Originating from Biochar

Biochars are obtained by pyrolyzing biomass materials and are increasingly used within the agricultural sector. Owing to the production process, biochars can contain polycyclic aromatic hydrocarbons (PAHs) in the high mg/kg range, which makes the determination of the environmental exposure of PAHs originating from biochars relevant. However, PAH sorption to biochar is characterized by very high (10^4–10^6 L/kg) or extreme distribution coefficients (KD) (>10^6 L/kg), which makes the determination of exposure scientifically and technically challenging. Cyclodextrin extractions, sorptive bioaccessibility extractions, Tenax extractions, contaminant traps, and equilibrium sampling were assessed and selected methods used for the determination of bioavailability parameters for PAHs in two model biochars. Results showed that: (1) the KD values of typically 10^6–10^9 L/kg made the biochars often act as sinks, rather than sources, of PAHs. (2) Equilibrium sampling yielded freely dissolved concentrations (pg–ng/L range) that were below or near environmental background levels. (3) None of the methods were found to be suitable for the direct measurement of the readily desorbing fractions of PAHs (i.e., bioaccessibility) in the two biochars. (4) The contaminant-trap method yielded desorption-resistant PAH fractions of typically 90–100%, implying bioaccessibility in the high μg/kg to low mg/kg range.
Hybridized reactive iron-containing nano-materials for water purification

Groundwater is an important source for drinking water in all corners of the globe, and in places like Denmark, it is the primary source for drinking water. Climate change and population growth will only lead to further dependence on groundwater as the supply for drinking water. However, the expanding population and industrialization of human civilization also leads to environmental consequences affecting groundwater sources. Storm-water and agricultural runoff, industrial spillage and dumping, acid mine drainage, and leakage from landfills are a few prime examples of routes of
contamination for pollutants to enter groundwater systems. In order to make these contaminated water sources viable for human consumption, the use of reactive iron (i.e. Fe0 or zero-valent iron), and in particular nanoscale zero-valent iron (nZVI), is being employed to reductively degrade and/or adsorb many of these pollutants. However, the use of nZVI, as it currently stands, has its limitations. These limitations are primarily rapid oxidation and aggregation, resulting in loss of reactivity and applicability. Therefore, development of new materials incorporating nZVI and improving synthesis strategies to increase the applicability of nZVI is paramount to its future success as a remediation technique. This PhD project has investigated various materials aimed at solving the reactivity loss of reactive iron to create a robust treatment system capable of treating polluted waters. This PhD project also investigated and developed a procedure to appropriately measure the reactivity of reactive iron for a universal testing method.

Coating of nZVI is a common solution to combating the limitations of the material, in that the coating can surround the nZVI particle and prevent it from interacting with other particles while still allowing for interaction with the aqueous pollutant. This study employed a synthetic organo-functionalized magnesium-based aminoclay (MgAC) for this exact purpose. By varying the ratio of MgAC to nZVI and monitoring the change in physical characteristics and reactivity, a composite material was formed that improved the overall functionality of nZVI. It was determined that the reactive iron (vs. oxidized iron) content, colloidal stability, particle size, and nitrate degradation could all be best enhanced at a weight ratio of 7.5:1 of MgAC:Fe. Another solution, although less common, to combating the limitations, is to entrap or impregnate a porous material with nZVI. This way acts in a similar manner, except that the nZVI is bound within a complex matrix rather than coated with a protective barrier. A variety of porous polymeric networks, termed covalent organic polymers (COPs), were impregnated with nZVI and evaluated similarly as with the MgAC. All COPs exhibited high uptake of nZVI, approximately 10% by mass. Reactivity quantification proved to be difficult when degrading an azo dye, due to the very high propensity of the COPs to adsorb both the dye and its degradation products. However, these COPs acted as extremely efficient carriers of nZVI for maintaining colloidal stability. In one case, the COP used (COP-19) increased the colloidal stability of nZVI by two orders of magnitude. Building on the application of these composite materials, investigating how best to handle the synthesized materials can prolong their lifetime. To do this, three washing and storage strategies of the MgAC coated nZVI were investigated. They were: washing the particles immediately after synthesis with a NaHCO3 buffer, washing the particles after storing with a NaHCO3 buffer, and washing the particles immediately after synthesis with a MgAC solution. For all the particle reactivity tests done, it was apparent that washing the particles after storing was detrimental to the material. The colloidal stability, reactive iron, and reactivity towards nitrate dropped rapidly through one week of storage. The other strategies, where washing was done immediately was able to preserve the three aforementioned properties much more efficiently though one week of storage, with MgAC washed particles faring better of the two. This pre-washing technique removes residual reactants in the synthesis mixture that can corrode the iron, and furthermore, pre-washing with MgAC adds more of the stabilizer to the material that protects the nZVI even more. Moreover, by looking deeper into the characteristics of uncoated nZVI, depending on the washing method, allowed for more insight to the nature of the mechanisms taking place during storage. It was observed that washing nZVI with MilliQ water after synthesis created an environment where the particles were slightly more oxidized from the start, which led to an increased formation of an iron-hydroxide shell during storage. Not washing nZVI or washing with the reductant NaBH4 prohibited initial oxidation, leading to subsequent iron-oxide formation during storage. This is important, because the hydroxide shell promotes more electron transfer, whereas the oxide shell acts as a depassivation layer. The increased electron transfer then allowed for higher reactivity during storage, up to one week.

To make comparison and quantification for researchers, a simple and effective method to assess the reactivity of nZVI is extremely important. And, as it is now, most of the reactivity characterization methods are often analytically intensive, requiring expensive equipment, and often don’t respond uniformly to different nZVI-based materials. This study sought to solve this problem, by developing a simple colorimetric assay that is capable to taking a degradation product produced by nZVI reacting with a compound, and creating a color reaction detectable with a simple spectrophotometer. This was done by utilizing the indophenol reaction, which uses phenol and selected other reagents to produce a blue color. Phenol can be produced from the dehalogenation of 4-chlorophenol by nZVI, and to a greater extent by bimetallic nickel-nZVI. That simple method was then optimized to reduce reagent volumes, nickel concentration, and to broaden the range of detectable compounds. These compounds capable of being used in the color assay with the same set of reagents were ultimately aniline, ammonium, and phenol; all of which can be produced by the degradation reaction from nZVI. Finally, to compare the applicability of the colorimetric assay to common halogenated groundwater contaminants; it was compared to the dehalogenation of TCE, TCA, and atrazine. The colorimetric assay performed similarly to the degradation of those chlorinated compounds; meaning the assay can be a simple tool to assess the reactivity of any nZVI when ultimately targeting more difficult to analyze compounds in real-world sources.

Ultimately, the primary goal of this PhD study was to develop a robust nanocomposite material containing nZVI for water treatment systems. Taking the lessons learned from initial composite work using MgAC and COPs, the final material combined granular activated carbon with COP and nZVI. After a lengthy process in developing a method to chemically graft COP material to the surface of activated carbon, it was possible to impregnate that composite material with nZVI. Because of the activated carbon backbone, the final material proved to be an extremely robust material with the structural integrity to be used in a packed-bed column that is common when treating high volumes of water. Although, continued optimization of the material is necessary, preliminary results when adsorbing and degrading contaminants were very promising, outperforming activated carbon alone and just the carbon impregnated with nZVI. Also, a bonus effect was achieved in the process. In that the entire composite material, in particular the COP attached to the surface of the carbon, acted as a protective barrier from the effects of oxidation. The carbon-COP-nZVI composites exhibited nearly 100% reactive iron content upon synthesis, compared to much lower amounts in other reported nZVI composites or the carbon-nZVI produced in this study having only 80% reactive iron content.

The results of this PhD concluded in various advances in the application and assessment of nZVI and nZVI composite materials. Various composite materials provided increased colloidal stability and reactivity for nZVI. Various washing and
storage strategies elucidated better methods for delivering nZVI to a water contaminant and the underlying mechanisms taking place in the nZVI corrosion process. Finally, novel materials combining three different technologies were developed to eventually lead to a robust water treatment system capable of degrading typically hard to remediate water pollutants.

**Hyperspatial mapping of water, energy and carbon fluxes with Unmanned Aerial Vehicles**

Having spatially distributed estimates of energy, water and carbon fluxes between the land and the atmosphere is of critical importance for improving water resource management, agricultural production, weather forecasting, and climate prediction. Traditionally, satellite based remote sensing data of vegetation or temperature has been used as inputs into land surface models (LSMs). However, the coarse resolution of satellite based remote sensing (3-90 km) data could not accurately capture spatial heterogeneity in fluxes due to changes in topography, soil types, and vegetation. With significant advances in navigation, flight control, miniaturized platforms and sensors, Unmanned Aerial Vehicles (UAVs) can provide ultra-high spatial resolution imagery (1 cm to 1 m). This presents a good opportunity to improve land surface modeling. From this perspective, our study explores the possibility to incorporate UAV-based remote sensing into LSMS. A site growing an energy crop with field sensors (eddy covariance, radiation or soil moisture) at DTU-Risø is chosen for the pilot study. A hexacopter (Tarot) equipped with a six band multispectral camera (Visible and near infrared), a thermal camera and a digital camera regularly flew over the flux site. In the near future, a smart UAV platform combining rotary and fixed wing functionality will be used as platform. The imagery acquired by UAVs will be used to retrieve the vegetation indices and land surface temperature. These data used for land surface modeling to estimate biomass, plant diseases or stress, water uptake.

**Identification and Application of Surrogate Models for Urban Drainage Modelling**

Having spatially distributed estimates of energy, water and carbon fluxes between the land and the atmosphere is of critical importance for improving water resource management, agricultural production, weather forecasting, and climate prediction. Traditionally, satellite based remote sensing data of vegetation or temperature has been used as inputs into land surface models (LSMs). However, the coarse resolution of satellite based remote sensing (3-90 km) data could not accurately capture spatial heterogeneity in fluxes due to changes in topography, soil types, and vegetation. With significant advances in navigation, flight control, miniaturized platforms and sensors, Unmanned Aerial Vehicles (UAVs) can provide ultra-high spatial resolution imagery (1 cm to 1 m). This presents a good opportunity to improve land surface modeling. From this perspective, our study explores the possibility to incorporate UAV-based remote sensing into LSMS. A site growing an energy crop with field sensors (eddy covariance, radiation or soil moisture) at DTU-Risø is chosen for the pilot study. A hexacopter (Tarot) equipped with a six band multispectral camera (Visible and near infrared), a thermal camera and a digital camera regularly flew over the flux site. In the near future, a smart UAV platform combining rotary and fixed wing functionality will be used as platform. The imagery acquired by UAVs will be used to retrieve the vegetation indices and land surface temperature. These data used for land surface modeling to estimate biomass, plant diseases or stress, water uptake.

**General information**

**State:** Published

**Organisations:** Department of Environmental Engineering, Water Resources Engineering, National Space Institute, Geodesy, Atmospheric Environment, Technical University of Denmark

**Authors:** Wang, S. (Intern), Köppl, C. J. (Ekstern), Bandini, F. (Intern), Jakobsen, J. (Intern), Olesen, D. H. (Intern), Ibrom, A. (Intern), Bauer-Gottwein, P. (Intern), Garcia, M. (Intern)

**Number of pages:** 1

**Publication date:** 2016

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**Main Research Area:** Technical/natural sciences

**Electronic versions:** NUE16_Sheng_Wang.pdf

**Publication:** Research - peer-review › Conference abstract for conference – Annual report year: 2016
Identification of abiotic and biotic reductive dechlorination in a chlorinated ethene plume after thermal source remediation by means of isotopic and molecular biology tools

Thermal tetrachloroethene (PCE) remediation by steam injection in a sandy aquifer led to the release of dissolved organic carbon (DOC) from aquifer sediments resulting in more reduced redox conditions, accelerated PCE biodegradation, and changes in microbial populations. These changes were documented by comparing data collected prior to the remediation event and eight years later. Based on the premise that dual C-Cl isotope slopes reflect ongoing degradation pathways, the slopes associated with PCE and TCE suggest the predominance of biotic reductive dechlorination near the source area. PCE was the predominant chlorinated ethene near the source area prior to thermal treatment. After thermal treatment, cDCE became predominant. The biotic contribution to these changes was supported by the presence of Dehalococcoides sp. DNA (Dhc) and Dhc targeted rRNA close to the source area. In contrast, dual C-Cl isotope analysis together with the almost absent VC 13C depletion in comparison to cDCE 13C depletion suggested that cDCE was subject to abiotic degradation due to the presence of pyrite, possible surface-bound iron (II) or reduced iron sulphides in the downgradient part of the plume. This interpretation is supported by the relative lack of Dhc in the downgradient part of the plume. The results of this study show that thermal remediation can enhance the biodegradation of chlorinated ethenes, and that this effect can be traced to the mobilisation of DOC due to steam injection. This, in turn, results in more reduced redox conditions which favor active reductive dechlorination and/or may lead to a series of reox reactions which may consecutively trigger biotically induced abiotic degradation. Finally, this study illustrates the valuable complementary application of compound-specific isotopic analysis combined with molecular biology tools to evaluate which biogeochemical processes are taking place in an aquifer contaminated with chlorinated ethenes.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, University of Neuchâtel, Geological Survey of Denmark and Greenland, SiREM
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Number of pages: 19
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Web of Science (2018): Indexed yes
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Web of Science (2017): Indexed Yes
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Scopus rating (2016): CiteScore 2.26 SJR 1.037 SNIP 1.077
Web of Science (2016): Indexed yes
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Scopus rating (2015): SJR 0.941 SNIP 1.073 CiteScore 2.12
Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 1.293 SNIP 1.516 CiteScore 2.4
BFI (2013): BFI-level 1
Identifying novel nitrifying bacteria in rapid gravity sand filters using stable isotope probing

General information
State: Published
Imaging geochemical heterogeneities using inverse reactive transport modeling: An example relevant for characterizing arsenic mobilization and distribution

The spatial distribution of reactive minerals in the subsurface is often a primary factor controlling the fate and transport of contaminants in groundwater systems. However, direct measurement and estimation of heterogeneously distributed minerals are often costly and difficult to obtain. While previous studies have shown the utility of using hydrologic measurements combined with inverse modeling techniques for tomography of physical properties including hydraulic conductivity, these methods have seldom been used to image reactive geochemical heterogeneities. In this study, we focus on As-bearing reactive minerals as aquifer contaminants. We use synthetic applications to demonstrate the ability of inverse modeling techniques combined with mechanistic reactive transport models to image reactive mineral lenses in the subsurface and quantify estimation error using indirect, commonly measured groundwater parameters. Specifically, we simulate the mobilization of arsenic via kinetic oxidative dissolution of As-bearing pyrite due to dissolved oxygen in the ambient groundwater, which is an important mechanism for arsenic release in groundwater both under natural conditions and engineering applications such as managed aquifer recharge and recovery operations. The modeling investigation is carried out at various scales and considers different flow-through domains including (i) a 1D lab-scale column (SO cm), (ii) a 2D lab-scale setup (60 cm x 30 cm) and (iii) a 2D field scale domain (20 nix 4 m). In these setups, synthetic dissolved oxygen data and forward reactive transport simulations are used to image the spatial distribution of As-bearing pyrite using the Principal Component Geostatistical Approach (PCGA) for inverse modeling. (C) 2015 Elsevier Ltd. All rights reserved.

General information
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Organisations: Department of Environmental Engineering, Water Resources Engineering, Stanford University
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Number of pages: 12
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Web of Science (2018): Indexed yes
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.53 SJR 2.202 SNIP 2.036
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.24 SNIP 2.062 CiteScore 4.31
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.951 SNIP 1.951 CiteScore 3.66
Web of Science (2014): Indexed yes
Impact of bacterial activity on turnover of insoluble hydrophobic substrates (phenanthrene and pyrene)—Model simulations for prediction of bioremediation success

Many attempts for bioremediation of polycyclic aromatic hydrocarbon (PAH) contaminated sites failed in the past, but the reasons for this failure are not well understood. Here we apply and improve a model for integrated assessment of mass transfer, biodegradation and residual concentrations for predicting the success of remediation actions. First, we provide growth parameters for Mycobacterium rutilum and Mycobacterium pallens growing on phenanthrene (PHE) or pyrene (PYR) degraded the PAH completely at all investigated concentrations. Maximum metabolic rates $v_{\text{max}}$ and growth rates $\mu$ were similar for the substrates PHE and PYR and for both strains. The investigated Mycobacterium species were not superior in PHE degradation to strains investigated earlier with this method. Real-world degradation scenario simulations including diffusive flux to the microbial cells indicate: that (i) bioaugmentation only has a small, short-lived effect; (ii) Increasing sorption shifts the remaining PAH to the adsorbed/sequestered PAH pool; (iii) mobilizing by solvents or surfactants resulted in a significant decrease of the sequestered PAH, and (iv) co-metabolization e.g. by compost addition can contribute significantly to the reduction of PAH, because active biomass is maintained at a high level by the compost. The model therefore is a valuable contribution to the assessment of potential remediation action at PAH-polluted sites.
Impact of influent quality on green microalgal cultivation with used water resources – experimental assessment combined with image analysis

General information
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Organisations: Department of Environmental Engineering, Water Technologies, Technical University of Denmark
Authors: Wágner, D. S. (Intern), Valverde Pérez, B. (Intern), Cazzaniga, C. (Ekstern), Steidl, M. (Ekstern), Dechesne, A. (Intern), Plósz, B. G. (Intern)
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Impact of Meteorological Parameters on Extracted Methane Concentration at Landfills

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Fathi Aghdam, E. (Intern), Scheutz, C. (Intern), Kjeldsen, P. (Intern)
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Main Research Area: Technical/natural sciences
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Impact of multicomponent ionic transport on pH fronts propagation in saturated porous media

Multicomponent ionic interactions have been increasingly recognized as important factors for the displacement of charged species in porous media under both diffusion- [1,2] and advection-dominated flow regimes [3,4]. In this study we investigate the propagation of pH fronts during multicomponent ionic transport in saturated porous media under flow-through conditions. By performing laboratory bench-scale experiments combined with numerical modeling we show the important influence of Coulombic effects on proton transport in the presence of ionic admixtures. The experiments were performed in a quasi two-dimensional flow-through setup under steady-state flow and transport conditions. Dilute solutions of hydrochloric acid with MgCl2 (1:2 strong electrolyte) were used as tracer solutions to experimentally test the effect of
electrochemical cross-coupling on the migration of diffusive/dispersive pH fronts. We focus on two experimental scenarios, with different composition of tracer solutions, causing remarkably different effects on the propagation of the acidic fronts with relative differences in the penetration depth of pH fronts of 36% between the two scenarios and of 25% and 15% for each scenario with respect to the transport of ions at liberated state (i.e. without considering the charge effects). Also significant differences in the dilution of the distinct ionic plumes, quantified using the flux-related dilution index at the laboratory bench scale [5], were measured at the outflow of the flow-through system. The dilution of the pH plumes also changed considerably (26% relative difference) in the two flow-through experiments only due to the different composition of the pore water solution and to the electrostatic coupling of the ions in the flow-through setups. Numerical transport simulations were performed to interpret the laboratory experiments. The simulations were based on a multicomponent ionic formulation accurately capturing the Coulombic interactions between the transported ions in the flow-through system. The results of purely forward simulations show a very good agreement with the high-resolution measurements performed at the outlet of the flow-through setup and illustrate the importance of charge effects on pH fronts propagation in porous media.

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Impacts of urban development and climate change in exposing cities to pluvial flooding
Urban areas are characterized by very high concentrations of people and economic activities and are thus particularly vulnerable to flooding during extreme precipitation. Urban development and climate change are among the key drivers of changes in the exposure of cities to the occurrence and impacts of pluvial flooding. Cities are often dominated by large areas of impervious surfaces, that is, man-made sealed surfaces which water cannot penetrate, and increases in these – for example, as a consequence of urban development – can cause elevated run-off volumes and flood levels during precipitation. Climate change is expected to affect the intensity and frequency of extreme precipitation, with increases projected for many regions, including most parts of Europe.

General information
State: Published
Organisations: Department of Management Engineering, Systems Analysis, Department of Environmental Engineering, Urban Water Systems, Department of Applied Mathematics and Computer Science, Dynamical Systems
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Publisher: Technical University of Denmark (DTU)
Improving methane production from digested manure biofibers by mechanical and thermal alkaline pretreatment

Animal manure digestion is associated with limited methane production, due to the high content in fibers, which are hardly degradable lignocellulosic compounds. In this study, different mechanical and thermal alkaline pretreatment methods were applied to partially degradable fibers, separated from the effluent stream of biogas reactors. Batch and continuous experiments were conducted to evaluate the efficiency of these pretreatments. In batch experiments, the mechanical pretreatment improved the degradability up to 45%. Even higher efficiency was shown by applying thermal alkaline pretreatments, enhancing fibers degradability by more than 4-fold. In continuous experiments, the thermal alkaline pretreatment, using 6% NaOH at 55 °C was proven to be the most efficient pretreatment method as the methane production was increased by 26%. The findings demonstrated that the methane production of the biogas plants can be increased by further exploiting the fraction of the digested manure fibers which are discarded in the post-storage tank.
Improving the energy balance of grass-based anaerobic digestion through harvesting optimization

Meadows, marginal and environmentally sensitive areas are often considered as the source to find the needed organic feedstock for the proliferated full-scale biogas plant. However, the anaerobic digestion (AD) of biomass from these areas is connected with specific challenges, originated from their complex lignocellulosic structure. Thus, pretreatment methods are typically applied in order to disrupt their rigid matrix and improve the digestibility.

Despite the fact that a lot of research has already focused on various pretreatment methods for lignocellulosic substrates, their overall process efficiency is still doubted and thus, they are not widely used in full-scale biogas plants. In addition, these methods are typically associated with increased costs or energy demands. Hence, there is a need to find effective and cost-efficient solutions that boost biomass decomposition. In this concept, one way to improve the overall process efficiency is to minimize the number of individual process steps prior to feeding the biomass to the reactor.

The present study examined the effect of full-scale harvesting machines (i.e. a simple front mounted disc mower and a disc mower equipped additionally with a number of coarse barbs) to simultaneously mow and mechanically pretreat two different lignocellulosic substrates. Thus, ensiled meadow grass was initially examined at the first experimental set up. Regarding the second field test, an area sowed with regularly cultivated grass was harvested. In order to determine the treatment with the best energy balance, the energy demand during harvesting was compared to the practical methane yield. The biomethanation process was evaluated using triplicate batch assays under thermophilic conditions following the guidelines of the biochemical methane potential (BMP) protocol.

The findings showed that methane production can efficiently be enhanced by mechanical pretreatment applied at the harvesting step. More specifically, the most effective treatment yielded more than 10% increase in the bioenergy production from both examined grass silages. Our study demonstrates that the appropriate harvester can improve the energy output by approximately 2.4 GJ/ha under optimal conditions and subsequently, the overall sustainability of grass-based AD.

General information
Improving the prediction of in-sewer transformation of illicit drug biomarkers by identifying a new modelling framework

In the context of wastewater-based epidemiology, uncertainties associated with in-sewer transformation are often not considered. However, sewer systems are biological reactors in which the concentration of organic pollutants (primary pollutants, e.g., COD, and secondary pollutants, e.g., illicit drugs) is altered during transport. Although reduced stability of several drug biomarkers was shown in raw sewage and biofilm, evidence on the type of transformation (biotic or abiotic) and the effect of different redox conditions on transformation is currently insufficient. In this study, the biotransformation and abiotic transformation of 16 illicit drugs were assessed in wastewater and mineral water, respectively. The targeted illicit drugs were: cocaine and its metabolites benzoylecgonine, ecgonine methyl ester, and cocaethylene; heroin and its metabolites 6-monoacetylmorphine, morphine, and morphine-3β-D-glucuronide; codeine and its metabolite norcodeine; methadone and its metabolite 2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine (EDDP); mephedrone; and tetrahydrocannabinol (THC) and its metabolites 11-hydroxy-Δ9-THC (THCOH), and 11-nor-9-carboxy-Δ9-THC (THCCOOH). All the transformation studies were performed using batch experiments under both aerobic and anaerobic conditions, while concomitantly assessing the degradation of primary pollutants. Furthermore, sorption to suspended solids and to reactor walls was also considered and quantified. The transformation of primary pollutants and illicit drugs in wastewater was simulated using Wastewater Aerobic/anaerobic Transformations in Sewers model (WATS)1 extended with the Activated Sludge Model for Xenobiotic trace chemicals (ASM-X)2. In addition, abiotic and biotic transformation pathways (based on available literature studies and statistical analysis) were considered for each drug biomarker. Our results suggest that ignoring the dynamics of biomass growth would result in significant overestimation (up to 385%) of aerobic biotransformation rate constants, whereas no significant difference was observed for anaerobic rate constants. Furthermore, abiotic transformation was found to be the main transformation mechanism for THC (aerobic conditions); mephedrone, methadone, cocaine, ecgonine methyl ester, cocaethylene, THCOH and THCCOOH (anaerobic conditions). By use of the proposed model the uncertainty of predicting illicit drug concentration at the excretion point can be reduced and hence the accuracy of back-calculation of illicit drug use in catchments can be improved.
standard acute ecotoxicity tests at three trophic levels, algae, invertebrate, and fish. As demonstrated by comparison with maximum aqueous concentrations at water solubility, chemicals with an octanol-water partition coefficient (Kow) greater than 10(6) are not expected to reach sufficiently high internal concentrations for exerting effects within the test duration of acute tests with fish and invertebrates, even though they might be intrinsically toxic. This toxicity cutoff was explained by the slow uptake, i.e., by kinetics, not by thermodynamic limitations. Predictions were confirmed by data entries of the OECD's screening information data set (SIDS) (n = 746), apart from a few exceptions concerning mainly organometallic substances and those with inconsistency between water solubility and Kow. Taking error propagation and model assumptions into account, we thus propose a revision of data requirements for highly hydrophobic chemicals with log Kow > 7.4: Short-term toxicity tests can be limited to algae that generally have the highest uptake rate constants, whereas the primary focus of the assessment should be on persistence, bioaccumulation, and long-term effects.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Korea University, Helmholtz Centre for Environmental Research
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Number of pages: 8
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Scopus rating (2017): SJR 2.535 SNIP 1.941 CiteScore 6.58
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Scopus rating (2016): CiteScore 6.26 SJR 2.559 SNIP 1.902
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BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.546 SNIP 1.838 CiteScore 5.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.777 SNIP 2.003 CiteScore 5.5
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 2.952 SNIP 2.102 CiteScore 5.52
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BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.115 SNIP 2.043 CiteScore 5.17
ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.18 SNIP 1.945 CiteScore 5.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.979 SNIP 1.726
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.86 SNIP 1.809
Increased levels of the oxidative stress biomarker 8-iso-prostaglandin F2α in wastewater associated with tobacco use

Wastewater analysis has been demonstrated to be a complementary approach for assessing the overall patterns of drug use by a population while the full potential of wastewater-based epidemiology has yet to be explored. F2-isoprostanes are a prototype wastewater biomarker to study the cumulative oxidative stress at a community level. In this work, 8-iso-prostaglandin F2α (8-iso-PGF2α) was analysed in raw 24 h-composite wastewater samples collected from 4 Norwegian and 7 other European cities in 2014 and 2015. Using the same samples, biomarkers of alcohol (ethyl sulfate) and tobacco (trans-3'-hydroxycotinine) use were also analysed to investigate any possible correlation between 8-iso-PGF2α and the consumption of the two drugs. The estimated per capita daily loads of 8-iso-PGF2α in the 11 cities ranged between 2.5 and 9.9 mg/day/1000 inhabitants with a population-weighted mean of 4.8 mg/day/1000 inhabitants. There were no temporal trends observed in the levels of 8-iso-PGF2α, however, spatial differences were found at the inter-city level correlating to the degree of urbanisation. The 8-iso-PGF2α mass load was found to be strongly associated with that of trans-3'-hydroxycotinine while it showed no correlation with ethyl sulfate. The present study shows the potential for 8-iso-PGF2α as a wastewater biomarker for the assessment of community public health.
Influence of data choices in Life Cycle Assessment of waste management systems

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Henriksen, T. (Intern), Astrup, T. F. (Intern), Damgaard, A. (Intern)
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Influence of dissolved organic carbon on biodegradation of pharmaceuticals by suspended biofilms in wastewater

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Organisations: Department of Environmental Engineering, Water Technologies, Aarhus University
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Clean water is a basic human need. However, rapid population growth and climate change result in an increase of water demand, whereas the resources of potable water are shrinking.

One of the solutions could be to use membrane technology to reclaim clean and safe drinking water from wastewater. Nonetheless, the existing membrane technologies often face fouling problem that lowers the economic viability of the membrane application in industrial scale.

Recent development in the membrane technology indicates that forward osmosis (FO) has a high potential for wastewater treatment, producing high quality water [1]. Compared to other pressure driven membrane processes, forward osmosis (FO) membranes suffered less severe fouling due to the lack of hydraulic pressure [2]. Furthermore, novel biomimetic membranes incorporating Aquaporins, highly selective water channels, became commercially available. These membranes were reported to achieve remarkable results in terms of water flux and solute rejection, though little is known whether they are suitable for wastewater treatment.

The objective of this study is to investigate 1) which types of wastewater can be treated by FO using biomimetic Aquaporin membranes, 2) which draw solution is most suitable for this application and 3) the extent and nature of the fouling. All experiments were conducted in a bench-scale FO setup using NaCl, MgCl2, NaOAc as a draw solution and different anaerobic digestion effluents as a feed. The effluents were characterised at the beginning and at the end of each experiment, regarding their total solids (TS), volatile solids (VS), total suspended solids (TSS), particle size distribution, Total Kjeldahl Nitrogen (TKN), Total available nitrogen (TAN), total organic carbon (TOC) and total phosphate (TP). The fouled membranes were analysed by Scanning Electron Microscope with Energy-dispersive X-ray spectroscopy (SEM-EDS), Fourier transform infrared spectroscopy (FTIR), ATP analysis and inductively coupled plasma optical emission spectrometry (ICP-OES). Our preliminary experimental results indicate that there is a correlation between the effluent composition and the fouling potential. Taken together our results can contribute understanding of how fouling can be mitigated by considering various feed pretreatment methods.

Influence of feed composition and membrane fouling on forward osmosis performance

Influence of mechanical wastewater pretreatment on membrane fouling during municipal wastewater treatment by forward osmosis
In aquatic toxicity testing of engineered nanoparticles (ENPs) the process of agglomeration is very important as it may alter bioavailability and toxicity. In the present study, we aimed to identify test conditions that are favorable for maintaining stable ENP suspensions. We evaluated the influence of key environmental parameters: pH (2-12) and ionic strength using M7, Soft EPA (S EPA) medium, and Very Soft EPA (VS EPA) medium; and observed the influence of these parameters on zeta potential, zeta average, and acute immobilization of Daphnia magna for three different ENPs. Despite being sterically stabilized, test suspensions of silver (Ag) ENPs formed large agglomerates in both VS EPA and M7 media; and toxicity was found to be higher in VS EPA medium due to increased dissolution. Low-agglomerate suspensions for zinc oxide (ZnO) could be obtained at pH 7 in VS EPA medium, but the increase in dissolution caused higher toxicity than in M7 medium. Titanium dioxide (TiO2) ENPs had a point of zero charge in the range of pH 7-8. At pH 7 in VS EPA, agglomerates with smaller hydrodynamic diameters (similar to 200 nm) were present compared to the high ionic strength M7 medium where hydrodynamic diameters reached micrometer range. The stable suspensions of TiO2 ENPs caused immobilization of D. magna, 48-h EC50 value of 13.7 mg L⁻¹ (95% CI, 2.4 mg-79.1 mg L⁻¹); whereas no toxicity was seen in the unstable, highly agglomerated M7 medium suspensions, 48-h EC50 > 100 mg L⁻¹. The current study provides a preliminary approach for methodology in testing and assessing stability and toxicity of ENPs in aquatic toxicity tests of regulatory relevance. (C) 2016 Elsevier Inc. All rights reserved.
Influences of mechanical pre-treatment on the non-biological treatment of municipal wastewater by forward osmosis

Municipal wastewater treatment commonly involves mechanical, biological and chemical treatment steps as state-of-the-art technologies for protecting the environment from adverse effects. The biological treatment step consumes the most energy and can create greenhouse gases. This study investigates municipal wastewater treatment without the biological treatment step, including the effects of different pre-treatment configurations, e.g., direct membrane filtration before forward osmosis. Forward osmosis was tested using raw wastewater and wastewater subjected to different types of mechanical pre-treatment, e.g., microsieving and microfiltration permeation, as a potential technology for municipal wastewater treatment. Forward osmosis was performed using thin-film-composite, Aquaporin Inside(TM) and HTI membranes with NaCl as the draw solution. Both types of forward osmosis membranes were tested in parallel for the different types of pre-treated feed and evaluated in terms of water flux and solute rejection, i.e., biochemical oxygen demand and total and soluble phosphorus contents. The Aquaporin and HTI membranes achieved a stable water flux with rejection rates of more than 96% for biochemical oxygen demand and total and soluble phosphorus, regardless of the type of mechanical pre-treated wastewater considered. This result indicates that forward osmosis membranes can tolerate exposure to municipal waste water and that the permeate can fulfil the Swedish discharge limits for small- and medium-sized wastewater treatment plants.

General information
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Organisations: Department of Environmental Engineering, Water Technologies, Lund University, Aquaporin A/S
Authors: Hey, T. (Ekstern), Zarebska, A. (Intern), Bajraktari, N. (Intern), Vogel, J. (Ekstern), Hélix-Nielsen, C. (Intern), La Cour Jansen, J. (Ekstern), Jönsson, K. (Ekstern)
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Web of Science (2010): Indexed yes
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BFI (2008): BFI-level 1
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Scopus rating (2007): SJR 0.402 SNIP 0.586
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.477 SNIP 0.544
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.506 SNIP 0.677
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.664 SNIP 0.647
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.545 SNIP 0.644
Scopus rating (2002): SJR 0.68 SNIP 0.731
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Informing groundwater model hydrostratigraphy with airborne time-domain electromagnetic data and borehole logs

Hydrological models of groundwater systems and integrated hydrological systems are commonly used tools to manage groundwater resources and support decision making. The models are utilized to quantitatively support management of water supply from well fields; perform dewatering calculations for construction sites; quantify groundwater contamination in time and space; estimate ecological impacts of anthropogenic or climatic stresses; characterize salt-water intrusion phenomena, etc. Applications can be at scales of tens to thousands of square kilometers. The reliability of numerical groundwater models is closely related to the quality and amount of hydrological and geological data available to inform the modeling process. This is particularly true for lithological and geological data required to map the 3-D distribution of aquifer materials, which is also called the hydrostratigraphy. A major challenge for groundwater modelers is that the hydrostratigraphy, which is one of the most critical parameterizations of groundwater models, is based on properties for which direct information is inherently difficult to obtain. The uncertainty resulting from this is non-trivial to estimate and thus rarely quantifiable.

Airborne time-domain electromagnetic (AEM) data obtained using novel methods of data acquisition and processing are attractive because the resulting electrical resistivity models of the subsurface can be obtained at a lateral resolution unmet by geological data while covering areas of hundreds of square kilometers. Application of geophysical data in hydrology however is challenged by the necessary petrophysical translation of the measured physical property into a hydrological property.

The PhD study investigated an approach to incorporate structural information contained in large AEM data sets directly into the groundwater modeling process. The work focuses on reproducibility and objectivity, which is typically lacking in traditional interpretations of AEM and lithological information, and the approaches presented in this thesis are to a large extent automatic. An approach that integrates EM data and borehole lithological information directly into groundwater models is proposed. The approach builds on a clay-fraction inversion which is a spatially variable translation of resistivity values from EM data into clay-fraction values using borehole lithological information. Hydrostratigraphical units are obtained through a k-means cluster analysis of the principal components of resistivity and clay-fraction values. Under the assumption that the units have uniform hydrological properties, the units constitute the hydrostratigraphy for a groundwater model. Only aquifer structures are obtained from geophysical and lithological data, while the estimation of the hydrological properties of the units is inversely derived from the groundwater model and hydrological data.

A synthetic analysis was performed to investigate the principles underlying the clustering approach using three petrophysical relationships between electrical conductivity and hydraulic conductivity. Aquifer structures obtained from clustering on electrical conductivity and clay fraction resulted in mismatch with the true pumping well capture isochrone of 8 to 13 percent. Results for clustering only on electrical conductivity were not stable.

The approach was first tested for the 156 km² large integrated hydrological model of the Danish case study Norsminde. The hydrological performance in terms of fit to the transient hydraulic head observations and stream discharge observations results in root mean square errors of 2.0 m and -0.79 m, and mean errors of 0.28 m³s⁻¹ and -0.011 m³s⁻¹ for head and discharge respectively. Benchmarking against comparable Danish models reported in scientific papers confirmed good hydrological performance.

The automatic hydrostratigraphical modeling approach was extended to quantify the uncertainty of groundwater model predictions. An ensemble of equally likely hydrostratigraphical models was simulated at locations with no data to parameterize the entire model domain, using indicator variograms. The method was applied to the 46 km² groundwater model of the Danish site Kasted. Hydrological performance of 75 realizations in terms of fit to steady-state hydraulic head observations and base-flow estimates correspond to root mean square errors around 5.5 m and mean errors of -0.2 m, and percentage errors around 0 to -4 respectively. Differences in local scale connectivity/dis-connectivity of aquifer materials resulted in a probabilistic well catchment area. Results indicate 85% probability that the well catchment area extends beyond the well catchment area determined from a manually developed deterministic geology.

The applications to Norsminde and Kasted sites, combined with the theoretical insight gained from the synthetic analysis, show promising results for direct integration of AEM data into the groundwater modeling process using cluster analysis. Because the presented methods are reproducible and time saving due to being highly automatized, the methods potentially have commercial value.
Innovative microbial electrochemical process for H₂O₂ synthesis and residual H₂O₂ removal for wastewater treatment

Sustainable H₂O₂ synthesis and residual H₂O₂ removal are key challenges to the treatment of recalcitrant wastewater using Fenton processes. In this study, an innovative bioelectrochemical system was developed to meet the challenges by alternate switching between microbial electrolysis cell (MEC) and microbial fuel cell (MFC) mode of operation. In the MEC mode, H₂O₂ was produced and then reacted with Fenton’s reagent (Fe II) to form hydroxyradical. When the system was switched to MFC mode, the unused H₂O₂ as residual is removed at the cathode as electron acceptor. For wastewater containing 50 mg L⁻¹ methylene blue (MB), complete decolorization and mineralization was achieved in the MEC mode with apparent first order rate constants of 0.43 and 0.22 h⁻¹, respectively. After switching the system to the MFC mode, unused H₂O₂ at concentration of 180 mg L⁻¹ was removed. The removal rate was 4.61 mg L⁻¹ h⁻¹ while maximum current density of 0.49 A m⁻² was generated. The MB degradation and removal of unused H₂O₂ were affected by different operational parameters such as external resistance, cathode pH and initial MB concentration. Furthermore, stack operation greatly improved the system performance. This study for the first time demonstrated an efficient and cost-effective bioelectrochemical system for H₂O₂ generation, residual removal and treatment of recalcitrant pollutants.

In-situ biogas upgrading in thermophilic granular UASB reactor: key factors affecting the hydrogen mass transfer rate

Biological biogas upgrading coupling CO₂ with external H₂ to form biomethane opens new avenues for sustainable biofuel production. For developing this technology, efficient H₂ to liquid transfer is fundamental. This study proposes an innovative setup for in-situ biogas upgrading converting the CO₂ in the biogas into CH₄, via hydrogenotrophic methanogenesis. The setup consisted of a granular reactor connected to a separate chamber, where H₂ was injected. Different packing materials (rashig rings and alumina ceramic sponge) were tested to increase gas-liquid mass transfer. This aspect was optimized by liquid and gas recirculation and chamber configuration. It was shown that by distributing H₂ through a metallic diffuser followed by ceramic sponge in a separate chamber, having a volume of 25% of the reactor, and by applying a mild gas recirculation, CO₂ content in the biogas dropped from 42 to 10% and the final biogas was upgraded from 58 to 82% CH₄ content.
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Web of Science (2018): Indexed yes
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Scopus rating (2017): SJR 2.029 SNIP 1.799 CiteScore 6.28
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Scopus rating (2016): CiteScore 5.94 SJR 2.215 SNIP 1.932
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.243 SNIP 1.897 CiteScore 5.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.399 SNIP 2.087 CiteScore 5.3
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 2.405 SNIP 2.477 CiteScore 5.97
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BFI (2012): BFI-level 2
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Web of Science (2012): Indexed yes
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Scopus rating (2011): SJR 2.308 SNIP 2.507 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
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Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.915 SNIP 2.236
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.736 SNIP 2.74
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.403 SNIP 2.396
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.314 SNIP 2.003
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.278 SNIP 1.98
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.19 SNIP 1.655
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.942 SNIP 1.665
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.908 SNIP 1.294
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Integrated assessment of sources, chemical stressors and stream quality along a groundwater fed stream system

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Organisations: Department of Environmental Engineering, Water Resources Engineering
Authors: Bjerg, P. L. (Intern), Sonne, A. T. (Intern), Rønde, V. K. (Intern), McKnight, U. S. (Intern)
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Integrated characterization of the development in natural attenuation of a PCE plume over 7 years after thermal remediation of the source zone with use of dual stable isotope and molecular microbial techniques

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Integrated environmental and economic assessment of waste management systems
The Solid Waste Management (SWM) sector has evolved from a simple control of emissions towards a resource recovery sector while still being constrained by strict emission regulations. For that waste authorities are paying increased attention to the waste hierarchy as a set of priorities for solid waste treatment options to boost this shift towards higher resource recovery. In this hierarchy, waste prevention has the highest priority, followed by re-use and recycling options, and what cannot be recycled should be energy recovered; and, finally, the least favoured option is disposal in landfills. However, the waste hierarchy does not consider the local needs/conditions of each geographical area, and it cannot be used to identify sustainable SWM options by itself. Environmental impact assessment can help with this task as holistic decision-support tool. Nevertheless, waste authorities need economic assessment of SWM systems alongside environmental impacts assessment to take budget constraints into account.

In light of the need for combined environmental and economic assessment of SWM, this PhD thesis developed a consistent and comprehensive method for integrated environmental and economic assessment of SWM technologies and systems. The method resulted from developing further the generic Life Cycle Costing (LCC) framework suggested by Hunkeler et al. (2008) and Swarr et al. (2011) to apply it on the field of SWM. The method developed includes: two modelling approaches (Accounting and Optimization), three cost approaches (Conventional, Environmental and Societal LCCs) and two goal perspectives (Planning and Analysis).
• The modelling approach describes how the scenarios are defined. The “Accounting approach” defines the technological pathway of each scenario before the study is performed, while in the “Optimization approach” the scenarios are the results of an optimization process.

• The cost approach describes cost principles and level of LCA integration. Conventional and Environmental LCCs are financial assessments, i.e. include marketed goods/services, while Environmental LCCs include environmental impacts in a parallel LCA, Conventional LCCs do not. Societal LCC is a welfare economic assessment, i.e. includes marketed goods/services and effects outside the economic system (externality costs).

• The goal perspective differentiates between “Analysis” and “Planning” perspective. Analysis LCCs evaluate current status of a SWM system, while Planning LCCs focusses on the consequences a change in a system with respect to the status quo.

The applicability of the LCC framework was tested through four case studies from which the following conclusions can be drawn:

• Organic source-segregation incurs financial and social costs mainly related to the cost of bags and bins used by households, as well as extra collection costs related to the additional collection scheme for organics collection as well as extra cost of residual waste collection (compared with mixed waste).

• The environmental benefits related to food waste prevention (due to avoided food production) could be overtaken by the environmental loads associated with the alternative consumptions purchased with the savings generated from the prevented (unpurchased) food. This could be avoided if prevention campaigns were accompanied by other policies aiming at reducing the impact of alternative consumption patterns. The inclusion of these income effects is especially critical when the alternatives being compared in an LCC have significant differences on the use of scarce resources such as income, land and time. In these cases, LCC studies should be supplemented by specific analysis of potential behavioural changes in consumption patterns (defining alternative consumptions) associated with the SWM systems being assessed.

• Recycling and prevention strategies can have significant economic consequences in existing waste facilities whose operation will have to be adjusted based on the waste changes. Marginal costs of diversion strategies in existing WtE facilities depend completely on the response in such facility. However, regardless of the response type, it was demonstrated that marginal costs of diversion are several times different than average costs. Hence, when performing Planning LCC the dynamics of the SWM system (including effects in existing waste facilities) should be taken into account to avoid misleading conclusions.

• Optimization of SWM using Societal LCC demonstrated that the social optimal solution results from balancing economic and externality costs. Contrary, optimizing using either economic costs or externality costs lead to socially suboptimal solutions.
Integration of freshwater impact in lifecycle assessment of three water supply technologies

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Inter-comparison of statistical downscaling methods for projection of extreme flow indices across Europe

The effect of methods of statistical downscaling of daily precipitation on changes in extreme flow indices under a plausible future climate change scenario was investigated in 11 catchments selected from 9 countries in different parts of Europe. The catchments vary from 67 to 6171km² in size and cover different climate zones. 15 regional climate model outputs and 8 different statistical downscaling methods, which are broadly categorized as change factor and bias correction based methods, were used for the comparative analyses. Different hydrological models were implemented in different catchments to simulate daily runoff. A set of flood indices were derived from daily flows and their changes have been evaluated by comparing their values derived from simulations corresponding to the current and future climate. Most of the implemented downscaling methods project an increase in the extreme flow indices in most of the catchments. The catchments where the extremes are expected to increase have a rainfall-dominated flood regime. In these catchments, the downscaling methods project a decrease in the extreme flows in three of the four catchments considered. A major portion of the variability in the projected changes in the extreme flow indices is attributable to the variability of the climate model ensemble, although the statistical downscaling methods contribute 35–60% of the total variance.
Flooding, Statistical downscaling, Regional climate models, Climate change, Europe

To provide greater transparency and comprehensive information to consumers regarding their purchase choices, the European Parliament and the Council have mandated via Regulation 1169/2011 that foods containing engineered nanomaterials (ENMs) be labeled. This review covers the main concerns related to the use of ENMs in foods and the potential impacts that this type of food labeling might have on diverse stakeholder groups, including those outside the European Union (EU), e.g., in the United States. We also provide recommendations to stakeholders for overcoming existing challenges related to labeling foods containing ENMs. The revised EU food labeling requirements will likely result in a number of positive developments and a number of challenges for stakeholders in both EU and non-EU countries. Although labeling of foods containing ENMs will likely improve transparency, provide more information to facilitate consumer decisions, and build trust among food safety authorities and consumers, critical obstacles to the successful implementation of these labeling requirements remain, including the need for (i) harmonized information requirements or regulations between countries in different regions of the world, (ii) clarification of the regulatory definitions of the ENMs to be used for food labeling, (iii) robust techniques to detect, measure, and characterize diverse ENMs in food matrices, and (iv) clarification of the list of ENMs that may be exempt from labeling requirements, such as several food additives used for decades. We recommend that food industries and food safety authorities be more proactive in communicating with the public and consumer groups regarding the potential benefits and risks of using ENMs in foods. Efforts should be made to improve harmonization of information requirements between countries to avoid potential international trade barriers.

**General information**

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Organisations: Department of Environmental Engineering, Environmental Chemistry, RTI International
Authors: Grieger, K. D. (Ekstern), Hansen, S. F. (Intern), Mortensen, N. P. (Ekstern), Cates, S. (Ekstern), Kowalcyk, B. (Ekstern)
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Inverse modeling of the biodegradation of emerging organic contaminants in the soil-plant system

Understanding the processes involved in the uptake and accumulation of organic contaminants into plants is very important to assess the possible human risk associated with. Biodegradation of emerging contaminants in plants has been observed, but kinetical studies are rare. In this study, we analyse experimental data on the uptake of emerging organic contaminants into lettuce derived in a greenhouse experiment. Measured soil, root and leaf concentrations from four contaminants were selected within the applicability domain of a steady-state two-compartment standard plant uptake model: bisphenol A (BPA), carbamazepine (CBZ), triclosan (TCS) and caffeine (CAF). The model overestimated concentrations in most cases, when no degradation rates in plants were entered. Subsequently, biodegradation rates were fitted so that the measured concentrations were met. Obtained degradation kinetics are in the order, BPA < CAF ≈ TCS < CBZ in roots, and BPA < TCS < CBZ.
Investigating comammox Nitrospira in rapid sand filters via metagenomics and single-cell genomics

General information
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Organisations: Department of Environmental Engineering, Water Technologies, Department of Bio and Health Informatics, Metagenomics, Aarhus University
Is the IP response related to geology or contaminants in a leachate plume at the Grindsted Landfill, Denmark?

Contaminants in leachate plumes from landfills and other contaminated sites are a threat to the environment. Efficient site characterization methods are needed. The perspectives of the IP method are investigated in combination with geological sampling and chemical analyses of water samples. Along a leachate plume from a landfill hosting both household and chemical waste, borehole IP data, geological samples, grain size, and contaminant concentrations in water samples are examined for correlations related to geology and concentrations of contaminants. Results relating the Cole-Cole parameters with sediment types and pore water resistivity representing the concentrations of the contaminants show that the formation resistivity primarily is controlled by the contaminant concentrations while the IP parameters primarily are related to the clay content and grain size distribution of sandy sediments at the site.

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Joint interpretation of enantiomer and stable isotope fractionation for chiral pesticides degradation

Chiral pesticides are important contaminants affecting the health and functioning of aquatic systems. The combination of stable isotope and enantiomer analysis techniques has been recently proposed to better characterize the fate of these contaminants in natural and engineered settings. We introduce a modeling approach with the aim of unifying and integrating the interpretation of isotopic and enantiomeric fractionation. The model is based on the definition of enantiomer-specific isotopologues and jointly predicts the evolution of concentration, enantiomer fractionation, as well as changes in stable isotope ratios of different elements. The method allows evaluating different transformation pathways and was applied to investigate enzymatic degradation of dichlorprop (DCPP), enzymatic degradation of mecoprop methyl ester (MCPMM), and microbial degradation of α-hexachlorocyclohexane (α-HCH) by different bacterial strains and under different redox conditions. The model accurately reproduces the isotopic and enantiomeric data observed in previous experimental studies and precisely captures the dual-dimensional trends characterizing different reaction pathways. Furthermore, the model allows testing possible combinations of enantiomer analysis (EA), compound specific isotope analysis (CSIA), and enantiomer specific isotope analysis (ESIA) to identify and assess isotope and enantiomer selective reaction mechanisms.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering
Authors: Jin, B. (Intern), Rolle, M. (Intern)
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  Scopus rating (2013): SJR 2.956 SNIP 2.676 CiteScore 6.02
  ISI indexed (2013): ISI indexed yes
  Web of Science (2013): Indexed yes
  BFI (2012): BFI-level 2
  Scopus rating (2012): SJR 2.914 SNIP 2.442 CiteScore 5.15
Joint optimization of regional water-power systems

Energy and water resources systems are tightly coupled; energy is needed to deliver water and water is needed to extract or produce energy. Growing pressure on these resources has raised concerns about their long-term management and highlights the need to develop integrated solutions. A method for joint optimization of water and electric power systems was developed in order to identify methodologies to assess the broader interactions between water and energy systems. The proposed method is to include water users and power producers into an economic optimization problem that minimizes the cost of power production and maximizes the benefits of water allocation, subject to constraints from the power and hydrological systems. The method was tested on the Iberian Peninsula using simplified models of the seven major river basins and the power market. The optimization problem was successfully solved using stochastic dual dynamic programming. The results showed that current water allocation to hydropower producers in basins with high irrigation productivity, and to irrigation users in basins with high hydropower productivity was sub-optimal. Optimal allocation was achieved by managing reservoirs in very distinct ways, according to the local inflow, storage capacity, hydropower productivity, and irrigation demand and productivity. This highlights the importance of appropriately representing the water users’ spatial distribution and marginal benefits and costs when allocating water resources optimally. The method can handle further spatial disaggregation and can be extended to include other aspects of the water-energy nexus.
Kinetics of nitrate adsorption and reduction by nano-scale zero valent iron (NZVI): Effect of ionic strength and initial pH

Kinetic models for pollutants reduction by Nano-scale Zero Valent Iron (NZVI) were tested in this study to gain a better understanding and description of the reaction. Adsorption kinetic models and a heterogeneous catalytic reaction kinetic equation were proposed for nitrate removal and for ammonia generation, respectively. A widely used pseudo-first-order reaction model was a poor fit for nitrate removal in an iron-limiting condition and for ammonia generation in an excess iron condition. However, in this study, pseudo-first-order and pseudo-second-order adsorption kinetic equations were a good fit for nitrate removal; in addition, a Langmuir-Hinshelwood kinetic equation was able to successfully describe ammonia generation, regardless of the NZVI dose, the ionic strength, and the initial pH. These results strongly indicate that nitrate reduction by NZVI is a heterogeneous catalytic reaction, and that the kinetic models can be used in diverse conditions. The kinetic parameters correlate well with the reaction condition, unless the NZVI dose was greatly increased or unless the NZVI surface was significantly changed at a very high initial pH.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Kyung Hee University, Korea Advanced Institute of Science & Technology
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Pages: 175-187
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Scopus rating (2015): SJR 0.321 SNIP 0.692 CiteScore 0.71
Scopus rating (2014): SJR 0.347 SNIP 0.919 CiteScore 0.8
Scopus rating (2013): SJR 0.342 SNIP 0.86 CiteScore 0.71
ISI indexed (2013): ISI indexed yes
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ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.176 SNIP 0.307
Original language: English
Land Use in LCIA: an absolute scale proposal for Biotic Production Potential

Environmental impacts caused by land occupation and transformation have been bypassed in many LCA studies due to soils’ multifunctionality and the interconnectedness between the ecosystem services they provide. These inherent modelling complexities have traditionally forced LCA practitioners to content with a mere quantification of Land Use (LU), as surface area and duration (in m² or ha and years) appropriated by humans, without further analysis of the impact pathways derived from those land uses. Milà i Canals established the first comprehensive, basic framework for taking soil quality aspect into LCIA that reached acceptance among the LCA community. Through contributions from UNEP-SETAC’s special task force on LU, great progress has ensued in developing further such LCIA. Building on the latest proposal by Koellner et al. and with the aim of bringing the Planetary Boundaries thinking into LCA, the present study proposes a single absolute scale for the midpoint impact category (MIC) of Biotic Production Potential (BPP). It is hypothesized that, for an ecosystem in equilibrium (where NPP equals decay), such an ecosystem has reached the maximum biotic throughput subject to site-specific conditions and no externally added inputs. The original ecosystem (or Potential Natural Vegetation) of a certain land gives then the maximum BPP with no additional, downstream or upstream, impacts. This Natural BPP is proposed as the maximum BPP in a hypothetical Absolute Scale for LCA’s Land Use framework. It is argued that this maximum BPP is Nature’s optimal solution through evolution-adaptation mechanisms, which provides the maximum matter throughput subject to the rest of environmental constraints (without further impacts). As a consequence, this scale rises a Land Use Optimality Point that suggests the existence of a limit regarding the maximization of divergent objectives with bioenergy. It will be attempted to model that beyond this point, and for the land available within a country, if the objective of Climate Change mitigation through bioenergy is further maximized, then the Fossil Fuel displacing objective will decrease, and vice versa.

General information
State: Published
Organisations: Department of Environmental Engineering, Atmospheric Environment, Department of Management Engineering, Quantitative Sustainability Assessment
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LCA of management strategies for RDF incineration and gasification bottom ash based on experimental leaching data

The main characteristics and environmental properties of the bottom ash (BA) generated from thermal treatment of waste may vary significantly depending on the type of waste and thermal technology employed. Thus, to ensure that the strategies selected for the management of these residues do not cause adverse environmental impacts, the specific properties of BA, in particular its leaching behavior, should be taken into account. This study focuses on the evaluation of potential environmental impacts associated with two different management options for BA from thermal treatment of Refuse Derived Fuel (RDF): landfilling and recycling as a filler for road sub bases. Two types of thermal treatment were considered: incineration and gasification. Potential environmental impacts were evaluated by life-cycle assessment (LCA) using the EASETECH model. Both non-toxicity related impact categories (i.e. global warming and mineral abiotic resource depletion) and toxic impact categories (i.e. human toxicity and ecotoxicity) were assessed. The system boundaries included BA transport from the incineration/gasification plants to the landfills and road construction sites, leaching of potentially toxic metals from the BA, the avoided extraction, crushing, transport and leaching of virgin raw materials for the road scenarios, and material and energy consumption for the construction of the landfills. To provide a quantitative assessment of the leaching properties of the two types of BA, experimental leaching data were used to estimate the potential release from each of the two types of residues. Specific attention was placed on the sensitivity of leaching properties and the determination of emissions by leaching, including: leaching data selection, material properties and assumptions related to emission modeling. The LCA results showed that for both types of BA, landfilling was associated with the highest environmental impacts in the non-toxicity related categories. For the toxicity related categories, the two types of residues behaved differently. For incineration BA the contribution of metal leaching to the total impacts had a dominant role, with the highest environmental loads resulting for the road scenario. For the gasification BA, the opposite result was obtained, due to the lower release of contaminants observed for this material compared to incineration BA. Based on the results of this study, it may be concluded that, depending on the type of BA considered, its leaching behavior may significantly affect the results of a LCA regarding its management strategies.
Legacy of a Chemical Factory Site: Contaminated Groundwater Impacts Stream Macroinvertebrates

Legislative and managing entities of EU member states face a comprehensive task because the chemical and ecological impacts of contaminated sites on surface waters must be assessed. The ecological assessment is further complicated by the low availability or, in some cases, absence of ecotoxicity data for many of the compounds occurring at contaminated sites. We studied the potential impact of a contaminated site, characterised by chlorinated solvents, sulfonamides, and barbiturates, on benthic macroinvertebrates in a receiving stream. Most of these compounds are characterised by low or unknown ecotoxicity, but they are continuously discharged into the stream by way of a long-lasting source generating long-term chronic exposure of the stream biota. Our results show that taxonomical density and diversity of especially sediment dwelling taxa were reduced by [50% at the sampling sites situated in the primary inflow zone of the contaminated GW. Moreover, macroinvertebrate communities at these sampling sites could be distinguished from those at upstream control sites and sites situated along a downstream dilution gradient using multidimensional scaling. Importantly, macroinvertebrate indices currently used did not identify this impairment, thus underpinning an urgent need for developing suitable tools for the assessment of ecological effects of contaminated sites in streams.

General information
State: Published
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Scopus rating (2015): SJR 0.821 SNIP 0.867 CiteScore 1.99
BFI (2014): BFI-level 1
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BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.986 SNIP 1.031 CiteScore 2.16
Life cycle assessment as development and decision support tool for wastewater resource recovery technology

Life cycle assessment (LCA) has been increasingly used in the field of wastewater treatment where the focus has been to identify environmental trade-offs of current technologies. In a novel approach, we use LCA to support early stage research and development of a biochemical system for wastewater resource recovery. The freshwater and nutrient content of wastewater are recognized as potential valuable resources that can be recovered for beneficial reuse. Both recovery and reuse are intended to address existing environmental concerns, for example, water scarcity and use of non-renewable phosphorus. However, the resource recovery may come at the cost of unintended environmental impacts. One promising recovery system, referred to as TRENs, consists of an enhanced biological phosphorus removal and recovery system (EBP2R) connected to a photobioreactor. Based on a simulation of a full-scale nutrient and water recovery system in its potential operating environment, we assess the potential environmental impacts of such a system using the EASETECH model. In the simulation, recovered water and nutrients are used in scenarios of agricultural irrigation-fertilization and aquifer recharge. In these scenarios, TRENs reduces global warming up to 15% and marine eutrophication impacts up to 9% compared to conventional treatment. This is due to the recovery and reuse of nutrient resources, primarily nitrogen. The key environmental concerns obtained through the LCA are linked to increased human toxicity impacts from the chosen end use of wastewater recovery products. The toxicity impacts are from both heavy metals release associated with land application of recovered nutrients and production of AlCl3, which is required for advanced wastewater treatment prior to aquifer recharge. Perturbation analysis of the LCA pinpointed nutrient substitution and heavy metals content of algae biofertilizer as critical areas for further research if the performance of nutrient recovery systems such as TRENs is to be better characterized. Our study provides valuable feedback to the TRENs developers and identifies the importance of system expansion to include impacts outside the immediate nutrient recovery system itself. The study also show for the first time the successful evaluation of urban-to-agricultural water systems in EASETECH.
Life cycle assessment modelling considering impurities in recyclable materials

**General information**

- **State:** Published
- **Organisations:** Department of Environmental Engineering, Residual Resource Engineering
- **Authors:** Faraca, G. (Intern), Damgaard, A. (Intern), Boldrin, A. (Intern), Astrup, T. F. (Intern)
- **Number of pages:** 1
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- **Main Research Area:** Technical/natural sciences

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Life cycle assessment of capital goods in waste management systems

The environmental importance of capital goods (trucks, buildings, equipment, etc.) was quantified by LCA modelling 1 tonne of waste treated in five different waste management scenarios. The scenarios involved a 240L collection bin, a 16m³ collection truck, a composting plant, an anaerobic digestion plant, an incinerator and a landfill site. The contribution of capital goods to the overall environmental aspects of managing the waste was significant but varied greatly depending on the technology and the impact category: Global Warming: 1-17%, Stratospheric Ozone Depletion: 2-90%, Ionising Radiation, Human Health: 2-91%, Photochemical Ozone Formation: 2-56%, Freshwater Eutrophication: 0.05-99%, Marine Eutrophication: 0.03-8%, Terrestrial Acidification: 2-13%, Terrestrial Eutrophication: 1-8%, Particulate Matter: 11-26%, Human Toxicity, Cancer Effect: 10-92%, Human Toxicity, non-Cancer Effect: 1-71%, Freshwater Ecotoxicity: 3-58%, Depletion of Abiotic Resources - Fossil: 1-31% and Depletion of Abiotic Resources - Elements (Reserve base): 74-99%.

The single most important contribution by capital goods was made by the high use of steel. Environmental impacts from capital goods are more significant for treatment facilities than for the collection and transportation of waste and for the landfilling of waste. It is concluded that the environmental impacts of capital goods should always be included in the LCA modelling of waste management, unless the only impact category considered is Global Warming.

**General information**

- **State:** Published
- **Organisations:** Department of Environmental Engineering, Residual Resource Engineering
- **Authors:** Brogaard, L. K. (Intern), Christensen, T. H. (Intern)
- **Pages:** 561-574
- **Publication date:** 2016
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**Publication information**

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- **Volume:** 56
Life Cycle Assessment of Cloudburst Management Plans in Adaptation to Climate Change in Copenhagen, Denmark

Expected increases in pluvial flooding, due to climatic changes, require large investments in the retrofitting of cities to keep damage at an acceptable level. Many cities have investigated the possibility of implementing stormwater management (SWM) systems which are multi-functional and consist of different elements interacting to achieve desired safety levels. Typically, an economic assessment is carried out in the planning phase, while environmental sustainability is given little or no attention. In this paper, life cycle assessment is used to quantify environmental impacts of climate change adaptation strategies. The approach is tested using a climate change adaptation strategy for a catchment in Copenhagen, Denmark.

A stormwater management system, using green infrastructure and local retention measures in combination with planned routing of stormwater on the surfaces to manage runoff, is compared to a traditional, sub-surface approach. Flood safety levels based on the Three Points Approach are defined as the functional unit to ensure comparability between systems. The adaptation plan has significantly lower impacts (3-18 person equivalents/year) than the traditional alternative (14-103 person equivalents/year) in all analysed impact categories. The main impacts are caused by managing rain events with return periods between 0.2 and 10 years. The impacts of handling smaller events with a return period of up to 0.2 years and extreme events with a return period of up to 100 years are lower in both alternatives. The uncertainty analysis shows the advantages of conducting an environmental assessment in the early stages of the planning process, when the design can still be optimised, but it also highlights the importance of detailed and site-specific data.
Life cycle assessment of stormwater management systems for Nørrebro, Copenhagen

General information
Life-Cycle Costing of Food Waste Management in Denmark: Importance of Indirect Effects

Prevention has been suggested as the preferred food waste management solution compared to alternatives such as conversion to animal fodder or to energy. In this study we used societal life-cycle costing, as a welfare economic assessment, and environmental life-cycle costing, as a financial assessment combined with life-cycle assessment, to evaluate food waste management. Both life-cycle costing assessments included direct and indirect effects. The latter are related to income effects, accounting for the marginal consumption induced when alternative scenarios lead to different household expenses, and the land-use-changes effect, associated with food production. The results highlighted that prevention, while providing the highest welfare gains as more services/goods could be consumed with the same income, could also incur the highest environmental impacts if the monetary savings from unpurchased food commodities were spent on goods/services with a more environmentally damaging production than that of the (prevented) food. This was not the case when savings were used, e.g., for health care, education, and insurances. This study demonstrates that income effects, although uncertain, should be included whenever alternative scenarios incur different financial costs. Furthermore, it highlights that food prevention measures should not only demote the purchase of unconsumed food but also promote a low-impact use of the savings generated.
Limited recovery of soil microbial activity after transient exposure to gasoline vapors

During gasoline spills complex mixtures of toxic volatile organic compounds (VOCs) are released to terrestrial environments. Gasoline VOCs exert baseline toxicity (narcosis) and may thus broadly affect soil biota. We assessed the functional resilience (i.e. resistance and recovery of microbial functions) in soil microbial communities transiently exposed to gasoline vapors by passive dosing via headspace for 40 days followed by a recovery phase of 84 days. Chemical exposure was characterized with GC-MS, whereas microbial activity was monitored as soil respiration (CO2 release) and soil bacterial growth ([3H]leucine incorporation). Microbial activity was strongly stimulated and inhibited at low and high exposure levels, respectively. Microbial growth efficiency decreased with increasing exposure, but rebounded during the recovery phase for low-dose treatments. Although benzene, toluene, ethylbenzene and xylene (BTEX) concentrations decreased by 83-97% during the recovery phase, microbial activity in high-dose treatments did not recover and numbers of viable bacteria were 3-4 orders of magnitude lower than in control soil. Re-inoculation with active soil microorganisms failed to restore microbial activity indicating residual soil toxicity, which could not be attributed to BTEX, but rather to mixture toxicity of more persistent gasoline constituents or degradation products. Our results indicate a limited potential for
functional recovery of soil microbial communities after transient exposure to high, but environmentally relevant, levels of gasoline VOCs which therefore may compromise ecosystem services provided by microorganisms even after extensive soil VOC dissipation.
Linking algal growth inhibition to chemical activity: A tool for identifying excess toxicity

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Technical University of Denmark, University of Toronto, ARC Arnot Research & Consulting Inc.
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Pages: 285-285
Publication date: 2016

Linking climate change mitigation and coastal eutrophication management through biogas technology: Evidence from a new Danish bioenergy concept

The interest in sustainable bioenergy solutions has gained great importance in Europe due to the need to reduce GHG emissions and to meet environmental policy targets, not least for the protection of groundwater and surface water quality. In the Municipality of Solrød in Denmark, a novel bioenergy concept for anaerobic co-digestion of food industry residues, manure and beach-cast seaweed has been developed and tested in order to quantify the potential for synergies between climate change mitigation and coastal eutrophication management in the Køge Bay catchment. The biogas plant, currently under construction, was designed to handle an annual input of up to 200,000t of biomass based on four main fractions: pectin wastes, carrageenan wastes, manure and beach-cast seaweed. This paper describes how this bioenergy concept can contribute to strengthening the linkages between climate change mitigation strategies and Water Framework Directive (WFD) action planning. Our assessments of the projected biogas plant indicate an annual reduction of GHG emissions of approx. 40,000t CO2 equivalents, corresponding to approx. 1/3 of current total GHG emissions in the Municipality of Solrød. In addition, nitrogen and phosphorous loads to Køge Bay are estimated to be reduced by approx. 63tyr.-1 and 9tyr.-1, respectively, contributing to the achievement of more than 70% of the nutrient reduction target set for Køge Bay in the first WFD river basin management plan. This study shows that anaerobic co-digestion of the specific food industry residues, pig manure and beach-cast seaweed is feasible and that there is a very significant, cost-effective GHG and nutrient loading mitigation potential for this bioenergy concept. Our research demonstrates how an integrated planning process where considerations about the total environment are integrated into the design and decision processes can support the development of this kind of holistic bioenergy solutions.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Roskilde University, Aarhus University, DHI Denmark
Linking nitrifiers diversity to the flux of their key resources

General information
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Organisations: Department of Environmental Engineering, Water Technologies, Urban Water Systems
Authors: Diwan, V. (Intern), Smets, B. F. (Intern), Albrechtsen, H. (Intern), Dechesne, A. (Intern)
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Livscyklusscreening af affaldsforebygelse: Emballageaffald og bygge- og anlægsaffald

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Long-Term Emission Factors for Land Application of Treated Organic Municipal Waste

The agro-ecosystem model Daisy was used to explore the long-term fate of nitrogen (N) after land application of compost and digestate (based on source separated organic municipal solid waste (MSW)). The cumulative crop N yield response and emissions for mineral fertilizer (MF), anaerobically digested organic waste (MSW-D), and composted organic waste (MSW-C) were derived by fitting a linear mixed model to the outcomes of the simulations. The non-linearity of crop N yield responses and emission responses to increasing N fertilizer application was addressed by dividing these responses into high and low crop response conditions. The crop N yield response and five emission pathways (NO\textsubscript{3}\textsuperscript{−} leaching to groundwater, NO\textsubscript{3}\textsuperscript{−} and NH\textsubscript{4}\textsuperscript{+} loss to surface water, and NH\textsubscript{3} and N\textsubscript{2}O emissions into the atmosphere) were quantified as environmental inventory factors, which were calculated for both high and low response conditions. The crop N yield response cumulated over time from the application of N fertilizer almost levelled out for MF within 3 to 5 years after application, while it increased over a time period of 100 years for MSW-C. In addition, MSW-D showed features of both MF and MSW-C, a steep rise in crop N yield response due to high inorganic N content and a gradual increase thereafter, due to the slow mineralization of organic N. Overall, 52–69 % of N applied as MF was up-taken by plant biomass, while plant uptakes of 15–28 % by MSW-D and 19–29 % by MSW-C were measured under high response conditions. When the N fertilizer application rate exceeded the rate of plant uptake, the rate of N utilization dropped by 80–90 % for MF, albeit to lesser degree for MSW-D and MSW-C. The simulations showed that emissions to the environment from organic fertilizers took place over a longer time and omission of the longs-term effects could result in underestimated potential impacts to the environment. As well as the time scope of assessment, local conditions were determining the N emissions. For the N\textsubscript{2}O emission, there were very small differences between high and low response conditions for organic fertilizer. The N\textsubscript{2}O emission factors varied for 1.8–3.0 % for MSW-D and 1.7–5.1 % for MSW-C. For NO\textsubscript{3}\textsuperscript{−} leaching to groundwater, there were large differences between high and low response conditions. For high response conditions, the emission factors varied from 6 to 39, 17 to 68, and 9 to 59 of input N from the application of MF, MSW-D, and MSW-C, respectively. Under low response conditions, much higher leaching emission factors were estimated ranging from 21 to 61 % for MF, 20 to 73 % for MSW-D, and 11 to 66 % for MSW-C.

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Copenhagen
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Pages: 111-124
Publication date: 2016
Main Research Area: Technical/natural sciences
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LOTUS—Preparing Sentinel-3 SAR Altimetry Processing for Ocean and Land

The Sentinel-3 satellite mission with its SRAL instrumentation contains new features compared to the conventional radar altimeter mission that form the basis for new innovative scientific analyses of both ocean and inland water levels. To utilize the full potential of the new data source, new methods and processing chains need to be developed. Subsequently, new potential Copernicus products should be developed that utilize the improved along-track resolution over both the oceans and over land. The main objective of the LOTUS project is to prepare the scientific and operational use of data from Sentinels 3. Then new operational processing, validation and delivery mechanisms need to be developed and implemented for generating the new dynamic products. Finally, the take-up of the new Copernicus products by the value-adding sectors needs to be stimulated and demonstrated to ensure that they will be used for commercial activities. LOTUS will develop processing scheme for extracting high-resolution sea surface heights, wave heights and wind speeds from SAR mode data. Over land, the LOTUS will develop processing scheme for extracting high-resolution river and lake heights, soil moisture, and snow water equivalents. This presentation shows results based on analyses using CRYOSAT data and available S-3 data. Furthermore, new DEMO data sets are presented and examples of scientific impact demonstrated.
LOTUS—Preparing Sentinel-3 SAR Altimetry Processing for Ocean and Land

The Sentinel-3 satellite mission with its SRAL instrumentation contains new features compared to the conventional radar altimeter mission that form the basis for new innovative scientific analyses of both ocean and inland water levels. To utilize the full potential of the new data source, new methods and processing chains need to be developed. Subsequently, new potential Copernicus products should be developed that utilize the improved alongtrack resolution over both the oceans and over land. The main objective of the LOTUS project is to prepare the scientific and operational use of data from Sentinels 3. Then new operational processing, validation and delivery mechanisms need to be developed and implemented for generating the new dynamic products. Finally, the take-up of the new Copernicus products by the value-adding sectors needs to be stimulated and demonstrated to ensure that they will be used for commercial activities. LOTUS will develop processing scheme for extracting high-resolution sea surface heights, wave heights and wind speeds from SAR mode data. Over land, the LOTUS will develop processing scheme for extracting high-resolution river and lake heights, soil moisture, and snow water equivalents. This presentation shows results based on analyses using CRYOSAT data and available S-3 data. Furthermore, new DEMO data sets are presented and examples of scientific impact demonstrated.

General information

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Organisations: National Space Institute, Geodesy, Department of Environmental Engineering, Water Resources Engineering, STARLAB, Newcastle University, DHI Denmark, STARKAB, CLS
Authors: Knudsen, P. (Intern), Andersen, O. B. (Intern), Nielsen, K. (Intern), Stenseng, L. (Intern), Villadsen, H. (Intern), Pelloquin, C. (Ekstern), Moreno, L. (Ekstern), Berry, P. (Ekstern), Thibaut, P. (Ekstern), Moreau, T. (Ekstern), Bauer-Gottwein, P. (Intern), Madsen, H. (Ekstern), Petersen, O. (Ekstern)
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Low-sludge age EBPR process for resource recovery – microbial and biochemical process characterization

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Organisations: Department of Environmental Engineering, Water Technologies, Residual Resource Engineering, Technical University of Denmark
Authors: Valverde Pérez, B. (Intern), Wagner, D. S. (Intern), Lóránt, B. (Ekstern), Gülay, A. (Intern), Radovici, M. (Ekstern), Angelidaki, I. (Intern), Smets, B. F. (Intern), Plósz, B. G. (Intern)
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Målerdata kan gemme på gratis informationer for forsyningerne: Et case studie fra Halsnæs Forsyning baseret på højopløste måledata

General information
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Organisations: Department of Environmental Engineering, Urban Water Systems, NIRAS A/S
Authors: Kirstein, J. K. (Intern), Borup, M. (Intern), Rygaard, M. (Intern), Hegh, K. (Ekstern)
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Management of source-separated organic household waste intended for anaerobic digestion

Driven by the Waste Management Directive and the Renewable Energy Directive, the biological treatment of organic household waste, such as food waste from kitchens, now needs to be undertaken by European Union member countries. Anaerobic digestion (AD), which allows for the utilisation of both energy (biogas production) and nutrients (through the agricultural use of digestion residue) is commonly suggested as the best way forward in this regard. The common practice of acquiring organic waste from other waste involves introducing sorting guidelines to citizens, with the corresponding material fractions included in these procedures, followed by the separate collection of source-separated organic household waste (SSOHW).

A main topic related to the implementation of this scheme on a large scale is feedstock characterisation. This is important for system optimisation regarding both technical performance, e.g. by predicting methane production and the amount of residue, and also the environmental profile, e.g. by assessing the environmental value of impact contributions when substituting fossil energy and mineral fertilisers. SSOHW is known as a highly heterogeneous waste stream, and thus its characterisation is not an easy task.

SSOHW is also accompanied by non-biodegradable impurities in the collected waste fractions. This issue is usually addressed through the physical pre-treatment of SSOHW, at which stage it is desirable to reject the maximum amount of non-biodegradable impurities while minimising biodegradable matter loss. Several well-established technologies, each with its own advantages and disadvantages, are known, and these sit alongside newly emerging solutions. To ensure the environmental sustainability of the waste management sector when implementing the AD of SSOHW, it is important that the process has a better environmental profile than the alternative treatment being displaced, in this case incineration. When comparing AD to incineration, climate change effects indicated by global warming potential (GWP) from a life cycle assessment (LCA) perspective can be used as criteria.

The overall aim of this PhD study is to provide background data for the environmental assessment of a wide range of AD of SSOHW implementations in Europe. To achieve this aim, three specific objectives were formulated regarding waste characterisation, physical pre-treatment and European framework conditions:

• Characterise individual material fractions present in Danish SSOHW pertinent to their biochemical methane potential and other parameters of importance for AD treatment.
• Describe the technologies currently available for the physical pre-treatment of SSOHW prior to AD in Scandinavian countries, and provide the necessary data required to include them in LCA SSOHW management models.
• Determine the framework conditions that will ensure the best AD of SSOHW performance when considering climate change.

Waste characterisations for all EU member states, as well as descriptions of all available pre-treatment technologies, were not possible to detail within the scope of the present PhD thesis. Therefore, waste characterisation was limited to Denmark, and only Scandinavian pre-treatment technologies were included, but it is assumed that the data, to some extent, can be used to describe more general European conditions if country-specific data are unavailable. Regarding the first objective, hand-sorting of SSOHW in a Danish municipality (where the source separation of organic household waste has been implemented) was performed, desirable material fractions sampled and a range of laboratory investigations performed. The material fractions covered were: animal food waste (AFW), vegetable food waste (VF), kitchen tissue (KT), vegetation waste (VW), moulded fibres (MF), animal straw (AS), dirty paper (DP) and dirty cardboard (DC).

For the second objective, a thorough assessment of a new pre-treatment technology in Denmark was followed by making a comparison to alternative pre-treatment technologies in Scandinavian countries. For the technology assessment, the material flow analysis principle was used, in that the technology process was described and LCA inventory data were generated. Amongst existing pre-treatment technologies, the screw press-, disc screen- and dispersion-based processes were represented by data from the literature.

The last objective was addressed through two LCA studies. The first assessed climate change effects associated with the AD of SSOHW compared to incineration, by concentrating on individual material fractions, and the second assessed the climate change effects of optimising the AD of SSOHW at the pre-treatment stage of the life cycle. Based on this work, the following results were achieved:

• Using the GWP criterion only one material fraction – VFW – was always better for AD compared to incineration. For AFW, KT, VW and DP, performance with AD was better unless it was compared to a highly efficient incinerator. Material fractions such as MF and DC were attractive for AD, albeit only when AD with CHP and incineration with mainly heat production were compared. AS was always better to incinerate.

• In Denmark, food waste (both animal- and vegetable-derived) and kitchen tissue were the main material fractions allowing GWP mitigation with AD when it was compared to incineration, while the inclusion of other material fractions with SSOHW sorting guidelines was of less importance.

• The new pre-treatment technology introduced in the present thesis is a promising solution for pre-treating SSOHW prior to AD, and it had advantages over the screw press-, disc screen- and dispersion-based pre-treatment technologies.

• Any change in pre-treatment efficiency, such as ± 10% material recovered from the biomass, does not affect the net GWP of the AD of SSOHW significantly, meaning that other aspects, e.g. economy, practicality or other environmental aspects of relevance, might be used as guidance when selecting the technology for practical use.

This study provides a systematic approach for assessment of contaminants in materials for recycling. Paper recycling is used as an illustrative example. Three selected chemicals, bisphenol A (BPA), diethylhexyl phthalate (DEHP) and mineral oil hydrocarbons (MOHs), are evaluated within the paper cycle. The approach combines static material flow analysis (MFA) with dynamic material and substance flow modeling. The results indicate that phasing out of chemicals is the most effective measure for reducing chemical contamination. However, this scenario was also associated with a considerable lag phase (between approximately one and three decades) before the presence of chemicals in paper products could be considered insignificant. While improved decontamination may appear to be an effective way of minimizing chemicals in products, this may also result in lower production yields. Optimized waste material source-segregation and collection was the least effective strategy for reducing chemical contamination, if the overall recycling rates should be maintained at the current level (approximately 70% for Europe). The study provides a consistent approach for evaluating contaminant levels in material cycles. The results clearly indicate that mass-based recycling targets are not sufficient to ensure high quality material recycling.

General information

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Organisations: Department of Environmental Engineering, Residual Resource Engineering, Vienna University of Technology
Authors: Pivnenko, K. (Intern), Laner, D. (Ekstern), Astrup, T. F. (Intern)
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Main Research Area: Technical/natural sciences
Measuring community-wide conjugative plasmid permissiveness

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Authors: Smets, B. F. (Intern), Klümper, U. (Intern), Dechesne, A. (Intern), Riber, L. (Ekstern), Brandt, K. K. (Ekstern), Gülay, A. (Intern), Sørensen, S. J. (Ekstern)
Number of pages: 1
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Publication date: 2016
Meeting the Needs for Released Nanomaterials Required for Further Testing—The SUN Approach

The analysis of the potential risks of engineered nanomaterials (ENM) has so far been almost exclusively focused on the pristine, as-produced particles. However, when considering a life-cycle perspective, it is clear that ENM released from genuine products during manufacturing, use, and disposal is far more relevant. Research on the release of materials from nanoproducts is growing and the next necessary step is to investigate the behavior and effects of these released materials in the environment and on humans. Therefore, sufficient amounts of released materials need to be available for further testing. In addition, ENM-free reference materials are needed since many processes not only release ENM but also nanosized fragments from the ENM-containing matrix that may interfere with further tests. The SUN consortium (Project on "Sustainable Nanotechnologies", EU seventh Framework funding) uses methods to characterize and quantify nanomaterials released from composite samples that are exposed to environmental stressors. Here we describe an approach to provide materials in hundreds of gram quantities mimicking actual released materials from coatings and polymer nanocomposites by producing what is called “fragmented products” (FP). These FP can further be exposed to environmental conditions (e.g., humidity, light) to produce “weathered fragmented products” (WFP) or can be subjected to a further size fractionation to isolate “sieved fragmented products” (SFP) that are representative for inhalation studies. In this perspective we describe the approach, and the used methods to obtain released materials in amounts large enough to be suitable for further fate and (eco)toxicity testing. We present a case study (nanoparticulate organic pigment in polypropylene) to show exemplarily the procedures used to produce the FP. We present some characterization data of the
FP and discuss critically the further potential and the usefulness of the approach we developed.

**General information**

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Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 2  
Scopus rating (2011): SJR 3.18 SNIP 1.945 CiteScore 5.16  
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Web of Science (2011): Indexed yes  
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BFI (2008): BFI-level 2  
Scopus rating (2008): SJR 2.96 SNIP 1.935  
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Scopus rating (2007): SJR 2.774 SNIP 1.914
Mesophilic and thermophilic alkaline fermentation of waste activated sludge for hydrogen production: Focusing on homoacetogenesis

The present study compared the mesophilic and thermophilic alkaline fermentation of waste activated sludge (WAS) for hydrogen production with focus on homoacetogenesis, which mediated the consumption of H2 and CO2 for acetate production. Batch experiments showed that hydrogen yield of WAS increased from 19.2 mL H2/gVSS at 37 °C and pH 10–80.1 mL H2/gVSS at 55 °C and pH 10. However, the production of volatile fatty acids (mainly acetate) was higher at 37 °C and pH 10 by comparison with 55 °C and pH 10. Hydrogen consumption due to homoacetogenesis was observed at 37 °C and pH 10 but not 55 °C and pH 10. Higher expression levels of genes relating with homoacetogenesis and lower expression levels of genes relating with hydrogen production were found at 37 °C and pH 10 compared to 55 °C and pH 10. The continuous experiment demonstrated the steady-state hydrogen yield of WAS was comparable to that obtained from batch experiments at 55 °C and pH 10, and homoacetogenesis was still inhibited. However, the steady-state hydrogen yield of WAS (6.5 mL H2/gVSS) was much lower than that (19.2 mL H2/gVSS) obtained from batch experiments at 37 °C and pH 10 due to the gradual enrichment of homoacetogens as demonstrated by qPCR analysis. The high-throughput sequencing analysis of 16S rRNA genes showed that the abundance of genus Clostridium, containing several homoacetogens, was 5 times higher at 37 °C and pH 10 than 55 °C and pH 10.

General information

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Organisations: Department of Environmental Engineering, Residual Resource Engineering, Fudan University
Authors: Wan, J. (Ekstern), Jing, Y. (Ekstern), Zhang, S. (Ekstern), Angelidaki, I. (Intern), Luo, G. (Ekstern)
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Main Research Area: Technical/natural sciences
Metagenomic analysis and functional characterization of the biogas microbiome using high throughput shotgun sequencing and a novel binning strategy

Biogas production is an economically attractive technology that has gained momentum worldwide over the past years. Biogas is produced by a biologically mediated process, widely known as "anaerobic digestion." This process is performed by a specialized and complex microbial community, in which different members have distinct roles in the establishment of a collective organization. Deciphering the complex microbial community engaged in this process is interesting both for unraveling the network of bacterial interactions and for applicability potential to the derived knowledge. In this study, we dissect the bioma involved in anaerobic digestion by means of high throughput Illumina sequencing (~51 gigabases of sequence data), disclosing nearly one million genes and extracting 106 microbial genomes by a novel strategy combining two binning processes. Microbial phylogeny and putative taxonomy performed using >400 proteins revealed that the biogas community is a trove of new species. A new approach based on functional properties as per network representation was developed to assign roles to the microbial species. The organization of the anaerobic digestion microbiome is resembled by a funnel concept, in which the microbial consortium presents a progressive functional specialization while reaching the final step of the process (i.e., methanogenesis). Key microbial genomes encoding enzymes involved in specific metabolic pathways, such as carbohydrates utilization, fatty acids degradation, amino acids fermentation, and syntrophic acetate oxidation, were identified. Additionally, the analysis identified a new uncultured archaeon that was putatively related to Methanomassiliicoccales but surprisingly having a methylotrophic methanogenic pathway. This study is a pioneer research on the phylogenetic and functional characterization of the microbial community populating biogas reactors. By applying for the first time high-throughput sequencing and a novel binning strategy, the identified genes were anchored to single genomes providing a clear understanding of their metabolic pathways and highlighting their involvement in anaerobic digestion. The overall research established a reference catalog of biogas microbial genomes that will greatly simplify future genomic studies.

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Organisations: Department of Environmental Engineering, Residual Resource Engineering, University of Padua
Authors: Campanaro, S. (Ekstern), Treu, L. (Intern), Kougias, P. (Intern), De Francisci, D. (Intern), Valle, G. (Ekstern), Angelidaki, I. (Intern)
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Scopus rating (2014): SJR 2.49 SNIP 1.792 CiteScore 5.86
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ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Rapid gravity sand filtration is a drinking water production technology widely used around the world. Microbially catalyzed processes dominate the oxidative transformation of ammonia, reduced manganese and iron, methane and hydrogen sulfide, which may all be present at millimolar concentrations when groundwater is the source water. In this study, six metagenomes from various locations within a groundwater-fed rapid sand filter (RSF) were analyzed. The community gene catalog contained most genes of the nitrogen cycle, with particular abundance in genes of the nitrification pathway. Genes involved in different carbon fixation pathways were also abundant, with the reverse tricarboxylic acid cycle pathway most abundant, consistent with an observed Nitrospira dominance. From the metagenomic data set, 14 near-complete genomes were reconstructed and functionally characterized. On the basis of their genetic content, a metabolic and geochemical model was proposed. The organisms represented by draft genomes had the capability to oxidize ammonium, nitrite, hydrogen sulfide, methane, potentially iron and manganese as well as to assimilate organic compounds. A composite Nitrospira genome was recovered, and amo-containing Nitrospira genome contigs were identified. This finding, together with the high Nitrospira abundance, and the abundance of atypical amo and hao genes, suggests the potential for complete ammonium oxidation by Nitrospira, and a major role of Nitrospira in the investigated RSFs and potentially other nitrifying environments.
Metagenomics and single-cell genomics reveal high abundance of comammox Nitrospira in a rapid gravity sand filter treating groundwater

The recent discovery of complete ammonia oxidizing (comammox) Nitrospira has revealed that the metabolic division of labor in nitrification is not obligate as was assumed during the last century. Despite the detection and enrichment of comammox Nitrospira from different nitrifying environments, the ecological relevance of comammox remains unknown. In this study, we analyzed the microbial communities from various locations within a groundwater-fed rapid sand filter (RSF), where Nitrospira were at very high relative abundances. Through metagenomics, a highly abundant composite multi-genome of Nitrospira genus was recovered harboring metabolic capacity for complete ammonia oxidation. We developed a cell extraction strategy that enables the disruption of Nitrospira cell clusters attached to the mineral coating of the sand. Individual cells were identified via fluorescent in situ hybridization (FISH) with Nitrospira-specific 16S rRNA probes and sorted via fluorescence-activated cell sorting (FACS). Sorted cells were screened and selected Nitrospira spp. were subject to whole-genome sequencing. The single cell genomes confirmed the genomic presence of a complete ammonia oxidation pathway and revealed clear taxonomic differences with the recently described comammox Nitrospira genomes. The high abundance of comammox Nitrospira spp. together with the low abundance of canonical ammonia oxidizing prokaryotes in the investigated RSF system suggests the essential role of this novel comammox Nitrospira in the RSFs and potentially other nitrifying environments.

General information
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Methane Production and Kinetic Modeling for Co-digestion of Manure with Lignocellulosic Residues

Anaerobic digestion (AD) of animal manure and lignocellulosic residues is gaining increased interest as a result of their wide availability, optimum physicochemical characteristics, high methane potential, and absence of conflict with the human food chain compared to energy crops. The aim of this study was to assess the biomethanation process of two lignocellulosic substrates, wheat straw (WS) and meadow grass (MG), with cattle manure (CM) under thermophilic (53°C) conditions, focusing on nutrient availability in the reaction mixtures, along with C/N ratios. Results showed, with the use of 50% WS on an organic matter basis in the feedstock and substitution of the rest of the volatile solids (VS) component share between CM and MG (25:75, 50:50, and 75:25), the methane yield can be increased by 20-24% compared to WS mono-digestion, with a methane production rate of 27, 23, and 22 N mL of CH₄ g⁻¹ of VS day⁻¹, respectively. Moreover, the positive effects of coupled biological reactions in the reaction mixture of co-digestion were explained using the synergistic effect value (η). The η value was calculated using estimated and experimental methane yields. Furthermore, in MG co-digestion, where 75% VS originated from MG and the rest was distributed as a 25:75 mixture of CM and WS, a 14% enhancement in the methane yield was shown in comparison to MG mono-digestion, with the maximum methane production rate of 25 N mL of CH₄ g⁻¹ of VS day⁻¹ in batch experiments. Finally, the best co-digestion results with the highest methane yield (up to 25%) and lowest lag phase (6-7 days) were achieved when 75% organic matter originated from CM. The combination presenting the above-mentioned increase in the methane yield also showed a methane production rate of 22 N mL of CH₄ g⁻¹ of VS day⁻¹. It was concluded that increasing the MG share in co-digestion improves the feedstock digestibility and also gives the higher methane production rate. In contrast, a high WS share increases the lag phase and is a detriment to the biodegradability. Finally, through co-digestion of two lignocellulosic substrates of different physicochemical characteristics with CM, the overall biodegradability compared to single-substrate digestion is improved and the methane yield is enhanced.
Methane production from formate, acetate and H$_2$/CO$_2$: focusing on kinetics and microbial characterization

For evaluating the methanogenesis from typical methanogenic precursors (formate, acetate and H$_2$/CO$_2$), CH$_4$ production kinetics were investigated at 37 +/- 1 degrees C in batch anaerobic digestion tests and stimulated by modified Gompertz model. The results showed that maximum methanation rate from formate, acetate and H$_2$/CO$_2$ were 19.58 +/- 0.49, 42.65 +/- 1.17 and 314.64 +/- 3.58 N mL/gVS/d in digested manure system and 6.53 +/- 0.31, 132.04 +/- 3.96 and 640.16 +/- 19.92 N mL/gVS/d in sewage sludge system during second generation incubation. Meanwhile the model could not fit well in granular sludge system, while the rate of formate methanation was faster than from H$_2$/CO$_2$ and acetate. Considering both the kinetic results and microbial assay we could conclude that H$_2$/CO$_2$ methanation was the fastest methanogenic step in digested manure and sewage sludge system, while the rate of formate methanation was faster than from H$_2$/CO$_2$ and acetate. Considering both the kinetic results and microbial assay we could conclude that H$_2$/CO$_2$ methanation was the fastest methanogenic step in digested manure and sewage sludge system with Methanomicrobiales as dominant methanogens, while granular sludge with Methanobacteriales as dominant methanogens contributed to the fastest formate methanation.

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<td>Web of Science (2003): Indexed yes</td>
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Methodological considerations for using umu assay to assess photo-genotoxicity of engineered nanoparticles

In this study we investigated the feasibility of high-throughput (96-well plate) umu assay to test the genotoxic effect of TiO₂ engineered nanoparticles (ENPs) under UV light (full spectrum) and visible light (455nm). Exposure of TiO₂ ENPs to up to 60min of UV light induced a photocatalytic production of ROS. However, UV light itself caused cytotoxic damage to Salmonella typhimurium at exposures >15min and a genotoxic effect at exposures >0.5min; and use of UV filters did not lower this effect. No genotoxicity of TiO₂ ENPs was observed under visible light conditions at concentrations up to 100μg/mL; or under dark conditions at concentrations up to 667μg/mL, though cytotoxicity was seen at the higher concentrations. Additionally, the growth factor calculation was influenced by a shading effect due to ENPs, and was corrected by considering the pre-incubation OD readings of Plate B. Recommendations provided in this paper, as well as investigation of the effect of the light sources should be considered when using the umu assay to quantify the photo-genotoxicity of engineered nanomaterials.
Methodologies for managing the Energy-Water-Food nexus at different scales

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Microbes in biological processes for municipal landfill leachate treatment: Community, function and interaction
Landfill leachate (LFL) contains high strength of ammonium and complex organic substances including biodegradable volatile fatty acids (VFAs), refractory aquatic humic substances (AHS) and micro-scale xenobiotic organic chemicals (XOCs), which promotes the diverse microbial community in LFL treatment bioreactors. These microbes cooperate to remove nitrogen, biodegrade organic matters, eliminate the toxicity of XOCs and produce energy. In these diverse
microbes, some show dominant in the bioreactor and are prevalent in many kinds of LFL treatment bio-processes, such as Brocadia from the phylum of Planctomycetes, Nitrosomonas sp., the phylum of Proteobacteria, Bacteroidetes and Firmicutes. The bioreactor's operational parameters influence the microbial community, inversely affect the bioreactor's performance. It is practical to accumulate desirable microbes by managing the bioreactor's running condition. High ammonium loading, low DO (<2 mg l⁻¹) and optimal pH value are the practical way to accumulate the desirable AOB and realize the partial nitrification. Nitrite and organic matters inhibit the anaerobic ammonium oxidation bacteria (AnAOB). In anaerobic LFL treatment bioreactors, Methanosaeta and Methanosarcina can outcompete sulfur reducing bacteria and homoacetogens to be the dominant Archaea. Nitrite oxidizing bacteria (NOB), heterotrophic denitrifying bacteria and AnAOB compete nitrite and influenced each other. How to manage NOB, heterotrophic denitrifying bacteria and AnAOB in good cooperation condition is still an issue and need further study.

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Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 0.879 SNIP 1.381 CiteScore 2.53
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.876 SNIP 1.453 CiteScore 2.51
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.989 SNIP 1.274 CiteScore 2.31
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.917 SNIP 1.365 CiteScore 2.34
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.009 SNIP 1.299
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.113 SNIP 1.372
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.657 SNIP 1.144
Scopus rating (2007): SJR 0.629 SNIP 1.027
Microbial and biochemical process characterization of a low-sludge age EBPR process for resource recovery

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Residual Resource Engineering, Technical University of Denmark
Authors: Valverde Pérez, B. (Intern), Wágner, D. S. (Intern), Lóránt, B. (Ekstern), Gülay, A. (Intern), Radovici, M. (Ekstern), Angelidaki, I. (Intern), Smets, B. F. (Intern), Plósz, B. G. (Intern)
Number of pages: 1
Publication date: 2016
Event: Poster session presented at MEWE and biofilms IWA specialist conference, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
MEWE_EBPR.pdf

Microbial biodiversity enhances micropollutants biotransformation in Moving Bed Biofilm Reactors (MBBR) with controlled biofilm thickness

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Environmental Chemistry, AnoxKaldnes AB
Authors: Torresi, E. (Intern), Fowler, J. (Intern), Polesel, F. (Intern), Smets, B. F. (Intern), Andersen, H. R. (Intern), Christensson, M. (Ekstern), Plósz, B. G. (Intern)
Number of pages: 1
Publication date: 2016
Event: Abstract from International Conference on Emerging Contaminants (EmCon2016) and Micropolllutants (WiOw2016) in the Environment, Sydney, Australia.
Main Research Area: Technical/natural sciences
Electronic versions:
Abstract_Z_carriers_Elena_Torresi.pdf
Microbial challenges – contamination and aftergrowth

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Authors: Albrechtsen, H. (Intern)
Number of pages: 9
Publication date: 2016

Microbial electrochemical monitoring of volatile fatty acids during anaerobic digestion
Volatile fatty acid (VFA) concentration is known as an important indicator to control and optimize anaerobic digestion (AD) process. In this study, an innovative VFA biosensor was developed based on the principle of a microbial desalination cell. The correlation between current densities and VFA concentrations was firstly evaluated with synthetic digestate. Two linear relationships were observed between current densities and VFA levels from 1 to 30 mM (0.04 to 8.50 mA/m², R²=0.97) and then from 30 to 200 mM (8.50 to 10.80 mA/m², R²=0.95). The detection range was much broader than that of other existing VFA biosensors. The biosensor had no response to protein and lipid which are frequently found along with VFAs in organic waste streams from AD, suggesting the selective detection of VFAs. The current displayed different responses to VFA levels when different ionic strengths and external resistances were applied, though linear relationships were always observed. Finally, the biosensor was further explored with real AD effluents and the results did not show significance differences with those measured by GC. The simple and efficient biosensor showed promising potential for online, inexpensive and reliable measurement of VFA levels during AD and other anaerobic processes.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Jin, X. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
Pages: 4422-4429
Publication date: 2016
Main Research Area: Technical/natural sciences

Publishing information
Journal: Environmental Science & Technology (Washington)
Volume: 50
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 2.535 SNIP 1.941 CiteScore 6.58
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.26 SJR 2.559 SNIP 1.902
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.546 SNIP 1.838 CiteScore 5.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.777 SNIP 2.003 CiteScore 5.5
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.952 SNIP 2.102 CiteScore 5.52
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.115 SNIP 2.043 CiteScore 5.17
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.18 SNIP 1.945 CiteScore 5.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.979 SNIP 1.726
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.86 SNIP 1.809
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.96 SNIP 1.935
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.774 SNIP 1.914
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.55 SNIP 1.893
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.608 SNIP 1.999
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.86 SNIP 2.046
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.54 SNIP 2.065
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 2.392 SNIP 1.949
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.387 SNIP 1.968
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 3.03 SNIP 2.315
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 3.367 SNIP 2.351
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Publication: Research - peer-review › Journal article – Annual report year: 2016

Microbial Electrochemical Systems and Technologies: It Is Time To Report the Capital Costs

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Zhang, Y. (Intern), Angelidaki, I. (Intern)
Microbial electrosynthesis of hydrogen peroxide in microbial reverse-electrodialysis electrolysis cell

Microbial reverse-electrodialysis electrolysis cell (MREC) as a novel type of microbial electrochemical technologies has been proposed to produce H2 and CH4. In this study, we developed MREC to produce the strong oxidant H2O2. In the MREC, electrical potential generated by the exoelectrogens and the salinity-gradient between sea water and river water were utilized to drive the high-rate H2O2 production without external power supply. Operational parameters such as air flow rate, pH, cathodic potential, flow rate of high and low concentration solution were investigated. The optimal H2O2 production were observed at high and low concentration solution flow rate of 0.5 mL/min, air flow rate of 8-20 mL/min, cathode potential of -0.485 ± 0.025 V (vs Ag/AgCl). Under the optimal conditions, the maximum H2O2 yield of 778 ± 11 mg/L could be obtained. Cathode potential was found as the key factor for H2O2 production, which can be controlled through adjusting the air flow rate without power supply and potentiostat. This study shows for the first time high yield synthesis of H2O2 from oxygen reduction in a microbial electrochemical system without external power supply.

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Li, X. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
Pages: 33-33
Publication date: 2016

Host publication information
Title of host publication: Book of abstracts: The 3rd European meeting of the international society for microbial electrochemistry and technology (EU-ISMET 2016)
Place of publication: Rome, Italy
Editors: Aulenta, F., Majone, M.
Main Research Area: Technical/natural sciences
Conference: 3rd European Meeting of the International Society for Microbial Electrochemistry and Technology (EU-ISMET 2016), Rome, Italy, 26/09/2016 - 26/09/2016
Electronic versions: Book_of_Abstracts_PDF.pdf
Source: PublicationPreSubmission
Source-ID: 126283368
Publication: Research › peer-review › Conference abstract in proceedings – Annual report year: 2016

Microbial granulation for lactic acid production

This work investigated the formation of microbial granules to boost the productivity of lactic acid (LA). The flocculated form of LA-producing microbial consortium, dominated by Lactobacillus sp. (91.5% of total sequence), was initially obtained in a continuous stirred-tank reactor (CSTR), which was fed with 2% glucose and operated at a hydraulic retention time (HRT) of 12h and pH 5.0±0.1 under a thermophilic condition (50°C). The mixed liquor in the CSTR was then transferred to an up-flow anaerobic sludge blanket reactor (UASB). The fermentation performance and granulation process were monitored with a gradual decrease of HRT from 8.0 to 0.17h, corresponding to an increase in the substrate loading from 60 to 2,880 g glucose L−1d−1. As the operation continued, the accumulation of biomass in the UASB was clearly observed, which changed from flocculent to granular form with decrease in HRT. Up to the HRT decrease to 0.5h, the LA concentration was maintained at 19-20 g L−1 with over 90% of substrate removal efficiency. However, further decrease of HRT resulted in a decrease of LA concentration with increase in residual glucose. Nevertheless, the volumetric LA productivity continuously increased, reaching 67 g L-fermenter−1h−1 at HRT 0.17h. The size of LA-producing granules and hydrophobicity gradually increased with decrease in HRT, reaching 6.0mm and 60%, respectively. These biogranules were also found to have high settling velocities and low porosities, ranging 2.69-4.73 cm s−1 and 0.39-0.92, respectively. This article is protected by copyright. All rights reserved.
Microbial granulation management: Simple changes in reactor operation enable control of granular properties and the engineering of microbial communities in wastewater applications

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: Blum, J. (Intern)
Pages: 82-82
Publication date: 2016

Host publication information
Title of host publication: The Danish Microbiological Society Annual Congress 2016: Programme & Abstracts
Place of publication: Copenhagen
Publisher: American Society for Microbiology
Article number: P70
Main Research Area: Technical/natural sciences
Conference: Danish Microbiological Society Annual Congress 2016, Copenhagen, Denmark, 14/11/2016 - 14/11/2016
Electronic versions:
Programme & Abstracts book
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

Microbial turnover of PAH: analysis of degradation and dissolution kinetics and simulation of remediation options

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Technical University of Munich, Helmholtz Centre for Environmental Research
Authors: Rein, A. (Ekstern), Adam, I. (Ekstern), Miltner, A. (Ekstern), Brumme, K. (Ekstern), Kästner, M. (Ekstern), Trapp, S. (Intern)
Pages: 314-314
Publication date: 2016

Host publication information
Title of host publication: SETAC Europe 26th Annual Meeting - abstract book
Place of publication: Nantes, France
Publisher: SETAC Europe
Main Research Area: Technical/natural sciences
Conference: SETAC Europe 26th Annual Meeting, Nantes, France, 22/05/2016 - 22/05/2016
Electronic versions:
SETAC_Europe_Abstractbook_Nantes.pdf
Microscale In Vitro Assays for the Investigation of Neutral Red Retention and Ethoxyresorufin-O-Deethylase of Biofuels and Fossil Fuels

Only few information on the potential toxic effectiveness of biofuels are available. Due to increasing worldwide demand for energy and fuels during the past decades, biofuels are considered as a promising alternative for fossil fuels in the transport sector. Hence, more information on their hazard potentials are required to understand the toxicological impact of biofuels on the environment. In the German Cluster of Excellence “Tailor-made Fuels from Biomass” design processes for economical, sustainable and environmentally friendly biofuels are investigated. In an unique and interdisciplinary approach, ecotoxicological methods are applied to gain information on potential adverse environmental effects of biofuels at an early phase of their development. In the present study, three potential biofuels, ethyl levulinate, 2-methyltetrahydrofuran and 2-methylfuran were tested. Furthermore, we investigated a fossil gasoline fuel, a fossil diesel fuel and an established biodiesel. Two in vitro bioassays, one for assessing cytotoxicity and one for aryl hydrocarbon receptor agonism, so called dioxin-like activity, as measured by Ethoxyresorufin-O-Deethylase, were applied using the permanent fish liver cell line RTL-W1 (Oncorhynchus mykiss). The special properties of these fuel samples required modifications of the test design. Points that had to be addressed were high substance volatility, material compatibility and low solubility. For testing of gasoline, diesel and biodiesel, water accommodated fractions and a passive dosing approach were tested to address the high hydrophobicity and low solubility of these complex mixtures. Further work has to focus on an improvement of the chemical analyses of the fuel samples to allow a better comparison of any effects of fossil fuels and biofuels.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, RWTH Aachen University
Authors: Heger, S. (Ekstern), Bluhm, K. (Ekstern), Brendt, J. (Ekstern), Mayer, P. (Intern), Anders, N. (Ekstern), Schäffer, A. (Ekstern), Seiler, T. (Ekstern), Hollert, H. (Ekstern)
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SJR 1.164 SNIP 1.111 CiteScore 3.01
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.11 SJR 1.236 SNIP 1.101
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.427 SNIP 1.136 CiteScore 3.32
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.559 SNIP 1.148 CiteScore 3.54
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.772 SNIP 1.153 CiteScore 3.94
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.982 SNIP 1.156 CiteScore 4.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Mikrobiologisk risikovurdering af øgede temperaturer i grundvandet ved ATES (Aquifer Thermal Energy Storage)

General information
State: Published
Authors: Tønder, M. M. (Intern), Christensen, S. C. B. (Intern), Larsen, S. L. (Intern), Albrechtsen, H. (Intern), Boe-Hansen, R. (Ekstern), Niemi Sørensen, S. (Ekstern)
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Electronic versions: mikrobiel_risikovurdering_af_ates_anlaeg.pdf
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Publication: Research › Report – Annual report year: 2016

Miljøpåvirkninger og afværgeforanstaltninger ifm. skifergasproduktion

General information
State: Published
Authors: Hansen, S. F. (Intern), Johnsen, A. R. (Ekstern), Jensen, P. N. (Ekstern)
Pages: 9-9
Publication date: 2016

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Title of host publication: Videnskabelig udredning af international viden om skifergas relateret til en dansk kontekst : DTU, GEUS, DCE
Publisher: Aarhus Universitet, GEUS og Danmarks Tekniske Universitet
Model-based integration of enantiomer and stable isotope fractionation for chiral pesticides degradation

Modeling contaminant plumes in fractured limestone aquifers

Determining the fate and transport of contaminant plumes from contaminated sites in limestone aquifers is important because they are a major drinking water resource. This is challenging because they are often heavily fractured and contain chert layers and nodules, resulting in a complex transport behavior. Improved conceptual models are needed for this type of site. Here conceptual models are developed by combining numerical models with field data. Several types of fracture flow and transport models are available for the modeling of contaminant transport in fractured media. These include the established approaches of the equivalent porous medium, discrete fracture and dual continuum models. However, these modeling concepts are not well tested for contaminant plume migration in limestone geologies. Our goal was to develop and evaluate approaches for modeling the transport of dissolved contaminant plumes in fractured limestone aquifers in 3D and to test methods for determining the required flow and transport parameters.

The models were compared for a contaminated site in Denmark, where a plume of dissolved PCE has migrated through a fractured limestone aquifer. Numerical modeling was used in the planning of field tests and to update the conceptual model in an iterative process. Field data includes information on spill history, distribution of the contaminant (multilevel sampling), geology and hydrogeology. To describe the geology and fracture system, data from borehole logs, packer tests, optical televiewers and cores was combined with an analysis of local heterogeneities and data from analogous sites.

A combined pump and tracer test was performed at the site with simultaneous contaminant sampling to determine flow and transport parameters of the fractures and matrix, and to quantify the contaminant distribution in the aquifer. Different models were used for the planning and interpretation of the pump and tracer test.

The models were evaluated by examining their ability to describe collected field data. The comparison with data showed that the models have substantially different representations of the contaminant behavior, with different consequences for evaluation of contaminant risk and potential remediation strategies. For instance, the fractured aquifer means that tracer tests result in fast breakthroughs, while larger scale plume transport is much slower. On the plume scale, the equivalent porous medium model and the dual-porosity model can reproduce the main features of the plume at a given time. However, small-scale fracture-matrix interactions such as diffusion of contaminant into the matrix result in non-linear plume speeds, and these cannot be represented with an equivalent-porous medium model. The paper concludes with recommendations on how to identify and employ suitable models to advance the conceptual understanding and as decision support tools for risk assessment and the planning of remedial actions.
Modeling multicomponent ionic transport in groundwater with IPhreeqc coupling: Electrostatic interactions and geochemical reactions in homogeneous and heterogeneous domains

The key role of small-scale processes like molecular diffusion and electrochemical migration has been increasingly recognized in multicomponent reactive transport in saturated porous media. In this study, we propose a two-dimensional multicomponent reactive transport model taking into account the electrostatic interactions during transport of charged ions in physically and chemically heterogeneous porous media. The modeling approach is based on the local charge balance and on the description of compound-specific and spatially variable diffusive/dispersive fluxes. The multicomponent ionic transport code is coupled with the geochemical code PHREEQC-3 by utilizing the IPhreeqc module, thus enabling to perform the geochemical calculations included in the PHREEQC's reaction package. The multicomponent reactive transport code is benchmarked with different 1-D and 2-D transport problems. Successively, conservative and reactive transport examples are presented to demonstrate the capability of the proposed model to simulate transport of charged species in heterogeneous porous media with spatially variable physical and chemical properties. The results reveal that the Coulombic cross-coupling between dispersive fluxes can significantly influence conservative as well as reactive transport of charged species both at the laboratory and at the field scale.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, University of Tubingen
Authors: Muniruzzaman, M. (Ekstern), Rolle, M. (Intern)
Pages: 1-15
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Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 1.561 SJR 1.551 CiteScore 3.49
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.53 SJR 2.202 SNIP 2.036
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.24 SNIP 2.062 CiteScore 4.31
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.951 SNIP 1.951 CiteScore 3.66
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.432 SNIP 1.748 CiteScore 3.03
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.567 SNIP 1.743 CiteScore 2.81
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.614 SNIP 1.714 CiteScore 2.84
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.712 SNIP 1.466
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.866 SNIP 1.639
Organic compounds are produced in vast quantities for industrial and agricultural use, as well as for human and animal healthcare [1]. These chemicals and their metabolites are frequently detected at trace levels in fresh water environments, such as groundwater systems, and are referred to as organic micropollutants. Degradation of various organic micropollutants occurs via different reaction pathways. Compound specific stable isotope analysis (CSIA) is a valuable tool to characterize different degradation pathways of these contaminants in different aquatic systems and under different environmental conditions. Recent advances in analytical techniques have promoted the fast development and implementation of multi-element CSIA. However, quantitative frameworks to evaluate multi-element stable isotope data and incorporating mechanistic information on the transformation of different organic contaminants [2,3] are still lacking. In this study we propose an integrated modeling approach to simultaneously predict concentration as well as bulk and position-specific multi-element isotope evolution during the transformation of organic micropollutants [4]. The model simulates position-specific isotopologues explicitly incorporating the atoms that experience isotope effects. Thus, it provides a mechanistic description of isotope fractionation occurring at specific molecular positions. We apply the proposed approach to interpret the data available for three selected organic micropollutants: dichlorobenzamide (BAM), isoproturon (IPU) and diclofenac (DCF). The model successfully reproduces the multi-element isotope data, and precisely captures the dual element isotope trends, characterizing the different degradation pathways. Besides illustrating the model capability of mechanistic evaluation of experimental observations, we also show its potential as a predictive and design tool to explore transformation pathways in micropollutants degradation scenarios for which position-specific isotope data are not (yet) available.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering
Authors: Jin, B. (Intern), Rolle, M. (Intern)
Number of pages: 1
Publication date: 2016
Event: Abstract from 9th International Association of Hydrological Sciences (IAHS) Groundwater Quality Conference (GQ16), Shenzhen, China.
Main Research Area: Technical/natural sciences
Electronic versions:
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Source: PublicationPreSubmission
Source-ID: 127769267
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016
Modelling and control of nitrogen and phosphorus removing systems

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, University of Bergen
Authors: Balbarini, N. (Intern), Boon, W. M. (Ekstern), Bjerg, P. L. (Intern), Nordbotten, J. M. (Ekstern), Binning, P. J. (Intern)
Number of pages: 1

Modelling free surface aquifers to analyze the interaction between groundwater and sinuous streams
Several mathematical methods for modelling free surface aquifers are available. Aquifer-stream interaction is an important application of these models, and are challenging to simulate because stream interaction is described by a highly variable head boundary, which can cause numerical instabilities and errors. In addition, when streams are sinuous, groundwater flow is truly 3-dimensional, with strong vertical flows and sharp changes in horizontal direction. Here 3 different approaches to simulating free surface aquifers are compared for simulating groundwater-stream interaction. The aim of the models was to investigate the effect of meander bends on the spatial and temporal variability of aquifer-stream interaction, and to develop a new 3D conceptual model of groundwater-stream interaction.

Three mathematical methods were tested, representing the three main methods available for modeling 3D unconfined aquifers: a saturated-unsaturated flow model, moving mesh, and a new coordinate transformation. The saturated/unsaturated model couples the saturated groundwater flow equation with a solution of Richards equation. The moving mesh solves the saturated groundwater equation with a free surface and deformable numerical finite element mesh. Finally, the new coordinate transform method employs a coordinate transform so that the saturated groundwater flow equation is solved on a fixed finite element mesh with a stationary free surface.

This paper describes in detail the new coordinate transform method. It employs a transformation of the vertical coordinate, so that the top surface remains stationary. The transformation introduces non-linearities into the saturated groundwater flow equation, with the hydraulic conductivity becoming a function of the head at the top boundary. Mathematical analysis is then applied to show well posedness, and provide stability and linear convergence results. Numerical results confirm the mathematical analysis.

The three methods were compared for a simplified 2-dimensional test case with highly variable stream flow boundaries. Results showed that all methods can properly simulate the groundwater head under steady-state and transient conditions. The coordinate transformation method was the least computationally demanding method, requiring 6 times less simulation time than the saturated-unsaturated and moving mesh flow models. The methods were then compared for a more challenging 3-dimensional problem. Results showed that the coordinate transformation method required 41 times less computational effort than the moving mesh.
The coordinate transformation method was then applied to simulate a field site located at Grindsted stream, Denmark. In order to investigate the importance of stream geometry for the problem, two scenarios were implemented: straight stream and a meandering stream. The model was compared to field data to verify results.

The model was shown to properly simulate groundwater head variability measured at piezometers and discharge to the stream as measured by heat flux, point velocity probes and flux meters. The results from the straight stream scenario and the meandering stream scenario showed that meander bends strongly affect groundwater-discharge to the stream: the discharge is focused at the outward pointing side of the meander bends. Similarly, the groundwater flow paths toward the stream are affected by the stream meanders. Shallow groundwater enters the meander from the outward-pointing side of the bend, while deep groundwater flows beneath the stream and enters the stream from the opposite side. On the basis of these results, a new three-dimensional conceptual model of groundwater-stream interaction is proposed. The new conceptual model demonstrates that conventional two-dimensional symmetric groundwater streamflow conceptual models do not apply for real meandering streams.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Resources Engineering, University of Bergen
Authors: Balbarini, N. (Intern), Boon, W. M. (Ekstern), Bjerg, P. L. (Intern), Nordbotten, J. M. (Ekstern), Binning, P. J. (Intern)
Number of pages: 1
Modelling Illicit Drug Fate in Sewers for Wastewater-Based Epidemiology

With increasing consumption of illicit drugs, in particular cocaine and cannabis, in recent decades, the negative social and public health impact has also propagated. Following drug consumption and human metabolism, fractions of unchanged parent drugs and metabolites are excreted into toilets. After transport in sewers, these chemicals enter wastewater treatment plants (WWTPs). Monitoring campaigns are normally performed at WWTP influent to collect representative samples. Following quantitative chemical analysis, measured drug loads are used to estimate population-normalized parent drug consumption based on a candidate biomarker (the parent drug itself or one of the human metabolites). This approach has gained increasing attention in the past decade and is termed wastewater-based epidemiology. It has been shown that this emerging approach can improve and complement survey-based methods.

Sewer systems can be considered as biological reactors, in which the concentration of organic chemicals present in wastewater can be impacted by in-sewer processes during hydraulic residence time. Illicit drug biomarkers, as trace organic chemicals in the range of nanograms to micrograms per liter, are subject to physical, chemical or biological processes in sewers (fate processes). The occurrence of these processes may lead to significant change of drug loads at WWTP influent compared to source release points. Therefore, not accounting for these variations may negatively affect drug use estimates. However, due to a lack of sufficient evidence on potential in-sewer sorption and transformation of drug biomarkers, these processes are often neglected by wastewater-based epidemiologists. The motivation of this thesis was to overcome this substantial knowledge gap by: (i) providing new evidence on sorption and transformation of drug biomarkers in raw wastewater and sewer biofilms; and (ii) developing modelling tools – by combining and extending existing modelling frameworks – to predict such processes. To achieve this goal, a substantial part of this thesis was dedicated to the experimental assessment and modelling of in-sewer processes by means of laboratory scale studies under the conditions representative to sewer systems. Eventually, the prediction of in-sewer processes at the catchment level was carried out and back-calculation of drug consumption was performed using measured data from a monitoring campaign.

Overall, the methodology used in this thesis combined different aspects, namely: (i) optimal experimental design; (ii) mathematical formulation of processes; (iii) model calibration; (iv) uncertainty analysis and model parameters identifiability; (v) model validation; and (vi) model application for back-calculation at catchment level. In this thesis, 16 drug biomarkers were selected based on their ubiquitous occurrence in wastewater, and include cocaine, mephedrone, methadone, heroin, codeine and tetrahydrocannabinol (THC) and their respective major human metabolites.

In-sewer processes, namely, sorption and transformation of these chemicals were assessed in raw wastewater (suspended biomass) and sewer biofilms in targeted batch experiments. These experiments were conducted under aerobic and anaerobic conditions. Annular rotating biofilm reactors were used to simulate shear conditions prevailing in sewers and were operated over 14 months. Abiotic transformation (e.g., hydrolysis) was also evaluated using mineral water and sorption to suspended solids and biofilms were additionally assessed. Overall, two sets of experiments were performed and used for model calibration and model validation purposes. To predict the fate of drug biomarkers in raw wastewater, simultaneous evaluation and modelling of substrate utilization and microbial growth processes was performed. It was hypothesized that active biomass dynamics during batch experiments (due to high substrate availability and significant microbial growth) can significantly impact the prediction of biotransformation rates. For this purpose, the Wastewater Aerobic/anaerobic Transformations in Sewers (WATS) model was combined with the Activated Sludge Model for Xenobiotics (ASM-X) to predict the fate of drug biomarkers together with the primary metabolic processes. Two new processes were considered, namely sorption-desorption to reactor wall and abiotic transformation. As for sewer biofilms, the extended ASM-X model was further modified by accounting for diffusive mass transfer limitation of biomarkers from the bulk phase into the biofilms and within the biofilm matrix.

Selected model parameters were estimated with the Bayesian optimization method DREAM(ZS). A calibration methodology was developed with focus on uncertainty propagation among model parameters, e.g., from abiotic transformation rates to biotransformation rates. Subsequently, uncertainty analysis was performed to assess the impact of variability of model parameters on model output. Moreover, different transformation pathways were tested for the selected biomarkers and new pathways were identified based on mass balance, uncertainty analysis, and feasibility of transformations (according to an existing pathway database). Results from the experimental and modelling assessment indicated that by ignoring primary metabolic processes in raw wastewater would impose significant overestimation (up to 385%) of transformation rates under aerobic conditions, whereas no difference was found under anaerobic conditions. Abiotic transformation processes were the dominant removal mechanism for many of the selected chemicals (e.g., cocaine: 80-100%, batch experiments with raw wastewater) under both aerobic and anaerobic conditions. Several biomarkers underwent substantial biotransformation e.g., almost complete removal of heroin and morphine-3-glucuronide after 12 h in batch experiments with raw wastewater. It was further observed that sewer biofilms can enhance biotransformation of a number of selected chemicals, such as benzoylcegonine and 6-monacetylmorphine. Overall, redox conditions were found to have an influence on biotransformation rates (especially for methadone) and, to a lesser extent,
on abiotic transformation rates. Only a few chemicals, such as 11-hydroxy-THC, were found to sorb onto suspended solids and sewer biofilms. Validation of calibrated models with an independent dataset was successful for most compounds, the main exception being methadone under aerobic conditions. To demonstrate the impact of in-sewer processes on estimation of daily drug use at catchment level, a generic scenario analysis was performed to assess the uncertainties associated with in-sewer processes and sampling. It was found that ignoring in-sewer processes for cocaine and its metabolite benzylecgonine can add up to 11% (median value for a large catchment) error in daily cocaine consumption estimates. This error was 43% and 11% for estimates of daily heroin use with 6-monoacetylmorphine and morphine as candidate biomarkers, respectively. In contrary, sampling error (flow-proportional sampling mode) was the highest in the smallest catchment – up to 17% for cocaine. Subsequently, measured cocaine and benzylecgonine loads from a 2-week monitoring campaign at the Lynetten WWTP influent (Copenhagen, Denmark) was used to estimate cocaine consumption in two upstream catchments by accounting for in-sewer fate processes. Significant differences in consumption trends were observed between weekdays, weekends, holidays and a street music festival. On average, twice as high cocaine consumption was found during festival period as compared to normal weekdays. Wastewater-based epidemiology is a truly interdisciplinary approach in which engineering tools, including models developed and tested in this thesis, can be beneficial for the accurate estimation of drug consumption in urban areas.

**General information**

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Organisations: Department of Environmental Engineering, Water Technologies, Urban Water Systems
Authors: Ramin, P. (Intern), Plósz, B. G. (Intern), Mikkelsen, P. S. (Intern)
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Original language: English
Main Research Area: Technical/natural sciences

**Modelling of two-stage WWT systems: a faster road towards resource recovery**

**General information**

State: Published
Organisations: Department of Environmental Engineering, Water Technologies
Authors: De Mulder, C. (Ekstern), Balemans, S. (Ekstern), Jimenez, J. (Ekstern), Regmi, P. (Ekstern), De Clippeleir, H. (Ekstern), Valverde Pérez, B. (Intern), Bott, C. (Ekstern), Miller, M. (Ekstern), Klaus, S. (Ekstern), Nopens, I. (Ekstern)
Number of pages: 3
Publication date: 2016
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**Modelling the Fate of Xenobiotic Trace Chemicals via Wastewater Treatment and Agricultural Resource Reuse**

As a result of widespread human activities, pharmaceuticals and biocides are ubiquitously present at trace levels in the environment. Large amounts of these substances, also identified as xenobiotic trace chemicals (XTCs), are released daily from: (i) households and healthcare facilities, following human consumption and disposal; (ii) husbandry and other analogous facilities, following veterinary consumption; and (iii) industrial facilities. A significant fraction of these emissions reaches municipal wastewater treatment plants (WWTPs), where XTCs undergo incomplete removal partly due to WWTP design limitations. These chemicals are thus eventually released to the environment, e.g. in freshwater bodies receiving WWTP effluents, representing a threat to living organisms. WWTPs have been generally identified as a major point source of XTC emissions to the environment. Nevertheless, due to the high number of marketed and consumed chemicals, and to the uncertainties associated to sampling and analytical methodologies, quantifying the elimination of XTCs during wastewater treatment still remains a challenge. Developing
robust modelling tools to predict the fate of XTCs in WWTPs can help overcoming this challenge. However, in-depth understanding of mechanisms and processes, determining XTCs removal during wastewater treatment, is still required. This PhD thesis aimed at filling knowledge gaps in the field of XTC fate modelling during and beyond wastewater treatment. We aimed at improving the comprehension of XTC fate, and thus the predictive capabilities of fate models: (i) at process scale, with a focus on sorption and biological transformation of XTCs in biological treatment systems; (ii) in full-scale WWTPs, assessing the impact of retransformation and WWTP operation on XTC elimination; and (iii) in integrated WWTP-agricultural systems. Different modelling tools, suiting the specific purposes of our investigations, were developed, extended and/or innovatively applied. Fate models used as reference in this thesis include: the Activated Sludge Modelling framework for Xenobiotics (ASM-X); the generic WWTP model SimpleTreat Activity; and the dynamic soil-plant model for fate prediction in agricultural systems.

Experimental and model-based observations were combined to assess sorption of ionizable XTCs onto activated sludge and XTC biotransformation in moving bed biofilm reactors (MBBRs). Most XTCs are in fact multispecies chemicals, being present in neutral and/or ionized form in wastewater. We demonstrated that pH conditions and, to a lesser extent, iron salt dosing for chemical phosphorus removal can significantly affect solid-liquid partitioning of the zwitterionic antibiotic ciprofloxacin onto activated sludge. Electrostatic interactions and complexation are thus dominating sorption mechanisms. Under a range of pH, redox and iron salt dosing conditions, non-linear sorption (n=0.62–1.33) was observed. Extensions to traditional partitioning models were accordingly proposed for ciprofloxacin and other zwitterionic XTCs, accounting for: (i) high non-linearity of XTC sorption; or (ii) ionization with changing pH and different sorption potential of ionized species. Furthermore, XTCs are typically present in ng L\(^{-1}\) to µg L\(^{-1}\) concentrations in wastewater, being referred to as non-growth substrates, and their biological degradation can be associated with microbial growth processes. In this PhD thesis, we assessed the influence of primary metabolic processes on XTC biotransformation in MBBR biofilm. Our investigation was performed by comparing biotransformation kinetics in pre-denitrifying MBBRs operated in single-stage and three-stage configurations. The latter configuration produced a prolonged biofilm exposure to organic electron donor (COD) loading and complexity tiered by segregated and integrated biofilm reactors, which significantly influenced kinetics of heterotrophic denitrification and XTC biotransformation. Biotransformation rate constants for a number of non-recalcitrant XTCs were found correlated to the denitrification potential of MBBR biofilm, suggesting that XTC degradation occurred via microbial co-metabolism. In addition, enhanced biotransformation kinetics was shown for a number of XTCs (sulfamethoxazole, erythromycin, atenolol) as compared to previous findings for conventional activated sludge. A number of factors have been described to influence the elimination of XTCs in full-scale WWTPs. Specifically, relevant impact was attributed to (i) solid residence time (SRT), at which biological treatment is operated; and (ii) the formation of conjugates, which can undergo biotic retransformation to parent chemicals. In this PhD thesis, we specifically assessed the influence of retransformation processes and SRT on the fate of sulfamethoxazole in full-scale WWTPs. A methodology based on the comparison of ASM-X predictions and literature data was used. We demonstrated that the impact of retransformation during secondary wastewater treatment is determined by: (i) the size of WWTP catchments, with major in-sewer retransformation expected in large catchments; (ii) the type of catchment (hospital or urban catchment). This evidence accordingly suggests an integrated approach to XTC fate assessment in wastewater systems (sewer networks and WWTPs). Furthermore, improved elimination of sulfamethoxazole was found and predicted in WWTPs operated at SRT greater than 16 d. Beyond this critical SRT, enhanced biotransformation kinetics may occur due to the enrichment of slow-growing organisms (e.g., specialist degraders) or mixed substrate utilization strategies. This finding supported our experimental evidence of enhanced sulfamethoxazole biotransformation kinetics in denitrifying MBBRs.

As a result of incomplete biodegradation in WWTPs, XTCs persist in effluents and sewage sludge. Reuse of municipal biosolids and treated wastewater or use of freshwater for agricultural purposes eventually leads to XTC uptake into food crops. In this PhD thesis, we developed and tested a generic simulation tool to predict the fate of XTCs from consumption, through wastewater treatment and eventually to the uptake by winter wheat for a number of geographical scenarios in the European Union. The tool combined was specifically addressed for fate prediction of ionizable XTCs (the biocide triclosan, the diuretic furosemide and the antibiotic ciprofloxacin). Furosemide was found rather persistent to wastewater treatment (removal efficiency ≤ 40%) and to further undergo significant accumulation in wheat. Uptake of furosemide was predicted to increase (+20% of emissions to soil) when emissions to the soil-plant system occurred via freshwater irrigation, as compared to soil amendment with biosolids. Due to the scarce availability of experimental data, our model predictions indicate the need of deepening investigations of XTC fate in agricultural systems. Accumulation in food crops may result in indirect human exposure to XTCs via dietary intake, which can be eventually estimated using model predictions. The presented simulation tool can thus be used for pre-screening and priority setting of chemicals, and to explore the impact of additional XTC emission pathways (e.g., manure application, irrigation with reclaimed WWTP effluent) in terms of food crop accumulation.

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Environmental Chemistry
Authors: Polesel, F. (Intern), Plósz, B. G. (Intern), Trapp, S. (Intern), Andersen, H. R. (Intern)
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Place of publication: Kgs. Lyngby
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Modelling the impact of Water Sensitive Urban Design technologies on the urban water cycle

Alternative stormwater management approaches for urban developments, also called Water Sensitive Urban Design (WSUD), are increasingly being adopted with the aims of providing flood control, flow management, water quality improvements and opportunities to harvest stormwater for non-potable uses. WSUD structures (WSUDs) are typically small, decentralized systems for managing stormwater runoff near the source. These systems interact with the urban hydrological cycle, modifying the evapotranspiration, runoff and groundwater recharge fluxes. It is challenging to quantify these hydrological changes because of the cost and complexity of modelling multiple WSUD systems in larger scale urban catchments. For this reason, new modelling tools are needed. These tools must be simple enough to be computationally efficient, while still describing the observed hydrological responses of urban catchments. The models must be able to simulate both the response of single WSUDs and many coupled WSUDs in an urban catchment.

This thesis aims to develop new models of two WSUD technologies: green roofs and infiltration trenches/soakaways. In particular the thesis has the following objectives:

1. To identify and develop new models of green roofs and infiltration devices relevant for urban drainage applications, and integrate them into urban hydrological models.
2. To quantify the long term hydrological performance of green roofs and infiltration devices using a statistical analysis of WSUD performance.
3. To model the interaction of infiltration based WSUDs with groundwater.
4. To assess a new combination of different WSUD techniques for improved stormwater management.
5. To model the impact of a widespread implementation of multiple soakaway systems at the catchment scale.
6. Test the models by simulating observed data describing the performance of single WSUD units, and the performance of multiple systems at a catchment scale.

To address these aims, new models of green roofs and soakaways are developed and tested using observations from several urban catchments. The models are used to quantify the hydrological performance of single devices relevant for urban drainage applications. Moreover, the coupling of soakaway and detention storages is also modeled to analyze the benefits of combining different local stormwater management systems.

These models are then integrated into urban drainage network models and groundwater models in order to analyze the impact of stormwater infiltration and local detention on drainage networks and groundwater flows. Detention in isolation and infiltration trenches and green roofs significantly reduce annual stormwater runoff. Annual runoff from green roofs is 43-68% of the incoming rainfall and 0-62% for soakaways. Peak flow and volume reductions during single events are also quantified as a function of the return period.

Using a part of a soakaway as detention storage significantly improves its ability to reduce single event peak runoff without significant changes to its annual performance. Peak flow and annual runoff reductions are quantified for different soakaway and detention volume combinations. These systems also avoid problems of sewer network surcharge in a small catchment during a 10 year return period event. The thesis quantifies the hydrological performance of infiltration devices interacting with groundwater. A threshold distance between infiltration devices and groundwater is estimated in order to classify whether infiltration devices are affected by groundwater or not. The threshold distance is determined as function of the soil hydraulic conductivity and the storage volume of the infiltration device. For instance, it is shown that in clay soils, infiltration trenches must be more than 11-12m above the water table if they are to be fully effective.

Widespread stormwater infiltration leads to increased groundwater recharge and the risk of groundwater flooding in areas with shallow groundwater. The increased occurrence of groundwater seepage above terrain is quantified in a case study by a catchment hydrological model that is calibrated to observations. Moreover, the performance of existing stormwater infiltration systems is affected by landuse changes in other parts of their catchment. These changes were quantified for the case study by a model and observations over a 20 year period. It was shown that urbanization with widespread stormwater infiltration increased the risk of groundwater flooding.

WSUDs are useful technologies for controlling urban stormwater runoff and the models presented in this thesis can help by simulating their hydrological impact. Careful engineering design is required to ensure that optimal results are achieved and to avoid unexpected outcomes such as increased groundwater flooding.
Modificering af regnserier så de reflekterer et ændret klima

General information
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Organisations: Department of Environmental Engineering, Urban Water Systems, Rambøll Danmark A/S
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Modificering af regnserier så de reflekterer et ændret klima

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Monitorings af metanemission, vedligeholdelse af biocover og forventninger til stopkriterier

General information
State: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Scheutz, C. (Intern), Kjeldsen, P. (Intern)
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Monitoring of volatile fatty acids during anaerobic digestion using a microbial electrochemical sensor

Volatile fatty acid (VFA) concentration is known as an important indicator to control and optimize anaerobic digestion (AD) process. In this study, an innovative VFA biosensor was developed based on the principle of a microbial desalination cell. The bulk substrate was dosed into the middle chamber innovatively which was separated from the anode chamber by an anion exchange membrane. The detection range can be broadened as only part of the ionized VFAs can transport through the membrane and the biofilm can be protected from inhibitors and toxicants.

The correlation between current densities and VFA concentrations was firstly evaluated with synthetic digestate. Two linear relationships were observed between current densities and VFA levels from 1 to 30 mM (0.04±0.01 to 8.50±0.32 mA/m2, R²=0.97) and then from 30 to 200 mM (8.50±0.32 to 10.80±1.26 mA/m2, R²=0.95). The detection range was much broader than that of other existing VFA biosensors. The biosensor had no response to protein and lipid which are frequently found along with VFAs in organic waste streams from AD, suggesting the selective detection of VFAs. The current displayed different responses to VFA levels when different ionic strengths and external resistances were applied, though linear relationships were always observed. Finally, the biosensor was further explored with real AD effluents and the results did not show significant differences with those measured by GC. The simple and efficient biosensor showed promising potential for online, inexpensive and reliable measurement of VFA levels during AD and other anaerobic processes. The outcomes will expand the application of bio-electrochemical system application.

General information
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Organisations: Department of Environmental Engineering, Residual Resource Engineering
Authors: Jin, X. (Intern), Angelidaki, I. (Intern), Zhang, Y. (Intern)
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Multi-angular observations of vegetation indices from UAV cameras

Unmanned aerial vehicles (UAVs) are found as an alternative to the classical manned aerial photogrammetry, which can be used to obtain environmental data or as a complementary solution to other methods (Nex and Remondino, 2014). Although UAVs have coverage limitations, they have better resolution compared to satellites and aircrafts, they are cheaper and easy to handle, providing data in a short period of time (Mateos et al., 2015; Uysal, Toprak and Polat, 2015). Furthermore, they can be equipped with different types of payloads carrying various sensors such as a thermal and multispectral cameras (Berni et al., 2009), hyper spectral camera (Burkart et al., 2015) and photometric elevation mapping sensor (Shahbazi et al., 2015) among others. Therefore, UAVs can be used in many fields such as agriculture, forestry, archeology, environment and traffic monitoring (Nex and Remondino, 2014). In this study, the UAV used is a hexacopter s900 equipped with a Global Positioning System (GPS) and two cameras; a digital RGB photo camera and a multispectral camera (MCA), with a resolution of 5472 x 3648 pixels and 1280 x 1024 pixels, respectively. In terms of applications, traditional methods using vegetation indices from reflectance often assume Lambertian models (de Moura et al., 2015), where the light is reflected equally in all the directions (Mobley, 2014) and, therefore, multi-angular reflectance is not considered. However, differences in directional scattering (anisotropy) can provide important data about biophysical behavior in vegetation such as leaf area index (LAI), leaf angular distribution (LAD), vegetation water content, nitrogen and chlorophyll content (Tagesson et al., 2015), canopy roughness and others (de Moura et al., 2015). The Bidirectional Reflectance Distribution Function (BRDF) describes the surface reflectance changes depending on viewing geometry, usually used to analyze remote sensing data from satellite, airborne and surface platforms. (Singh et al., 2016). BRDF observations can also be obtained with the MCA camera located in the UAV. Thus, the aim of this study is to capture multi-angular observations in different forest locations (Søren and Riis) in Denmark by flying the UAV over the area of interest. Since the payload has a fix position, the viewing angles obtained due to the Field of view (FOV) of the MCA camera can be exploited and the flight pattern simulates some goniometer positions. This approach allows to measure different azimuth and zenith angles according to the sun position and to acquire different characteristics of vegetation depending on a specific time and amount of light.

General information

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Organisations: Department of Environmental Engineering, Water Resources Engineering, National Space Institute, Geodesy, Technical University of Denmark
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Nanoproducts – what is actually available to European consumers?

It remains unclear which kinds of nanoproducts are available on the European market, although this information is a prerequisite for any kind of exposure and risk assessment. In order to address this lack of information, we have established The Nanodatabase (http://www.nanodb.dk), which is an online inventory of products claimed by manufacturers to contain nanomaterials (NMs) or be based on nanotechnology. The database currently entails 2231 products. The database is unique and includes basic information about the product (name, NM used, location of NM, product category, etc.) as well as a safety evaluation of each individual product according to the NanoRiskCat-framework. Our analysis of products that are currently present in the database shows that most products fall into “personal care” and “clothing” categories (≥300), followed by “sporting goods” and “cleaning” (>200). Silver and titanium dioxide are the most used NMs, but it is not possible to identify the NMs used for almost 60% of the products in the database. The data analysis shows that for most product categories the dominant route of exposure is dermal, and that the exposure potential as well as human and environmental hazard potential of most products is either “high” or “unknown”. In order to address the current lack of reporting by manufacturers when it comes to nanoproducts, we recommend that it is made mandatory to disclose and report any nanomaterials used in a consumer product and it becomes illegal to advertise and market products as “nano” when they have no content of nanomaterials.

General information

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Organisations: Department of Environmental Engineering, Environmental Chemistry, Residual Resource Engineering
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Main Research Area: Technical/natural sciences

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Web of Science (2015): Indexed yes
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BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
Projects:

**Development of Aquaporin Inside (TM) technology for osmotic membrane bioreactors**

Department of Environmental Engineering  
Period: 01/06/2018 → 31/05/2021  
Number of participants: 4  
Phd Student:  
Sanahuja-Embuena, Victoria (Intern)  
Supervisor:  
Camilleri-Rumbau, Maria Salud (Ekstern)  
Trzaskus, Krzysztof Wojciech (Ekstern)  
Main Supervisor:  
Hélix-Nielsen, Claus (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Industrial PhD  
Project: PhD

**Exchange of gases and volatile compounds between groundwater and air**

Department of Environmental Engineering  
Period: 01/04/2018 → 31/03/2021  
Number of participants: 2  
Phd Student:  
Ahmadi, Navid (Intern)  
Main Supervisor:  
Rolle, Massimo (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

**Integrating system dynamics approaches to improve policy implementation for peri-urban water resources management**

Department of Environmental Engineering  
Period: 01/04/2018 → 31/03/2021  
Number of participants: 3  
Phd Student:  
Carnohan, Shane (Intern)  
Supervisor:  
McKnight, Ursula S. (Intern)  
Main Supervisor:  
Bjerg, Poul Legstrup (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD
Lake remediation by microbial fuel cells

Department of Environmental Engineering
Period: 01/02/2018 → 31/01/2021
Number of participants: 4
Phd Student:
Haxthausen, Karl Rasmus August (Intern)
Supervisor:
Gosewinkel, Ulrich Bay (Ekstern)
Zhang, Yifeng (Intern)
Main Supervisor:
Trapp, Stefan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Contaminant mass discharge of chlorinated solvents in clay tills: Concepts, quantification and risk assessment

Department of Environmental Engineering
Period: 01/01/2018 → 07/05/2021
Number of participants: 3
Phd Student:
Rosenberg, Louise (Intern)
Supervisor:
Broholm, Mette Martina (Intern)
Bjerg, Poul Legstrup (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Monitoring rivers and streams with unmanned aerial systems for determination of ecological status

Department of Environmental Engineering
Period: 01/01/2018 → 31/12/2020
Number of participants: 4
Phd Student:
Köppl, Christian Josef (Intern)
Supervisor:
Bauer-Gottwein, Peter (Intern)
McKnight, Ursula S. (Intern)
Main Supervisor:
Garcia, Monica (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Biological production of n-Hexanol

Department of Environmental Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 3
Phd Student:
Yang, Xiaoyong (Intern)
Diffuse radiation and temperature effects on crop water use efficiency

Department of Environmental Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 5
Phd Student:
Sobejano Paz, Veronica (Intern)
Supervisor:
Bauer-Gottwein, Peter (Intern)
Liu, Suxia (Ekstern)
Mo, Xingguo (Ekstern)
Main Supervisor:
Garcia, Monica (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Ecology of antibiotic resistance genes and mobile genetic elements in microbial communities of the urban water system

Department of Environmental Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 3
Phd Student:
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Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Ecology of antibiotic resistance genes and mobile genetic elements in microbial communities of the urban water system

Department of Environmental Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 3
Phd Student:
Parchen, Camiel (Ekstern)
Supervisor:
Dechesne, Arnaud (Intern)
Main Supervisor:
Smets, Barth F. (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD
Hydraulic Modelling and data assimilation for deep urban tunnel systems
Department of Environmental Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 4
PhD Student:
Palmitessa, Rocco (Intern)
Supervisor:
Borup, Morten (Intern)
Law, Adrian Wing Keung (Ekstern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Microbial electrochemistry meet UV: For effektive degradation of organic matter
Department of Environmental Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 3
PhD Student:
Zou, Rusen (Intern)
Supervisor:
Zhang, Yifeng (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Planning Tools for Stormwater Pollution Management
Department of Environmental Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 4
PhD Student:
Jensen, Ditte Marie Reinholdt (Intern)
Supervisor:
Vezzaro, Luca (Intern)
Vezzaro, Luca (Intern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Sustainability Assessment of Residual Biomass Resource Management
Department of Environmental Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 3
PhD Student:
Albizzati, Paola Federica (Intern)
Supervisor:
Tonini, Davide (Intern)
Main Supervisor:
Astrup, Thomas Frueergaard (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

**Leak detection in water supply pipes using drone-borne sensor technology**
Identification of water leaks in distribution pipes with UAVs via microwave and thermal monitoring

Department of Environmental Engineering
Water Resources Engineering
National Space Institute
Geodesy
Department of Applied Mathematics and Computer Science
Image Analysis & Computer Graphics
Dronelnspektion ApS
Drone Systems ApS
Aarhus Water
Solrød Vandværk
HOFOR A/S
VandCenter Syd
Period: 16/11/2017 → 30/06/2018
Number of participants: 4
Project participant:
Bandini, Filippo (Intern)
Jakobsen, Jakob (Intern)
Bauer-Gottwein, Peter (Intern)
Frisvad, Jeppe Revall (Intern)

**Bioinorganic artificial photosynthesis of single cell protein from carbon dioxide.**
Department of Environmental Engineering
Period: 01/11/2017 → 31/10/2020
Number of participants: 3
PhD Student:
Xu, Mingyi (Intern)
Supervisor:
Zhang, Yifeng (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Privatist
Project: PhD

**Ex-situ biogas upgrading through biologically mediated CO2 hydrogenation**
Department of Environmental Engineering
**Powdered bioaugmentation inocula to alleviate ammonia toxicity in anaerobic digesters**

Department of Environmental Engineering  
Period: 01/11/2017 → 31/10/2020  
Number of participants: 3  
Phd Student:  
Yan, Miao (Intern)  
Supervisor:  
Fotidis, Ioannis (Intern)  
Main Supervisor:  
Angelidaki, Irini (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Offentlig finansiering  
Project: PhD

**Supporting water infrastructure investment planning with hydro-economic models**

Department of Environmental Engineering  
Period: 01/09/2017 → 31/08/2020  
Number of participants: 5  
Phd Student:  
Payet-burin, Raphaël (Intern)  
Supervisor:  
Cardenal, Silvio Javier Pereira (Intern)  
Kromann, Mikkel Aabenhus (Ekstern)  
Strzepek, Kenneth Marc (Ekstern)  
Main Supervisor:  
Bauer-Gottwein, Peter (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Privatist  
Project: PhD

**An in vitro method for toxicity testing of inhaled particles**

Department of Environmental Engineering  
Period: 15/08/2017 → 14/08/2020  
Number of participants: 4  
Phd Student:  
Da Silva, Emilie (Intern)  
Supervisor:  
Hougaard, Karin Særig (Ekstern)  
Særli, Jorid Birkelund (Intern)  
Main Supervisor:  

Baun, Anders (Intern)

**Financing sources**
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

**Decision support tools for managing water resources in mixed land use catchments**
Department of Environmental Engineering  
Period: 15/08/2017 → 08/12/2020  
Number of participants: 3  
Phd Student:  
Lemaire, Grégory Guillaume (Intern)  
Supervisor:  
McKnight, Ursula S. (Intern)  
Main Supervisor:  
Bjerg, Poul Løgstrup (Intern)

**Financing sources**
Source: Internal funding (public)  
Name of research programme: Institut stipendie (DTU)  
Project: PhD

**Documentation and quantification of natural and enhanced degradation of chlorinated contaminants in the subsurface**
Department of Environmental Engineering  
Period: 15/08/2017 → 14/08/2020  
Number of participants: 3  
Phd Student:  
Ottosen, Cecilie Bang (Intern)  
Supervisor:  
Bjerg, Poul Løgstrup (Intern)  
Main Supervisor:  
Broholm, Mette Martina (Intern)

**Financing sources**
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

**Operational monitoring and Forecasting system for Resilience of agriculture and forestry under intensification of the Water cycle: a Big Data approach**
Department of Environmental Engineering  
Water Resources Engineering  
TSK  
Period: 01/07/2017 → 01/09/2019  
Number of participants: 1  
Acronym: FORWARD  
Project participant:  
Garcia, Monica (Intern)

**Karakterisering og kvantificering af producerede nanobobler i vand**
Department of Environmental Engineering  
Urban Water Systems  
Water Technologies
CM Aqua Technologies ApS

Water ApS

Brancheorganisationen AquaCirkle

Period: 01/07/2017 → 30/04/2018

Number of participants: 4

Acronym: NanoBobler

Project participant:

Nielsen, Katrine (Intern)

Andersen, Henrik Rasmus (Intern)

Kaarsholm, Kamilla Marie Speht (Intern)

Droumpali, Ariadni (Intern)

Project

Development of the next generation of Aquaporin Inside TM biomimetic membranes

Department of Environmental Engineering

Period: 01/07/2017 → 30/06/2020

Number of participants: 4

PhD Student:

Górecki, Radoslaw Pawel (Intern)

Supervisor:

Spulber, Mariana (Ekstern)

Trzaskus, Krzysztof Wojciech (Ekstern)

Main Supervisor:

Hélix-Nielsen, Claus (Intern)

Financing sources

Source: Internal funding (public)

Name of research programme: Industrial PhD

Project: PhD

Balancing Costs and Benefits of New Urban Water Management Objectives for Both Real Time Applications and Urban Planning

Department of Environmental Engineering

Period: 01/06/2017 → 31/05/2020

Number of participants: 4

PhD Student:

Skrydstrup, Julie (Intern)

Supervisor:

Gregersen, Ida Bülow (Intern)

Löwe, Roland (Intern)

Main Supervisor:

Arnbjerg-Nielsen, Karsten (Intern)

Financing sources

Source: Internal funding (public)

Name of research programme: Samfinansieret - Andet

Project: PhD

Krav til rensning af regnbetinget udledning i Danmark og EU

Department of Environmental Engineering

Urban Water Systems

Teknologisk Institut

Københavns Universitet

Period: 01/05/2017 → 30/06/2018

Number of participants: 2
Agricultural Water Innovations in the Tropics
Department of Environmental Engineering
Water Resources Engineering
Period: 01/04/2017 → 01/05/2020
Number of participants: 1
Acronym: AgWIT,
Project participant:
Garcia, Monica (Intern)

Wastewater Treatment Textbook revision
Revision of 3rd edition
Department of Environmental Engineering
Period: 01/04/2017 → 31/12/2017
Number of participants: 1
Project participant:
Arvin, Erik (Intern)

Monitoring of the Yucatan Peninsula with UAVs
Deployment of Unmanned Aerial Vehicles (UAVs) to observe water level, bathymetry and temperature in the worldwide unique water bodies of the Yucatan peninsula (Mexico).
Department of Environmental Engineering
Water Resources Engineering
Period: 10/02/2017 → 05/04/2017
Number of participants: 4
cenote, lagoon, Yucatan, bathymetry, water level, temperature, UAVs
Project participant:
Bandini, Filippo (Intern)
Lopez, Alejandro (Ekstern)
Project Manager, organisational:
Merediz-Alonso, Gonzalo (Ekstern)
Project Manager, academic:
Bauer-Gottwein, Peter (Intern)
Documents:
Research contract

Airborne and satellite remote sensing for hydrologic modelling applications
Department of Environmental Engineering
Period: 01/02/2017 → 31/01/2020
Number of participants: 4
Phd Student:
Kittel, Cecile Marie Margarethla (Intern)
Supervisor:
Garcia, Monica (Intern)
Tøttrup, Christian (Ekstern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Circular Economy: Integrated sustainability assessment of resource recovery and cycling
Department of Environmental Engineering
Period: 01/12/2016 → 10/04/2020
Number of participants: 3
Phd Student: Andreasi Bassi, Susanna (Intern)
Supervisor: Boldrin, Alessio (Intern)
Main Supervisor: Astrup, Thomas Fruegraard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden EU-finansiering
Project: PhD

Circular Economy: Life cycle assessment of chemicals in material cycles
Department of Environmental Engineering
Period: 01/12/2016 → 14/08/2020
Number of participants: 3
Phd Student: Xanthopoulou, Larisa (Intern)
Supervisor: Baun, Anders (Intern)
Main Supervisor: Astrup, Thomas Fruegraard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Life cycle assessment modelling of advanced (bio)energy technologies
Department of Environmental Engineering
Period: 01/12/2016 → 30/11/2019
Number of participants: 3
Phd Student: Lodato, Concetta (Intern)
Supervisor: Tonini, Davide (Intern)
Main Supervisor: Astrup, Thomas Fruegraard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Optimal and holistic implementation of central drinking water softening
Department of Environmental Engineering
Period: 01/12/2016 → 28/01/2020
Number of participants: 4
Phd Student:
Tang, Camilla (Intern)
Supervisor:
Rygaard, Martin (Intern)
Wormslev, Erik C. (Ekstern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansierede - Virksomhed
Project: PhD

Fuldautomatisk decentral rensning af partikler i regnbetingede udledninger
Department of Environmental Engineering
Urban Water Systems
Water Technologies
Teknologisk Institut
HydroSystems
Period: 01/11/2016 → 31/10/2018
Number of participants: 6
Acronym: FUPARU
Project participant:
Nielsen, Katrine (Intern)
Mikkelsen, Peter Steen (Intern)
Andersen, Henrik Rasmus (Intern)
Vezzaro, Luca (Intern)
Borup, Morten (Intern)
Chhetri, Ravi Kumar (Intern)
Project

Plant Uptake of Environmental Chemicals
Department of Environmental Engineering
Period: 01/11/2016 → 10/12/2020
Number of participants: 4
Phd Student:
Jensen, Christian Kjær (Intern)
Supervisor:
Mikkelsen, Teis Nørgaard (Intern)
Rein, Arno (Ekstern)
Main Supervisor:
Trapp, Stefan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Quantification of trace gas emissions from waste management facilities
Department of Environmental Engineering
Period: 01/11/2016 → 31/10/2019
Number of participants: 3
Phd Student:
Duan, Zhenhan (Intern)
Supervisor:
Scheutz, Charlotte (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Models for real time warning and control strategies in urban drainage and wastewater systems
Department of Environmental Engineering
Period: 01/10/2016 → 30/09/2019
Number of participants: 4
Phd Student:
Pedersen, Jonas Wied (Intern)
Supervisor:
Madsen, Henrik (Intern)
Vezzaro, Luca (Intern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Computational modelling and simulation of anaerobic biomass conversion to biogas, focusing on the effects of substrate characterisation, solid-liquid-gas phase interactions and microbial growth dynamics
Department of Environmental Engineering
Period: 15/09/2016 → 14/01/2020
Number of participants: 3
Phd Student:
Kovalovszki, Adam (Intern)
Supervisor:
Alvarado-Morales, Merlin (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Digital tools for landscape architects: A case study of digital tools used for analyzing and screening climate adaptation challenges in the early design phase
Danish Title: Undersøgelse af digitale værktøjer hos arkitekttegnestuer til beregning og screening af regnvand i den tidlige designfase
DTU Environment/European Regional Development Fund.
Department of Civil Engineering
Section for Building Design
Department of Environmental Engineering
Urban Water Systems
Period: 01/09/2016 → 31/12/2016
Number of participants: 3
Project participant:
Ambjerg-Nielsen, Karsten (Intern)
Mikkelsen, Peter Steen (Intern)
Optimized water distribution using high-resolution data sources and novel data analysis methods

Department of Environmental Engineering
Period: 01/09/2016 → 14/11/2019
Number of participants: 4
Phd Student:
Kirstein, Jonas Kjeld (Intern)
Supervisor:
Borup, Morten (Intern)
Høgh, Klavs (Ekstern)
Main Supervisor:
Rygaard, Martin (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

SMAP Soil Moisture Data To Improve Remotely Sensed Global Estimates of Evapotranspiration
Evapotranspiration is a key variable in the hydrological cycle, however it cannot be measured directly using remote sensing data. This project aims to integrate SMAP NASA soil moisture products directly into global remote sensing evapotranspiration algorithms to improve modeling and assess regional droughts.

Department of Environmental Engineering
Water Resources Engineering
Period: 01/08/2016 → 01/08/2018
Number of participants: 2
Project participant:
Garcia, Monica (Intern)
Fisher, Josh (Ekstern)

Development of sectorial drought indices in the Iberian Peninsula: improving monitoring and early warning of droughts in Spain (in Spanish)

Department of Environmental Engineering
Water Resources Engineering
Period: 01/07/2016 → 01/07/2018
Number of participants: 2
Project participant:
Garcia, Monica (Intern)
Vicente-Serrano, Sergio (Ekstern)

Optimized real-time management of interacting water systems for a smarter city

Department of Environmental Engineering
Period: 01/07/2016 → 28/07/2019
Number of participants: 5
Phd Student:
Lund, Nadia Schou Vorndran (Intern)
Supervisor:
Borup, Morten (Intern)
Helwigh, Ole Mark (Ekstern)
Madsen, Henrik (Intern)
Prediction Methods for the Environmental Fate of Organic Chemicals

Department of Environmental Engineering
Period: 01/07/2016 → 16/02/2019
Number of participants: 4
PhD Student:
Brock, Andreas Libonati (Intern)
Supervisor:
Kästner, Matthias (Ekstern)
Rein, Arno (Ekstern)
Main Supervisor:
Trapp, Stefan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansierede - Virksomhed
Project: PhD

Mixture Effects in Biodegradation Testing of Aromatic and Aliphatic Hydrocarbons

Department of Environmental Engineering
Period: 15/06/2016 → 13/12/2019
Number of participants: 4
PhD Student:
Hammershøj, Rikke Høst (Intern)
Supervisor:
Andersen, Henrik Rasmus (Intern)
Birch, Heidi (Intern)
Main Supervisor:
Mayer, Philipp (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansierede - Virksomhed
Project: PhD

Computational Fluid Dynamics Simulations of electroosmotic phenomena

Department of Environmental Engineering
Period: 01/02/2016 → 20/10/2019
Number of participants: 3
PhD Student:
Aschmoneit, Fynn Jerome (Intern)
Supervisor:
Yde, Lars (Ekstern)
Main Supervisor:
Hélix-Nielsen, Claus (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD
**Biocover systems for green hours gas mitigation at landfills**

Department of Environmental Engineering  
Period: 01/01/2016 → 31/05/2018  
Number of participants: 3  
Phd Student:  
Olesen, Andreas Ole Urup (Intern)  
Supervisor:  
Scheutz, Charlotte (Intern)  
Main Supervisor:  
Kjeldsen, Peter (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

**Ozonation of semi-closed aquatic systems - Online control**

Department of Environmental Engineering  
Period: 01/01/2016 → 31/12/2018  
Number of participants: 6  
Phd Student:  
Spiliotopoulou, Aikaterini (Intern)  
Supervisor:  
Jensen, Christian Thybo Anker (Ekstern)  
Martin, Richard (Ekstern)  
Pedersen, Lars-Flemming (Intern)  
Petersen, Paw Allan tinghuus (Ekstern)  
Main Supervisor:  
Andersen, Henrik Rasmus (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Industrial PhD  
Project: PhD

**The effect of sorption and dosing on the degradation of poorly water soluble substances in different environmental matrices using standard OECD guidelines**

Department of Environmental Engineering  
Period: 01/01/2016 → 31/12/2018  
Number of participants: 4  
Phd Student:  
Shrestha, Prasit (Intern)  
Supervisor:  
Birch, Heidi (Intern)  
Hennecke, Dieter (Ekstern)  
Main Supervisor:  
Mayer, Philipp (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Stipendie fra udlandet  
Project: PhD

**Uptake and effects of nanoparticles and microplastics in aquatic organisms**

Department of Environmental Engineering  
Period: 01/12/2015 → 30/11/2018  
Number of participants: 4  
Phd Student:
Rist, Sinja (Intern)
Supervisor:
Hartmann, Nanna B. (Intern)
Meibom, Peter (Intern)
Main Supervisor:
Baun, Anders (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Biological Sample Preparation for Electron Microscopy
Special Topic Course
Center for Electron Nanoscopy
DTU Danchip
Department of Environmental Engineering
Urban Water Engineering
Department of Micro- and Nanotechnology
Center for Intelligent Drug Delivery and Sensing Using Microcontainers and Nanomechanics
Nanoprobes
Amphiphilic Polymers in Biological Sensing
National Food Institute
Research Group for Bioactives – Analysis and Application
Research Group for Nano-Bio Science
Period: 16/11/2015 → 20/11/2015
Number of participants: 6
Project participant:
Schneider, Carina (Intern)
von Halling Laier, Christoffer (Intern)
Ullah, Saif (Intern)
Andersen, Alina Joukainen (Intern)
García Moreno, Pedro Jesús (Intern)
Main Supervisor:
Mateiu, Ramona Valentina (Intern)
Project

Support for 3rd regulatory review of nanomaterials – environmental legislation
Ricardo Energy & Environment, in partnership with subcontractors Milieu Consulting and the Technical University of Denmark (DTU), was commissioned by the European Commission to carry out a project entitled “The preparation of the third regulatory review on nanomaterials - environmental legislation”, specific contract number 070201/ENV/2015/SI2.716613/ENV.A3, Commission reference ENV.C.3/ETU/2015/0030. The study objective was to compile and develop information on nanomaterials and advanced materials in the environment and explore further the regulatory implementation challenges. The study had three main components: - A preliminary evaluation of releases of nanomaterials to different media (air, water, land, recycling and waste disposal). - A review of progress on the application of environmental and other key legislation to nanomaterials. - A prospective view on future developments in advanced materials, and challenges for environmental legislation. Consultation with stakeholders was carried out by email and telephone, and a stakeholder workshop was held on 21 June 2016. At the workshop, the interim findings were presented, and stakeholder feedback and views were discussed. Following the workshop, stakeholders provided feedback in writing. This feedback has been taken into account for the finalisation of the report.

Department of Environmental Engineering
Environmental Chemistry
Addressing China's water challenges with hydroeconomic optimization

Department of Environmental Engineering
Period: 01/11/2015 → 31/10/2018
Number of participants: 2
PhD Student:
Martinsen, Grith (Intern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Mechanisms of release and transport of arsenic in groundwater of semi-arid basins in China

Department of Environmental Engineering
Period: 01/11/2015 → 31/10/2018
Number of participants: 3
PhD Student:
Stolze, Lucien (Intern)
Supervisor:
Bauer-Gottwein, Peter (Intern)
Main Supervisor:
Rolle, Massimo (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Characterization and recycling of waste fractions from recycling centers

Department of Environmental Engineering
Period: 15/10/2015 → 14/10/2018
Number of participants: 4
PhD Student:
Faraca, Giorgia (Intern)
Supervisor:
Boldrin, Alessio (Intern)
Damgaard, Anders (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD
Pilotprojekt til et frivilligt måleprogram for metanudledning fra biogas - og opgraderings anlæg.
Department of Environmental Engineering
Residual Resource Engineering
Energistyrelsen
AgroTech A/S
SP Sveriges Provnings- och Forskningsinstitut
Period: 09/10/2015 → 20/11/2015
Number of participants: 2
Project participant:
Fredenslund, Anders Michael (Intern)
Scheutz, Charlotte (Intern)
Project

Hyperspatial mapping of water, energy and carbon fluxes with Unmanned Aerial Vehicles
Department of Environmental Engineering
Period: 01/10/2015 → 02/03/2019
Number of participants: 4
Phd Student:
Wang, Sheng (Intern)
Supervisor:
Bauer-Gottwein, Peter (Intern)
Ibrom, Andreas (Intern)
Main Supervisor:
Garcia, Monica (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Innovative bioaugmentation strategies to tackle ammonia inhibition in anaerobic digestion process
Department of Environmental Engineering
Period: 01/10/2015 → 30/09/2018
Number of participants: 3
Phd Student:
Tian, Hailin (Intern)
Supervisor:
Fotidis, Ioannis (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Innovative-bio-electrochemical-anaerobic-digestion coupled system for ammonia recovery and energy production from food-waste residues
Department of Environmental Engineering
Period: 01/10/2015 → 28/02/2019
Number of participants: 3
Phd Student:
Zhao, Nannan (Intern)
Supervisor:
Zhang, Yifeng (Intern)
**Main Supervisor:**
Angelidaki, Irini (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

**Large-scale operational hydrologic modeling using remote sensing data**

Department of Environmental Engineering
Period: 01/10/2015 → 30/09/2018
Number of participants: 5
Phd Student:
Jiang, Liguang (Intern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Garcia, Monica (Intern)
Frappart, Frédéric (Ekstern)
Refsgaard, Jens Christian (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

**Mechanisms and regulation of nitrous oxide (N2O) production during biological wastewater treatment**

Department of Environmental Engineering
Period: 01/10/2015 → 30/09/2018
Number of participants: 4
Phd Student:
Su, Qingxian (Intern)
Supervisor:
Jensen, Marlene Mark (Intern)
Thamdrup, Bo (Ekstern)
Main Supervisor:
Smets, Barth F. (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

**Biomimetic Membranes for Water Treatment and Energy Production**

Department of Environmental Engineering
Period: 15/09/2015 → 15/12/2018
Number of participants: 3
Phd Student:
Schneider, Carina (Intern)
Supervisor:
Fotidis, Ioannis (Intern)
Main Supervisor:
Hélix-Nielsen, Claus (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD
Development of Global biodiversity Indicators
GEO BON (the Group on Earth Observations Biodiversity Observation Network) consortium involving researchers and organizations around the world has developed a novel set of global indicators to address important gaps in our understanding of biodiversity change across scales, from national to global. These indicators are embedded in open online analysis platforms following GEO data sharing principles and have the long-term commitment of established research institutions.

Department of Environmental Engineering
Water Resources Engineering
Group on Earth Observations Biodiversity Observation Network
Period: 09/09/2015 → 07/10/2017
Number of participants: 1
biodiversity, remote sensing, evaporative fraction
Project participant:
Garcia, Monica (Intern)
Documents:
GBCI_Version1.2_low_Biodiversity_Index
Project

Characterization of recyclable materials in household waste
Department of Environmental Engineering
Period: 01/09/2015 → 08/01/2019
Number of participants: 4
Phd Student:
Eriksen, Marie Kampmann (Intern)
Supervisor:
Boldrin, Alessio (Intern)
Damgaard, Anders (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Linking the exposure and effects of organic chemical mixtures to their equilibrium partitioning concentrations in lipids
Department of Environmental Engineering
Period: 01/09/2015 → 15/03/2019
Number of participants: 3
Phd Student:
Trac, Ngoc Lam (Intern)
Supervisor:
Nørgaard Schmidt, Stine (Intern)
Main Supervisor:
Mayer, Philipp (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Microbial community evolution models for describing the degradation of chlorinated solvents
Department of Environmental Engineering
Period: 01/09/2015 → 20/12/2018
Number of participants: 4
Phd Student:
Murray, Alexandra Marie (Intern)
Supervisor:
Broholm, Mette Martina (Intern)
Rolle, Massimo (Intern)
Main Supervisor:
Broholm, Mette Martina (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Surrogate modeling of inundation for both real time control and planning applications
Department of Environmental Engineering
Period: 01/09/2015 → 19/09/2019
Number of participants: 3
Phd Student:
Thrysøe, Cecilie (Intern)
Supervisor:
Borup, Morten (Intern)
Main Supervisor:
Ambjerg-Nielsen, Karsten (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Shale gas in a Danish context
Department of Environmental Engineering
Environmental Chemistry
Period: 31/08/2015 → 29/01/2016
Number of participants: 1
Shale gas, Risk screening
Project participant:
Hansen, Steffen Foss (Intern)

Relations
Press / Media items:
Forskere står med mange ubesvarede skifergasspørgsmål: Der er stadig mange ubesvarede spørgsmål om skifergasboringernes konsekvenser for miljøet og grundvandet.
36 risici ved at bore efter skifergas
Rapport: Sådan gør vi skifergas miljøvenlig
Debat: Nej, skifergas er da alt andet end forsvarligt
Hård kritik af Total og kommune

Life-cycle assessment of climate adaption technologies for stormwater management
Department of Environmental Engineering
Period: 15/08/2015 → 07/02/2019
Number of participants: 5
Phd Student:
Brudler, Sarah (Intern)
Supervisor:
Water in Urban Areas (Vand i Byer)
Innovation Network funded by Danish Agenc for Science and Higher education. A partnership for climate change adaptation and innovation

Department of Environmental Engineering
Urban Water Systems
Period: 01/08/2015 → 31/07/2018
Number of participants: 1
Acronym: ViB
Project participant:
Godskesen, Berit (Intern)

Innovative bioaugmentation strategies to tackle ammonia inhibition in an-aerobic digestion process

Department of Environmental Engineering
Residual Resource Engineering
Lemvig Biogasanlæg A.m.b.A.
Period: 01/08/2015 → 31/07/2018
Number of participants: 3
Acronym: MicrobStopNH3
Number of related Ph.D. students: 1
Project participant:
Fotidis, Ioannis (Intern)
De Francisci, Davide (Intern)
Project Manager, academic:
Angelidakis, Irini (Intern)

Biomimetic Phopshate Recovery

Department of Environmental Engineering
Period: 01/08/2015 → 31/01/2019
Number of participants: 3
Phd Student:
Truelsen, Sigurd Friis (Intern)
Supervisor:
Pedersen, Per Amstrup (Ekstern)
Main Supervisor:
Hélix-Nielsen, Claus (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Micropollutants removal for hospital wastewater

Department of Environmental Engineering
Period: 15/05/2015 → 14/05/2018
Number of participants: 6
Phd Student: Ooi, Gordon Tze Hoong (Intern)
Supervisor: Bester, Kai (Ekstern)
Main Supervisor: Andersen, Henrik Rasmus (Intern)
Examiner: Trapp, Stefan (Intern)
Fick, Jerker (Ekstern)
Kreuzinger, Norbert (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Wastewater Treatment Using Staged Moving Bed Biofilm Reactor (MBBR) - Biological Transformation Products and Toxicity
Project: PhD

Vand Innovation SMVer
Department of Environmental Engineering
Urban Water Systems
Office for Innovation & Sector Services
Period: 01/05/2015 → 31/07/2018
Number of participants: 6
Acronym: ViS
Project participant:
Godskesen, Berit (Intern)
Mikkelsen, Peter Steen (Intern)
Kærn, Viggo Aaberg (Intern)
Nielsen, Katrine (Intern)
Neergaard, Birgitte (Intern)
Philipsen, Lærke (Intern)

Data quality in LCA of waste management: importance for result interpretation and result decision making
Department of Environmental Engineering
Period: 01/04/2015 → 31/07/2018
Number of participants: 3
Phd Student: Henriksen, Trine (Intern)
Supervisor: Astrup, Thomas Fruegaard (Intern)
Main Supervisor: Damgaard, Anders (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansierede - Virksomhed
Project: PhD

Engineering microbial communities in granular autotrophic nitrogen removal systems by steering metabolic networks
Department of Environmental Engineering
Period: 01/03/2015 → 21/05/2018
Number of participants: 7
Phd Student:
Blum, Jan-Michael (Intern)
Supervisor:
Jensen, Marlene Mark (Intern)
Thamdrup, Bo (Ekstern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Andersen, Henrik Rasmus (Intern)
Vlaeminck, Siegfried E. (Ekstern)
Wilén, Britt-Marie (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Microbial resource management for the mitigation of nitrous oxide emissions from the Partial Nitritation- Anammox process
Project: PhD

Miljøvurdering af indsamling, genanvendelse og bortskaffelse af tøj, og tekstilaffald
Department of Environmental Engineering
Period: 15/01/2015 → 17/02/2019
Number of participants: 4
Phd Student:
Nørup, Nynne (Intern)
Supervisor:
Damgaard, Anders (Intern)
Pihl, Kaj A. (Ekstern)
Main Supervisor:
Scheutz, Charlotte (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

Improving phosphorus recovery by supplementing existing Danish wastewater treatment using electrodialysis. MUDP-project.
Department of Civil Engineering
Arctic Technology Centre, ARTEK
Department of Environmental Engineering
Urban Water Engineering
Naturstyrelsen
Period: 01/01/2015 → 31/07/2015
Number of participants: 4
biological, wastewater treatment, electrodialysis, phosphorus
Project ID: 26452
Project participant:
Andersen, Henrik Rasmus (Intern)
Supervisor:
Jensen, Pernille Erland (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Project Coordinator:
Ebbers, Benjamin (Intern)
Project:

**Microplastics Occurrence, effects and sources of releases to the environment in Denmark**

Microplastics Occurrence, effects and sources of releases to the environment in Denmark Environmental project No. 1793, 2015. Ministry of Environment and Food The Danish Environmental Protection Agency.

Department of Environmental Engineering
Environmental Chemistry
COWI AS
Period: 01/01/2015 → 12/11/2015
Number of participants: 1
Microplastics
Project participant:
Hansen, Steffen Foss (Intern)
Documents:
Lassen et al. 2015
Project

**Micropollutants removal for hospital wastewater**

Department of Environmental Engineering
Period: 01/01/2015 → 18/04/2018
Number of participants: 6
Phd Student:
Tang, Kai (Intern)
Supervisor:
Mayer, Philipp (Intern)
Main Supervisor:
Andersen, Henrik Rasmus (Intern)
Examiner:
Mayer, Philipp (Intern)
McArdell, Christa S. (Ekstern)
Stasinakis, Athanasios (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: **Privatist**
Project: PhD

**Optimization of greenhouse gas mitigation of landfills**

Department of Environmental Engineering
Period: 01/01/2015 → 20/06/2018
Number of participants: 6
Phd Student:
Fathi Aghdam, Ehsan (Intern)
Supervisor:
Scheutz, Charlotte (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)
Examiner:
Damgaard, Anders (Intern)
Gregory, Robert G. (Ekstern)
Oonk, Johan (Ekstern)
Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansierede - Virksomhed

Relations
Publications:
Methane production, recovery and emission from two Danish landfills
Project: PhD

Drivers and Barriers to the Innovation and Implementation of Alternative Solutions to Climate Adaption
Department of Environmental Engineering
Period: 15/12/2014 → 11/10/2018
Number of participants: 4
Phd Student:
Madsen, Herle Mo (Intern)
Supervisor:
Andersen, Maj Munch (Intern)
Rygaard, Martin (Intern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Functional nonostructured materials to real water treatment applications
Department of Environmental Engineering
Period: 15/12/2014 → 14/03/2018
Number of participants: 8
Phd Student:
Ko, Dongah (Intern)
Supervisor:
Hwang, Yuhoon (Intern)
Jakobsen, Mogens Havsteen (Intern)
Yavuz, Cafer T. (Ekstern)
Main Supervisor:
Andersen, Henrik Rasmus (Intern)
Examiner:
Baun, Anders (Intern)
Dossi, Eleftheria (Ekstern)
Holm, Peter Engelund (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)

Relations
Publications:
Functional nanostructured materials for stormwater runoff treatment
Project: PhD

Innovative microbial electrolysis cell-anaerobic digestion coupled system for ammonia recovery and energy production from ammonia-rich residues
Department of Environmental Engineering
Period: 15/12/2014 → 18/04/2018
Number of participants: 6
Phd Student:
Li, Xiaohu (Intern)  
Supervisor:  
Zhang, Yifeng (Intern)  
Main Supervisor:  
Angelidaki, Irini (Intern)  
Examiner:  
Kougias, Panagiotis (Intern)  
Thomsen, Anne Belinda (Intern)  
Verstraete, Willy (Ekstern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Stipendie fra udlandet  
Project: PhD

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**Water Supplies' Water Footprint**  
Department of Environmental Engineering  
Period: 15/12/2014 → 18/03/2019  
Number of participants: 6  
Phd Student:  
Gejl, Ryle Nørskov (Intern)  
Supervisor:  
Bjerg, Poul Legstrup (Intern)  
Hauschild, Michael Zwicky (Intern)  
Henriksen, Hans Jørgen (Ekstern)  
Rasmussen, Jens (Ekstern)  
Main Supervisor:  
Rygaard, Martin (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Industrial PhD  
Project: PhD

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**Investigating the fate of nanomaterials in waste water treatment plants; removal, release and subsequent impacts**  
Department of Environmental Engineering  
Environmental Chemistry  
Norwegian Research Council  
Period: 01/12/2014 → 30/05/2018  
Number of participants: 2  
Nanoparticles, Wastewater treatment  
Acronym: NanoWASTE  
Project participant:  
Hansen, Steffen Foss (Intern)  
Polesel, Fabio (Intern)  

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**Contrasting the Water Innovation Systems in Europe and China**  
Department of Environmental Engineering  
Period: 01/12/2014 → 20/06/2018  
Number of participants: 8  
Phd Student:  
Moro, Mariú Abritta (Intern)  
Supervisor:  
Andersen, Maj Munch (Intern)  
McKnight, Ursula S. (Intern)
Deciphering the microbial ecology in biogas reactors for optimizing the anaerobic digestion process

Department of Environmental Engineering
Period: 01/12/2014 → 28/02/2018
Number of participants: 7
PhD Student:
Zhu, Xinyu (Intern)
Supervisor:
Kougias, Panagiotis (Intern)
Treu, Laura (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Zhang, Yifeng (Intern)
Nielsen, Jeppe Lund (Ekstern)
de Sousa, Diana Zita Machado (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Relations
Publications:
Deciphering the microbial ecology in biogas reactors for optimizing the anaerobic digestion process
Project: PhD

Microbial aggregates: A computational approach to investigate mechanisms & implications

Department of Environmental Engineering
Period: 01/12/2014 → 19/06/2018
Number of participants: 4
PhD Student:
Cockx, Bastiaan (Intern)
Supervisor:
Kreft, Jan Ulrich (Ekstern)
Płósz, Benedek G. (Intern)
Main Supervisor:
Smets, Barth F. (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Bioelectrochemical-anaerobic digestion-coupled system for simultaneous recovery and bioenergy production

Department of Environmental Engineering
Period: 15/10/2014 → 20/12/2017
Number of participants: 6
Phd Student:
Jin, Xiangdan (Intern)
Supervisor:
Zhang, Yifeng (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Kougias, Panagiotis (Intern)
He, Zhen Jason (Ekstern)
Norddahl, Birgir (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet

Relations
Publications:
Bioelectrochemical systems serve anaerobic digestion process for process monitoring and biogas upgrading
Project: PhD

Swimming pool disinfection by-products
Department of Environmental Engineering
Period: 15/10/2014 → 30/08/2017
Number of participants: 6
Phd Student:
Cheema, Waqas Akram (Intern)
Supervisor:
Kaarsholm, Kamilla Marie Speht (Intern)
Main Supervisor:
Andersen, Henrik Rasmus (Intern)
Examiner:
Albrechtsen, Hans-Jørgen (Intern)
Chowdhury, Shakhawat (Ekstern)
Uhl, Wolfgang (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Privatist

Relations
Activities:
7th International Conference
7th International Conference
Destruction of DBPs and their precursors in swimming pool water by combined UV-treatment and ozonation
Effect of UV treatment on DBPs formation in chlorinated seawater swimming pools- a laboratory study
IOA-PAG International Conference
2016 IUVA World Congress
2017 IUVA Americas Conference
Project: PhD

Chemical disinfection of combined sewer overflow (CSO) water
Department of Environmental Engineering
Period: 01/10/2014 → 20/12/2017
Number of participants: 6
Phd Student:
Chhetri, Ravi Kumar (Intern)
Development of innovative landfill gas management technologies

Department of Environmental Engineering
Period: 01/10/2014 → 22/10/2018
Number of participants: 4
PhD Student:
Fjelsted, Lotte (Intern)
Supervisor:
Christensen, Anders Georg (Intern)
Scheutz, Charlotte (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)

Relations
Publications:
Chemical disinfection of combined sewer overflows
Project: PhD

Realizing autotrophic nitrogen removal in membrane-aerated biofilms

Department of Environmental Engineering
Period: 01/10/2014 → 14/03/2018
Number of participants: 6
PhD Student:
Ma, Yunjie (Intern)
Supervisor:
Plósz, Benedek G. (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Andersen, Henrik Rasmus (Intern)
Nerenberg, Robert (Ekstern)
Lackner, Susanne (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet

Relations
Publications:
Monitoring and modeling of nitrogen conversions in membrane-aerated biofilm reactors: Effects of intermittent aeration
Project: PhD
Modelling tools for integrating geological, geophysical and contamination data for characterization of groundwater plumes

Department of Environmental Engineering
Period: 01/09/2014 → 05/12/2017
Number of participants: 7
Phd Student: Balbarini, Nicola (Intern)
Supervisor: Binning, Philip John (Intern)
Bauer-Gottwein, Peter (Intern)
Main Supervisor: Bjerg, Poul Løgstrup (Intern)
Examiner: Bauer-Gottwein, Peter (Intern)
Annable, Michael David (Ekstern)
Schirmer, Mario (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Modelling tools for integrating geological, geophysical and contamination data for characterization of groundwater plumes
Project: PhD

Interdisciplinary tools for identification and quantification of groundwater contamination arising from point sources

Department of Environmental Engineering
Period: 15/08/2014 → 06/05/2019
Number of participants: 3
Phd Student: Rønde, Vinni Kampman (Intern)
Supervisor: McKnight, Ursula S. (Intern)
Main Supervisor: Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Innovative optical Tools for proximal sensing of ecophysiological processes (OPTIMISE). ESSEM COST Action ES1309
Important European and international initiatives (SPECNET, BIOSPEC and COST Action ES0903) explored the use of proximal optical sensing of ecosystem where carbon and water vapor flux is estimated by eddy covariance techniques. Such optical observations provide data at the high spectral, temporal and spatial resolutions necessary to more fully comprehend the links between light use, plant physiology and ecosystem functioning and provide key validation datasets for satellite remote sensing, such as the Sentinel missions, and the flux communities. The recent advances in UAV platforms and optical sensors provide unprecedented opportunities for high spatial, spectral and multi-angular near-ground Earth observations. This will enable scientists to answer ecological and physiological questions at multiple scales through integrated empirical and modeling methods. Important progress is also being made in remote sensing of steady-state fluorescence, the most direct proxy for photosynthesis. The FLuorescence EXplorer (FLEX) mission, selected for further studies, will also benefit as this Action will support FLEX validation and calibrations campaigns. Furthermore, scientists have recognized the need to develop a 'smart' on-line platform to process and analyses optical data along with biophysical and water/carbon flux measurements and share these with other scientific communities and stakeholders which will also be addressed in this Action.

Department of Environmental Engineering
Water Resources Engineering
Period: 01/07/2014 → 30/04/2017
Number of participants: 1
Acronym: OPTIMISE
Working partner:
Garcia, Monica (Intern)

**Relations**

**Activities:**
Optimise Workshop
Project

**Ressourceeffektivisering af anlæg til opvarmning og/eller køling af bygninger mv. med brug af grundvand**

Department of Environmental Engineering
Urban Water Engineering
Enopsol
Krüger A/S
Period: 01/06/2014 → 30/06/2015
Number of participants: 3
Acronym: ATES
Project participant:
Christensen, Sarah Christine Boesgaard (Intern)
Tønder, Marta Munk (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Project

**Biofilm architecture vs composition attenuates pathogen invasion**

Department of Environmental Engineering
PhD in Environmental Monitoring with Unmanned Airborne Vehicles
Period: 01/06/2014 → 05/12/2017
Number of participants: 7
PhD Student:
Kinnunen, Marta (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Dechesne, Arnaud (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Trapp, Stefan (Intern)
Burmølle, Mette (Ekstern)
Curtis, Thomas P. (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Marie Curie (EU-stipendium)

**Relations**

**Publications:**
Invasion in microbial communities: Role of community composition and assembly processes
Project: PhD

**PhD in Environmental Monitoring with Unmanned Airborne Vehicles**
The PhD project is based on remote sensing from Unmanned Airborne Vehicles (UAVs), environmental modeling and data assimilation. Data are acquired using a water laser ranger, a multi-spectral camera and a thermal camera mounted on lightweight unmanned airborne vehicles. Implementation of the payload on the UAVs, processing of the data and informing of hydrological models are the the main study areas. The main objective is to study water and energy fluxes from land and water surfaces, including evapotranspiration, with a spatial accuracy that has no parallel in other remote sensing technologies.
Sky Watch
Period: 01/05/2014 → 30/04/2017
Number of participants: 1
UAVs drones remote sensing hydrology water
Project participant: Bandini, Filippo (Intern)

Environmental Monitoring with Unmanned Airborne Vehicles
Department of Environmental Engineering
Period: 01/05/2014 → 20/12/2017
Number of participants: 6
Phd Student: Bandini, Filippo (Intern)
Supervisor: Garcia, Monica (Intern)
Main Supervisor: Bauer-Gottwein, Peter (Intern)
Examiner: Bjerg, Poul Leegstrup (Intern)
Carbonneau, Patrice Eric (Ekstern)
Madsen, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Hydraulics and drones: observations of water level, bathymetry and water surface velocity from Unmanned Aerial Vehicles

Updating large-scale hydrodynamic models with radar altimetry data from CryoSat
Department of Environmental Engineering
Period: 01/04/2014 → 30/09/2017
Number of participants: 6
Phd Student: Schneider, Raphael (Intern)
Supervisor: Madsen, Henrik (Intern)
Main Supervisor: Bauer-Gottwein, Peter (Intern)
Examiner: Mikkelsen, Peter Steen (Intern)
Bates, Paul David (Ekstern)
Refsgaard, Jens Christian (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansierede - Virksomhed

Relations
Publications:
CryoSat-2 satellite radar altimetry for river analysis and modelling
Using long weather forecast to improve integrated wastewater management

Department of Environmental Engineering
Period: 01/04/2014 → 05/12/2017
Number of participants: 6
PhD Student: Courdent, Vianney Augustin Thomas (Intern)
Supervisor: Grum, Morten (Intern)
Main Supervisor: Mikkelsen, Peter Steen (Intern)
Examiner: Ambjerg-Nielsen, Karsten (Intern)
Ingildsen, Pernille (Ekstern)
Willems, Patrick (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD

Relations
Publications:
Numerical Weather Prediction and Relative Economic Value framework to improve Integrated Urban Drainage-Wastewater management
Project: PhD

Risikovurdering og kildeidentificering af stoffer i digestat fra REnescience

Department of Environmental Engineering
Residual Resource Engineering
Environmental Chemistry
DONG Energy A/S
Period: 01/03/2014 → 31/12/2014
Number of participants: 3
Acronym: REnescience
Project participant:
Eriksson, Eva (Intern)
Pivnenko, Kostyantyn (Intern)
Project Coordinator:
Astrup, Thomas Fruergaard (Intern)

Partitioning between heterotrophic and autotrophic forest respiration by means of stable isotopes

Department of Environmental Engineering
Period: 01/03/2014 → 30/09/2017
Number of participants: 7
PhD Student: Brændholt, Andreas (Intern)
Supervisor: Ibrom, Andreas (Intern)
Main Supervisor: Larsen, Klaus Steenberg (Intern)
Examiner:
Pilegaard, Kim (Intern)
Scheutz, Charlotte (Intern)
Friborg, Thomas (Ekstern)
Rütting, Tobias (Ekstern)

**Financing sources**
- Source: Internal funding (public)
- Name of research programme: *Offentlig finansiering*

**Relations**
- Publications:
- Estimation of ecosystem respiration and its components by means of stable isotopes and improved closed-chamber methods
- Project: PhD

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**Characterization and Management of Nanowaste**

Department of Environmental Engineering
- Period: 15/01/2014 → 30/09/2017
- Number of participants: 7
- PhD Student: Heggelund, Laura Roverskov (Intern)
- Supervisor: Astrup, Thomas Fruegaard (Intern)
- Hansen, Steffen Foss (Intern)
- Main Supervisor: Boldrin, Alessio (Intern)
- Examiner: Kjeldsen, Peter (Intern)
- Ingerslev, Flemming (Intern)
- Mitrano, Denise M. (Ekstern)

**Financing sources**
- Source: Internal funding (public)
- Name of research programme: *Samfinansieret - Andet*

**Relations**
- Publications:
- Characterization of waste from nanoenabled products
- Project: PhD

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**Effect of niche dimensionality on nitrifier community diversity**

Department of Environmental Engineering
- Period: 15/01/2014 → 19/04/2017
- Number of participants: 4
- PhD Student: Diwan, Vaibhav (Intern)
- Supervisor: Albrechtsen, Hans-Jørgen (Intern)
- Smet, Barth F. (Intern)
- Main Supervisor: Dechesne, Arnaud (Intern)

**Financing sources**
- Source: Internal funding (public)
- Name of research programme: *Marie Curie (EU-stipendium)*
- Project: PhD

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**Functionality increase in MBBRs due to metabolic expansion vs community expansion**

Department of Environmental Engineering
- Period: 15/01/2014 → 26/04/2017
- Number of participants: 8
Phd Student:
Torresi, Elena (Intern)

Supervisor:
Andersen, Henrik Rasmus (Intern)
Andersen, Henrik Rasmus (Intern)
Plósz, Benedek G. (Intern)

Main Supervisor:
Smets, Barth F. (Intern)

Examiner:
Rolle, Massimo (Intern)
Patureau, Dominique (Ekstern)
Wilén, Britt-Marie (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet

Relations
Publications:
Removal of micropollutants in Moving Bed Biofilm reactors (MBBRs)
Project: PhD

N2O dynamics in conventional and innovative mainstream and side-stream nitrogen removal technologies
Department of Environmental Engineering
Period: 15/01/2014 → 22/12/2017
Number of participants: 3
Phd Student:
Ekström, Sara Elisabet Margareta (Intern)
Supervisor:
Plósz, Benedek G. (Intern)
Main Supervisor:
Smets, Barth F. (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Treatment of worm infested biological rapid sand filters
Department of Environmental Engineering
Urban Water Engineering
Krüger A/S
Two anonymous water utilities
Period: 01/01/2014 → 23/06/2015
Number of participants: 1
Project participant:
Christensen, Sarah Christine Boesgaard (Intern)

Relations
Activities:
Treatment of worm infested rapid sand filters
Publications:
Treatment of worm infested biological rapid sand filters
Ormebekæmpelse i vandværksfiltre
Project
Colloidal fractions of persistent organic pollutants in road runoff: sources, generation and innovative treatment techniques

Department of Environmental Engineering
Environmental Chemistry
Chalmers University of Technology
Period: 01/01/2014 → 31/12/2016
Number of participants: 1
Acronym: ColloidPOP
Number of related Ph.D. students: 1
Project participant:
Eriksson, Eva (Intern)

Unified testing procedures for wind turbines through inflow characterisation using nacelle lidars
UniTTe addresses the question of how best to characterise the wind when measuring the power and loads on modern wind turbines.

Current international standards require us to measure the wind from a mast, far in-front of the rotor and at the rotor centre height (hub-height). UniTTe proposes a radical change so that in the future we will measure with a lidar (laser anemometer) mounted on the nacelle, measure quite close to the rotor and measure over a range of heights. The advantages will be significant: avoiding erecting high masts (hugely expensive offshore), getting better correlation between the wind and the power and loads and achieving universal procedures that work equally well both offshore and in mountains.

UniTTTe - Unified Turbine Testing
Department of Wind Energy
Test and Measurements
Department of Electrical Engineering
Aeroelastic Design
Residual Resource Engineering
Wind Turbines
Period: 01/01/2014 → 31/12/2017
Number of participants: 11
nacelle lidars, power performance, loads assessment, inflow, induction
Acronym: UniTTTe
Number of related Ph.D. students: 2
Project participant:
Friis Pedersen, Troels (Intern)
Trolsborg, Niels (Intern)
Meyer Forsting, Alexander Raul (Intern)
Bechmann, Andreas (Intern)
Courtney, Michael (Intern)
Borraccino, Antoine (Intern)
Vignaroli, Andrea (Intern)
Natarajan, Anand (Intern)
Sathe, Ameya (Intern)
Dimitrov, Nikolay Krasimirov (Intern)
Project Manager, academic:
Wagner, Rozenn (Intern)

Relations
Related projects:
Modeling of Wind Turbine Inflow
Activities:
EWEA Technology Workshop
Wind Europe Summit 2016
Perdigao NEWA meeting
11th EAWE PhD seminar on Wind Energy in Europe
Power curve measurement using $V_\infty$ estimates from nacelle lidars and its uncertainty
ISARS2016
12th German Wind Energy Conference DEWEK 2015
ECCOMAS Congress 2016
Predicting free-stream wind speed in complex terrain with lidar measurements
Power curve measurement using $V_\infty$ estimates from nacelle lidars and its uncertainty

Publications:
- Calibration report for Avent 5-beam Demonstrator lidar
- Calibration report for ZephIR Dual Mode lidar (unit 351)
- Generic methodology for calibrating profiling nacelle lidars

Project:

Forward osmosis biomimetic membranes for sensor and separation applications

Department of Environmental Engineering
Period: 01/01/2014 → 15/03/2017
Number of participants: 5
Phd Student: Bajraktari, Niada (Intern)
Main Supervisor: Hélix-Nielsen, Claus (Intern)
Examiner: Pinelo, Manuel (Intern)
Christensen, Morten Lykkegaard (Ekstern)
Jönsson, Ann-Sofi (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Sustainable Production of Third Generation (3G) Bioenergy Carriers and High Value Aquatic Fish Feed from Macroalgae

Department of Environmental Engineering
Period: 01/01/2014 → 30/08/2017
Number of participants: 6
Phd Student: D'Este, Martina (Intern)
Supervisor: Alvarado-Morales, Merlin (Intern)
Main Supervisor: Angelidaki, Irini (Intern)
Examiner: Fotidis, Ioannis (Intern)
Thomsen, Anne Belinda (Intern)
Nakashimada, Yutaka (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
- Algal Biomass for Bioenergy and Bioproducts Production in Biorefinery Concepts
Project: PhD
The structure and functional role of microbial communities in rapid sand filters

Department of Environmental Engineering
Period: 01/01/2014 → 30/09/2017
Number of participants: 7
Phd Student:
Palomo, Alejandro (Intern)
Supervisor:
Rasmussen, Simon (Intern)
Smets, Barth F. (Intern)
Main Supervisor:
Sicheritz-Pontén, Thomas (Intern)
Examiner:
Petersen, Thomas Nordahl (Intern)
Daims, Holger (Ekstern)
Thamdrup, Bo (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Marie Curie (EU-stipendium)

Relations
Publications:
Discovery and description of complete ammonium oxidizers in groundwater-fed rapid sand filters
Project: PhD

Biogas enhancement and upgrading

Department of Environmental Engineering
Period: 15/12/2013 → 06/06/2017
Number of participants: 6
Phd Student:
Bassani, Ilaria (Intern)
Supervisor:
Kougias, Panagiotis (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Jensen, Marlene Mark (Intern)
Guwy, Alan (Ekstern)
Norddahl, Birgir (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Hydrogen assisted biological biogas upgrading
Project: PhD

Establishment and calibration of consensus process models of N2O dynamics

Department of Environmental Engineering
Period: 15/12/2013 → 30/08/2017
Number of participants: 7
Phd Student:
Domingo-Felez, Carlos (Intern)
Supervisor:
Plósz, Benedek G. (Intern)
Sin, Gürkan (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Gernaey, Krist V. (Intern)
Plaza, Elzbieta (Ekstern)
Sperandio, Mathieu (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Establishment and calibration of consensus process model for nitrous oxide dynamics in water quality engineering
Project: PhD

Full-scale quantification of greenhouse gas emissions from wastewater treatment plants
Department of Environmental Engineering
Period: 15/12/2013 → 21/03/2018
Number of participants: 6
Phd Student:
Delre, Antonio (Intern)
Supervisor:
Mønster, Jacob (Intern)
Main Supervisor:
Scheutz, Charlotte (Intern)
Examiner:
Ibrom, Andreas (Intern)
Allen, Grant (Ekstern)
Thomsen, Marianne (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Greenhouse gas emissions from wastewater treatment plants: measurements and carbon footprint assessment
Project: PhD

Assessment of the drinking water quality sensor prototype "Zebra"
Department of Environmental Engineering
Urban Water Engineering
Grundfos A/S
Period: 01/12/2013 → 31/07/2014
Number of participants: 3
Project participant:
Christensen, Sarah Christine Boesgaard (Intern)
Vang, Óluva Karin (Intern)
Albrechtsen, Hans-Jørgen (Intern)

New technology for an efficient utilization of meadow grass in biogas reactor
Department of Environmental Engineering
Period: 01/12/2013 → 15/03/2017
Number of participants: 6
Phd Student:
Enhancing biogas production from recalcitrant lignocellulosic residue

Project: PhD

Controlling factors for nitrification in biological rapid sand filters for drinking water treatment

Department of Environmental Engineering
Period: 15/11/2013 → 25/10/2017
Number of participants: 6
Phd Student:
Wagner, Florian Benedikt (Intern)
Supervisor:
Boe-Hansen, Rasmus (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Jensen, Marlene Mark (Intern)
Roslev, Peter (Ekstern)
van der Wielen, Paul W. J. J. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Enhancing biogas production from recalcitrant lignocellulosic residue

Importance of copper for nitrification in biological rapid sand filters for drinking water production
Project: PhD

Ecotoxicity and groundwater remediation potential of engineered nanoparticles

Department of Environmental Engineering
Period: 15/11/2013 → 08/02/2017
Number of participants: 7
Phd Student:
Hjorth, Rune (Intern)
Supervisor:
Broholm, Mette Martina (Intern)
Hansen, Steffen Foss (Intern)
Main Supervisor:
Baun, Anders (Intern)
Examiner:
Rygaard, Martin (Intern)
Malloy, Timothy F. (Ekstern)
Syberg, Kristian (Ekstern)
Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Environmental risk assessment and management of engineered nanomaterials - The role of ecotoxicity testing
Project: PhD

Systematic quantification of biogas potential in urban organic waste
Department of Environmental Engineering
Period: 15/11/2013 → 26/04/2017
Number of participants: 7
Phd Student:
Fitamo, Temesgen Mathewos (Intern)
Supervisor:
Boldrin, Alessio (Intern)
Main Supervisor:
Scheutz, Charlotte (Intern)
Examiner:
De Francisci, Davide (Intern)
La Cour Jansen, Jes (Intern)
La Cour Jansen, Jes (Intern)
Ward, Alastair James (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Systematic Quantification of Biogas Potential in Urban Organic Waste
Project: PhD

Risk assessment of stream water: linking mass discharge from contaminated sites, in-stream fate and water health
Department of Environmental Engineering
Period: 01/11/2013 → 26/06/2017
Number of participants: 6
Phd Student:
Sonne, Anne Thobo (Intern)
Supervisor:
McKnight, Ursula S. (Intern)
Main Supervisor:
Bjerg, Poul Løgstrup (Intern)
Examiner:
Broholm, Mette Martina (Intern)
Kronvang, Brian (Ekstern)
Roy, James W. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Integrated assessment of chemical stressors and ecological impact in mixed land use stream systems
Project: PhD
Innovative bioelectrochemical-anaerobic-digestion coupled system for ammonia recovery and energy production from ammonia-rich residues

Inhibition of anaerobic digestion process by high levels of ammonia (NH4+/NH3) is the most serious problem existing in Danish biogas plants. No viable/applicable method to overcome this problem has been found up to now. This project proposes an innovative process which integrates bioelectrochemical system (BES) with anaerobic digestion to recover ammonia, and thereby enhance biomethanation of ammonia-rich residues. In this process, ammonia recovery and electricity production will be realized in a novel BES submerged in an anaerobic reactor. Moreover, removal of ammonia from anaerobic reactor will alleviate or counteract ammonia inhibition and enhance the conversion of ammonia-rich wastes to biogas, giving synergistic advantages for both ammonia recycling and increase of biogas production. The system performance and potential limitations will be addressed and technical solutions will be developed.

Department of Environmental Engineering

Residual Resource Engineering
Period: 01/10/2013 → 30/09/2017
Number of participants: 3
Bioelectrochemistry, Anaerobic digestion, Ammonia recovery, Bioenergy, Biocatalysis, Wastewater handling, Open land, Sustainability
Acronym: ElectroAD
Number of related Ph.D. students: 1
Project participant:
Zhang, Yifeng (Intern)
Fotidis, Ioannis (Intern)
Project Coordinator:
Angelidaki, Irini (Intern)

Release of nanoparticles from consumer products

Department of Environmental Engineering
Period: 01/10/2013 → 01/12/2016
Number of participants: 6
Phd Student:
Mackevica, Aiga (Intern)
Supervisor:
Olsson, Mikael Emil (Intern)
Main Supervisor:
Hansen, Steffen Foss (Intern)
Examiner:
Löschner, Katrin (Intern)
Cornelis, Geert (Ekstern)
Jensen, Keld Alstrup (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Release of nanomaterials from consumer products and implications for consumer exposure assessment
Project: PhD

Rensning af drikkevand

Department of Environmental Engineering
Urban Water Engineering
Period: 15/09/2013 → 30/04/2014
Number of participants: 4
Project participant:
Christensen, Sarah Christine Boesgaard (Intern)
Andersen, Henrik Rasmus (Intern)
Refstrup, Mona (Intern)
Characterization of Biomass Combustion Ashes

Department of Environmental Engineering
Period: 01/09/2013 → 05/12/2017
Number of participants: 5
Phd Student:
Maresca, Alberto (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Polettini, Alessandra (Ekstern)
Steenari, Britt-Marie (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Publications:
Characterisation of wood combustion ashes
Project: PhD

Quantitative spatio-temporal flood risk modelling in an urban context

Department of Environmental Engineering
Period: 01/09/2013 → 30/09/2014
Number of participants: 3
Phd Student:
Sto. Domingo, Niña Donna Farpale (Intern)
Supervisor:
Helwigh, Ole Mark (Ekstern)
Main Supervisor:
Arnbjerg-Nielsen, Karsten (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

Wastewater resource recovery using green micro-algae

Department of Environmental Engineering
Period: 01/09/2013 → 08/02/2017
Number of participants: 6
Phd Student:
Wágner, Dorottya Sarolta (Intern)
Supervisor:
Smets, Barth F. (Intern)
Main Supervisor:
Plósz, Benedek G. (Intern)
Examiner:
Hartmann, Nanna B. (Intern)
Ellegaard, Marianne (Ekstern)
Steyer, Jean-Philippe (Intern)

Financing sources
Source: Internal funding (public)
Environmental Assessment of Sewage Sludge Management - Focusing on Sludge Treatment Reed Beds

Department of Environmental Engineering
Period: 01/08/2013 → 30/09/2017
Number of participants: 6
Phd Student:
Larsen, Julie Dam (Intern)
Supervisor:
Pilegaard, Kim (Intern)
Main Supervisor:
Scheutz, Charlotte (Intern)
Examiner:
Pilegaard, Kim (Intern)
Headley, Tom (Ekstern)
Molle, Pascal (Ekstern)

Financing sources
Source: Internal funding (public)

Relations
Publications:
Environmental Assessment of Sewage Sludge Management – Focusing on Sludge Treatment Reed Bed Systems

Improving Weather Risk Management in West Africa: Evaluation of Remote Sensing for Index Insurance

The Weather Risk Management Facility (WRMF)1 is a joint initiative between two United Nations agencies, the International Fund for Agricultural Development (IFAD) and the World Food Programme (WFP). It has been working to address the challenges weather risk (particularly drought) poses for smallholders producing crops in rural areas. One way the WRMF does this is by developing and supporting innovative weather and climate risk management tools – including index insurance – that improve rural livelihoods and reduce hunger. Launched in 2008 with the support of the Bill and Melinda Gates Foundation, the WRMF draws on IFAD’s experience in rural finance and on WFP’s expertise in disaster-risk reduction and management.

Building on lessons learned from carrying out pilots and research, the WRMF identified key constraints and success factors in the uptake, sustainability and scalability of index insurance2. Index insurance offers structural opportunities where, as part of a larger package of risk management strategies and services, it can be delivered through risk aggregators, such as agricultural finance providers, input suppliers and contract farming organizations. Indexation can also form a basis for risk financing and insurance for governments, relief agencies, at a more aggregated level.

This latest project, ‘Improving Weather Risk Management in West Africa: Evaluation of Remote Sensing for Index Insurance’, is designed to test the feasibility of index implementation for poor rural smallholders using innovative remote sensing technology. The project will address implementation needs, and research and evaluate methodologies, focusing on selected test locations in West Africa (e.g. Senegal). The rationale for this project is that conventional weather index insurance (using weather stations) and area yield index insurance (using crop yield data), suffer from significant constraints, such as lack of appropriate weather station coverage and adequate yield information. In many cases these constraints represent a severe limitation to the introduction and scaling up of insurance products – both traditional crop and indexed insurance. By removing some of the obstacles encountered by such approaches, and despite a different set of technical, organizational and financial challenges, remote sensing may offer new opportunities for development of new insurance instruments for indexation. The specific goal of this project is to research and develop sustainable index insurance products for smallholder farmers who are producing crops in drought-prone areas of developing countries. Any successfully piloted methodologies could then feed into existing IFAD and WFP programmes such as R43 and other ongoing operations.

This briefing note is primarily written for organizations, research centres, and firms which are involved in remote sensing and agricultural productivity monitoring, to explain about the project and the way in which the WRMF hopes to engage with them during phase 2 and potentially beyond.

Consultancy project. Member of the Evaluation Committee.

Department of Environmental Engineering
Water Resources Engineering
International Fund for Agricultural Development
Period: 31/07/2013 → 30/04/2014
Number of participants: 1
Project participant:
Garcia, Monica (Intern)

Relations
Activities:
Workshop Evaluation Meeting Committee
Project

Integration of biomass and wind power for biogas enhancement and upgrading via hydrogen assisted anaerobic digestion
Department of Environmental Engineering
Residual Resource Engineering
Period: 01/07/2013 → …
Number of participants: 3
upgrade, biogas, enhancement
Acronym: SYMBIO
Project participant:
Kougias, Panagiotis (Intern)
Luo, Gang (Intern)
Project Coordinator:
Angelidaki, Irini (Intern)

Future Scenario Analysis in Solid Waste Management
Department of Environmental Engineering
Period: 01/07/2013 → 05/12/2017
Number of participants: 6
Phd Student:
Bisinella, Valentina (Intern)
Supervisor:
Christensen, Thomas Højlund (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)
Examiner:
Boldrin, Alessio (Intern)
Brandão, Miguel M. R. (Ekstern)
Guyonnet, Dominique (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Future scenario development within life cycle assessment of waste management systems
Project: PhD

Microbial degradation of pesticides in rapid sandfilters in water supply - Process understanding
Department of Environmental Engineering
Period: 01/05/2013 → 21/03/2018
Number of participants: 6
Phd Student:
Hedegaard, Mathilde Jørgensen (Intern)
Supervisor:
Boe-Hansen, Rasmus (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Bjerg, Poul Legstrup (Intern)
Boon, Nico (Ekstern)
Nybroe, Ole (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Microbial degradation of pesticides in rapid sand filters used for drinking water treatment
Project: PhD

A novel method to recover ammonia from biogas plants
In this project, we will develop an innovative technology to recover inhibitors from anaerobic digestion
Department of Environmental Engineering
Residual Resource Engineering
Period: 01/04/2013 → 31/10/2013
Number of participants: 2
Biocatalysis, Biogas, Biohydrogen, Bioelectrochemistry, Monitoring, Control, Bioenergy
Acronym: ElectroAD1
Project ID: 30992
Project participant:
Zhang, Yifeng (Intern)
Angelidaki, Irini (Intern)

Feasibility of phytoremediation for common soil and groundwater pollutants
Department of Environmental Engineering
Period: 01/04/2013 → 20/12/2017
Number of participants: 6
Phd Student:
Clausen, Lauge Peter Westergaard (Intern)
Supervisor:
Broholm, Mette Martina (Intern)
Main Supervisor:
Trapp, Stefan (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Eggen, Trine (Ekstern)
Magid, Jakob (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Feasibility of phytoremediation for common soil and groundwater pollutants
Project: PhD

Aquavalens: Protecting the health of Europeans by improving methods for the detection of pathogens in drinking water and water used in food preparation
New research approaches are needed to enable rapid determination of the pathogen load of European drinking water sources and supply systems used for food processing and preparation, human consumption and drinking. The new approaches should be based on molecular methods and complement the current time-consuming microbiological techniques, which are based on the cultivation of indicator bacteria. Highly standardised methods are essential, validated
with certified molecular reference material. The approaches will need to address the issue of inhibition of molecular methods and assess the significance of any positive detection. The combination of molecular techniques with electronic sensors will also be investigated. The new techniques will result in detailed insight into the pathogen load, the hygienic quality and the specific microbial strains (viruses, bacteria, protozoa) responsible for outbreaks of waterborne infections. They will lead to better understanding of the sources, infectivity and virulence of these strains. The efficacy of the new techniques has to be demonstrated. AQUAVALENS is centred on the concept of developing suitable platforms that harness the advances in new molecular techniques to permit the routine detection of waterborne pathogens and improve the provision of hygienically safe water for drinking and food production that is appropriate for large and small systems throughout Europe. Whilst in recent years there has been considerable developments, especially in molecular technology, very few systems are available that meet the needs of water providers. Consequently, and unless it proves essential, rather than necessarily develop new technologies, the key focus will be to adopt and, where appropriate, adapt existing technologies to develop these detection systems.

National Food Institute
Division of Food Microbiology
Department of Environmental Engineering
Urban Water Engineering
University of East Anglia
University of Barcelona
Helmholtz-Zentrum für Infektionsforschung
Public Health Wales National Health Service Trust
Technologiezentrum Wasser Karlsruhe (DVGW)
University of Belgrade
University of Helsinki
Heriot-Watt University
University of Iceland
Instituto Superior Técnico
University of Surrey
Universita Degli Studi Di Genova
Vienna University of Technology
Medical University of Vienna
Moredun Research Institute
Universitat Rovira i Virgili
Swedish University of Agricultural Sciences
National Food Agency
Period: 01/03/2013 → 28/02/2017
Number of participants: 5
Acronym: Aquavalens
Project participant:
Bang-Berthelsen, Iben (Intern)
Idrizi, Resadije (Intern)
Bang, Dang Duong (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Project Manager, academic:
Schultz, Anna Charlotte (Intern)
Project

Microbial water quality in clean water tanks following inspection and cleaning
Department of Environmental Engineering
Urban Water Engineering

VandCenter Syd
Period: 01/03/2013 → 30/09/2013
Number of participants: 2
Project participant:
Christensen, Sarah Christine Boesgaard (Intern)
Albrechtsen, Hans-Jørgen (Intern)

Relations
Activities:
Microbial growth in clean water tanks

Publications:
Microbial water quality in clean water tanks following inspection and cleaning
Mikrobiel vandkvalitet i rentvandsbeholdere efter inspektion og rensning

Modelling of in-sewars transformation of biomarkers

Department of Environmental Engineering
Period: 15/02/2013 → 08/02/2017
Number of participants: 6
PhD Student:
Ramin, Pedram (Intern)
Supervisor:
Mikkelsen, Peter Steen (Intern)
Main Supervisor:
Płösz, Benedek G. (Intern)
Examiner:
Trapp, Stefan (Intern)
Gumbau, Paloma Grau (Ekstern)
Vollertsen, Jes (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Modelling Illicit Drug Fate in Sewers for Wastewater-Based Epidemiology

NanoDen: Nanomaterial - Occurrence and effects in the Danish Environment
The overall objective of the project is to provide answers to whether nanomaterials might cause a risk to the Danish environment, and if so under which conditions. Further the project will generate some new knowledge in relation to the fate of nanomaterials in the environment, knowledge generated with the aim of improving the exposure estimations in the project. The project will aim at answering the questions related to emissions, environmental fate, exposure/concentrations, effects and risks of nanomaterials in the Danish environment with the aim of eventually providing answers in relation to the overall objective. This will include an eventual summarising presentation and discussion in sub-project 6 of assumptions and uncertainties, including methodological issues encountered throughout the project. The focus in the project will be on translating existing knowledge into the best possible estimations of risks of nanomaterials within the scope of the project.

Department of Environmental Engineering
Environmental Chemistry
FISCH4 – Fish Feed from Food Waste

Food waste represents a large fraction of total produced bio-waste and is composed of raw or cooked food materials generated before, during or after food preparation. It includes vegetable peelings, dairy leftovers products, meat trimmings, and spoiled or excess ingredients or prepared food. Although EU measures intend to prevent the wastage of food, waste treatment processes, such as Anaerobic Digestion (AD), are necessary to handle non-edible food waste. Implementation of AD for treating food waste in Europe has increased at a large pace. The overall objective of FISCH4 is the demonstration of a novel biotechnological process that converts food waste (especially of plant and dairy origin) into fish feed ingredients, using unpurified biogas (CH4, CO2, H2S) as intermediate. The two step process involves: (i) anaerobic digestion of food waste for biogas production, with a focus on process application and not on fundamental research and, (ii) biogas conversion by mixed methanotrophic/ heterotrophic/sulfidotrophic biomass (here referred as mixed biomass – MB), using unpurified biogas containing CO2, CH4 and H2S and the liquid fraction of the anaerobic digester effluent, as source of carbon, energy and nutrients (Figure 1). Although the methanotrophic reactor will be designed and operated to maximize the utilization of methane from the biogas, applying e.g. high pressure and biogas recirculation, there will be a fraction of remaining biogas that can be used for energy production. The concept is envisaged for large-scale biogas plants where the biogas and the liquid effluent can be pumped to a separate industrial unit for MB production. Biogas remaining unused in the biological process will be used for electricity/biogas production before upgrading. The co-production of energy will be evaluated through energy balances that will assess the possibility of turning the process energetically self-sufficient. Economic viability; environmental performance, including, but not limited to, low greenhouse gas (GHG) emissions over the complete life cycle (LC), and social acceptability, the three sets of criteria usually recognized as the tests for sustainability, will be assessed in the project. FISCH4 consortium gathers expertise on biotechnological processes, biogas processes, microbiology, food quality and safety, aquaculture and fisheries and environmental and social and economic life cycle assessment. The consortium of 7 academic and 4 SME from 6 European countries and one participant from India has the scientific, technical and management expertise to promote an efficient transfer of lab-scale results into a novel industrial product that will contribute for the development of the EU sustainable economy. Figure 1

Department of Environmental Engineering

Reactive nanomaterials for water purification

Department of Environmental Engineering

Project Manager, organisational:

Financial sources

Source: Unknown

Name of research programme: U Kendt

Amount: 0.00 Danish Kroner
Examiner:
Baun, Anders (Intern)
Dossi, Eleftheria (Ekstern)
Ranville, James (Ekstern)

Financial sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)

Relations
Publications:
Hybridized reactive iron-containing nano-materials for water purification
Project: PhD

Resource quality indicators: Concept and methodology development
Department of Environmental Engineering
Period: 01/12/2012 → 31/05/2014
Number of participants: 2
PhD Student:
Rørbech, Jakob Thaysen (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)

Financial sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Sustainable assessment of full chain bioenergy production
Department of Environmental Engineering
Period: 01/12/2012 → 05/04/2017
Number of participants: 9
PhD Student:
Saez de Bikuna Salinas, Koldo (Intern)
Supervisor:
Hauschild, Michael Zwicky (Intern)
Pilegaard, Kim (Intern)
Main Supervisor:
Ibrom, Andreas (Intern)
Examiner:
Damgaard, Anders (Intern)
Sin, Gürkan (Intern)
Damgaard, Anders (Intern)
Brandão, Miguel M. R. (Ekstern)
Cherubini, Francesco (Ekstern)

Financial sources
Source: Internal funding (public)
Name of research programme: Institut/centerfinansieret

Relations
Publications:
Enquiring into the roots of bioenergy - epistemic uncertainties in life cycle assessments
Project: PhD

Innovative biogas process for ammonia-rich wastes
Department of Environmental Engineering
Period: 01/11/2012 → 30/06/2016
Number of participants: 6
Phd Student:
Wang, Han (Intern)
Supervisor:
Fotidis, Ioannis (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Dechesne, Arnaud (Intern)
Norddahl, Birgir (Ekstern)
Schnürer, Anna Liselotte (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Kvantitativt potentiale for regnvandshåndtering
Department of Environmental Engineering
Period: 01/11/2012 → 10/12/2018
Number of participants: 3
Phd Student:
Lerer, Sara Maria (Intern)
Supervisor:
Arnberg-Nielsen, Karsten (Intern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Composition of waste materials and recyclables
Department of Environmental Engineering
Period: 01/10/2012 → 21/04/2016
Number of participants: 7
Phd Student:
Götze, Ramona (Intern)
Supervisor:
Boldrin, Alessio (Intern)
Scheutz, Charlotte (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Grosso, Mario (Ekstern)
Riber, Christian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Environmental assessment of biowaste management in the Danish-german border region
Department of Environmental Engineering
Period: 01/10/2012 → 21/04/2016
Number of participants: 6
Phd Student:
Jensen, Morten Bang (Intern)
Supervisor:
Møller, Jacob (Intern)
Main Supervisor:
Scheutz, Charlotte (Intern)
Examiner:
Boldrin, Alessio (Intern)
Hansson, Per-Anders (Ekstern)
Kirkeby, Janus Søgaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Fosfat-bioscavengers/biosensorer for osmotisk baseret detektion/ressource- genindvinding
Department of Environmental Engineering
Period: 01/10/2012 → 30/06/2016
Number of participants: 5
Phd Student:
Gruber, Mathias Felix (Intern)
Main Supervisor:
Hélix-Nielsen, Claus (Intern)
Examiner:
Plósz, Benedek G. (Intern)
Aurell, Erik (Ekstern)
Jensen, Mogens Høgh (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Informing groundwater models with airborne time-domain electromagnetic data
Department of Environmental Engineering
Period: 01/10/2012 → 30/06/2016
Number of participants: 6
Phd Student:
Marker, Pernille Aabye (Intern)
Supervisor:
Mosegaard, Klaus (Intern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Bjerg, Poul Legstrup (Intern)
Binley, Andrew (Ekstern)
Højberg, Anker Lajer (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Wastewater resource recovery via the Enhanced Biological Phosphorus Removal and Recovery (EBP2R) process coupled with green microalgae cultivation
Department of Environmental Engineering
Period: 01/10/2012 → 27/01/2016
Number of participants: 6
Phd Student: Valverde Pérez, Borja (Intern)
Supervisor: Smets, Barth F. (Intern)
Main Supervisor: Plósz, Benedek G. (Intern)
Examiner: Trapp, Stefan (Intern)
Oehmen, Adrian (Ekstern)
Villez, Kris (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)

Relations
Publications:
Used water resource recovery using green microalgae
Project: PhD

Projekt om afløb fra tagflader og befæstede arealer – vurdering af forureningsrisici for grundvand
Department of Environmental Engineering
Environmental Chemistry
Urban Water Engineering
Krüger A/S
Period: 27/09/2012 → 01/03/2013
Number of participants: 2
Acronym: Tag-risici
Project participant:
Eriksson, Eva (Intern)
Mikkelsen, Peter Steen (Intern)

Relations
Publications:
Afstrømning fra tagflader og befæstede arealer – Vurdering af forureningsrisici for grundvand
Project

Municipal organic waste management
Department of Environmental Engineering
Period: 15/09/2012 → 22/03/2016
Number of participants: 6
Phd Student: Naroznova, Irina (Intern)
Supervisor: Møller, Jacob (Intern)
Main Supervisor: Scheutz, Charlotte (Intern)
Examiner: Boldrin, Alessio (Intern)
La Cour Jansen, Jes (Intern)
Hansen, Trine Lund (Intern)

Financing sources
Source: Internal funding (public)
Algal biofilter optimization near fish farm

Department of Environmental Engineering
Period: 01/09/2012 → 29/02/2016
Number of participants: 6
Phd Student:
Silva Marinho, Goncalo (Intern)
Supervisor:
Holdt, Susan Levestad (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Karakashev, Dimitar Borisov (Intern)
Bruhn, Annette (Ekstern)
Stanley, Michele Suzanne (Ekstern)

Financing sources
Source: Internal funding (public)

Assessment of resource quality in waste management

Department of Environmental Engineering
Period: 01/09/2012 → 15/10/2013
Number of participants: 4
Phd Student:
Vyzinkarova, Dana (Intern)
Supervisor:
Hellweg, Stefanie (Ekstern)
Rechberger, Helmut (Ekstern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Internal funding (public)

Biomimetic polymeric membranes for water treatment

Department of Environmental Engineering
Period: 01/09/2012 → 15/12/2015
Number of participants: 7
Phd Student:
Habel, Joachim Erich Otto (Intern)
Supervisor:
Almdal, Kristoffer (Intern)
Geschke, Oliver (Intern)
Main Supervisor:
Hélix-Nielsen, Claus (Intern)
Examiner:
Ndoni, Sokol (Intern)
Arleth, Lise (Intern)
Bates, Frank (Ekstern)

Financing sources
Source: Internal funding (public)
Composition of municipal solid waste in Denmark

Department of Environmental Engineering
Period: 01/09/2012 → 01/09/2016
Number of participants: 6
Phd Student:
Edjabou, Maklawe Essonanawe (Intern)
Supervisor:
Scheutz, Charlotte (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Fischer, Christian (Ekstern)
Salhofer, Stefan (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Environmental Effects and Risk Evaluation of Engineered Nanoparticles - Ecotoxicity

Department of Environmental Engineering
Period: 01/09/2012 → 15/12/2015
Number of participants: 6
Phd Student:
Skjolding, Lars Michael (Intern)
Supervisor:
Selck, Henriette (Ekstern)
Main Supervisor:
Baun, Anders (Intern)
Examiner:
Hansen, Steffen Foss (Intern)
Banta, Gary Thomas (Ekstern)
Henry, Theodore B. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Quantification and critical analysis of resource flows in Denmark

Department of Environmental Engineering
Period: 01/09/2012 → 29/09/2016
Number of participants: 6
Phd Student:
Klinglmair, Manfred (Intern)
Supervisor:
Astrup, Thomas Fruergaard (Intern)
Main Supervisor:
Scheutz, Charlotte (Intern)
Examiner:
Ibrom, Andreas (Intern)
Binder, Claudia R. (Ekstern)
Kirkeby, Janus Søgaard (Intern)
Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Anthropogenic phosphorus flows in Denmark
Project: PhD

Waste material recycling: Assessement of contaminants limiting recycling
Department of Environmental Engineering
Period: 15/08/2012 → 01/09/2016
Number of participants: 6
Phd Student:
Pivnenko, Kostyantyn (Intern)
Supervisor:
Eriksson, Eva (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)
Examiner:
Hansen, Steffen Foss (Intern)
Dornack, Christina (Ekstern)
Riber, Christian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

An innovative process for simultaneous utilization of hydrogen and in-situ biogas upgrading
This project proposes an innovative process in which hydrogen produced by water electrolysis using excess electricity from wind mills, will be biologically converted by binding CO2 to CH4 in biogas reactors. Simultaneous H2 utilization and in-situ biogas upgrading will be achieved in such process, giving synergistic advantages for both wind mills and biogas plants. The effects of hydrogen on the biochemistry and microbiology of the process, and the technical solutions for improving hydrogen utilization in the biogas reactors will be studied in order to optimize the conversion of hydrogen to methane in biogas reactors. This idea of the current project has never been applied and it offers several advantages: (1) Contributes to cheaper upgrading cost of biogas due to low CO2 content in biogas; (2) Increased energy efficiency by full utilization of the wind mill capacity; (3) Possibility to control electricity production according to the energy demand variations.

Department of Environmental Engineering
Period: 01/07/2012 → 30/06/2015
Number of participants: 2
Project ID: 30954
Project participant:
Angelidaki, Irini (Intern)
Project Manager, organisational:
Luo, Gang (Intern)

Qualitative and Quantitative Methods for Evaluation of Human Exposure to Nanomaterials
Department of Environmental Engineering
Period: 01/06/2012 → 17/11/2016
Number of participants: 7
Phd Student:
Liguori, Biase (Intern)
Supervisor:
Hansen, Steffen Foss (Intern)
Jensen, Keld Alstrup (Ekstern)
Main Supervisor:
Baun, Anders (Intern)
Examiner:
Olsen, Stig Irving (Intern)
Riediker, Michael (Ekstern)
Tongeren, Martie Van (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Occupational Exposure Assessment of Nanomaterials using Control Banding Tools
Project: PhD

Sustainable Production and Utilization of Microalgae for industrial wastewater treatment

Department of Environmental Engineering
Period: 01/06/2012 → 30/08/2017
Number of participants: 7
Phd Student:
Podevin, Michael Paul Ambrose (Intern)
Supervisor:
Fotidis, Ioannis (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Zhang, Yifeng (Intern)
Zhang, Yifeng (Intern)
Schmidt, Jens Ejbye (Intern)
Schmidt, Jens Ejbye (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Microalgal biorefinery symbiosis: screening, production, and process analytical technology
Project: PhD

Energy-efficient, community-based water and wastewater-treatment systems for deployment in India

The overall aim of ECO-India is to design and develop innovative cost-effective solutions for community-based water- and wastewater-treatment systems. These systems will be deployed at pilot sites in arsenic-affected water-stressed regions in India. The two consortia, Indian (DST) and European (FP7), will establish pilot schemes for:

• Catchment area and reservoir management
• Surface water supply schemes
• Arsenic removal (including monitoring using UFZ’s field-tested Arsolux arsenic sensor)
• Disinfection treatment for potable water based on Trustwater's CE-certified mixed-oxidant generation systems.
• Online monitoring of water quality
• Water distribution network, together with online/offline water quality monitoring programmes
• Sewerage and wastewater treatment.

In addition, prototype energy-efficient modules for water deionisation and heavy metal removal will be developed. A feasibility study will be performed to assess the potential for energy harvesting from sludge.

Department of Environmental Engineering
Residual Resource Engineering
Aquatic toxicity testing for hazard identification of engineered nanoparticles

Department of Environmental Engineering
Period: 01/04/2012 → 30/06/2016
Number of participants: 7
Phd Student:
Sørensen, Sara Nørgaard (Intern)
Supervisor:
Hansen, Steffen Foss (Intern)
Lützhøft, Hans-Christian Holten (Ekstern)
Main Supervisor:
Baun, Anders (Intern)
Examiner:
Mayer, Philipp (Intern)
Kühnel, Dana (Ekstern)
Palmqvist, Annemette (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Modelling the Fate and Optimizing the Removal of Selected Xenobiotic Organic Micropolllutants from Point and Network Water Resources

Department of Environmental Engineering
Period: 01/04/2012 → 27/01/2016
Number of participants: 7
Phd Student:
Polesel, Fabio (Intern)
Supervisor:
Andersen, Henrik Rasmus (Intern)
Trapp, Stefan (Intern)
Main Supervisor:
Plösz, Benedek G. (Intern)
Examiner:
Eriksson, Eva (Intern)
Jeppsson, Ulf A. C. (Ekstern)
Johnson, David R. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Sustainable Production and Utilization of Microalgae

Department of Environmental Engineering
Period: 01/04/2012 → 21/04/2016
Number of participants: 6
Phd Student:
van Wagenen, Jonathan Myerson (Intern)
Supervisor:
De Francisci, Davide (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Karakashev, Dimitar Borisov (Intern)
Barbosa, Maria (Ekstern)
Eriksen, Niels Thomas (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Anvendelse af okker i Holbæk forsyning A/S
Ansøgning til VTU fonden om fuldskala afprøvning af anvendelse af okker internt i forsyningsselskabet.

Department of Environmental Engineering
Period: 01/02/2012 → 01/02/2013
Number of participants: 1
Acronym: PilotOkker
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Demonstrationsanlæg for Filtrering af vejvand for udledning til ferskvandsområde (DemFil).

Der opstilles et skivefilter demonstrationsanlæg til rensning af vejvand fra separat regnvandssystem ved Bagsværd Sø. Herved afskærres vejvandet fra fælleskloak-systemet som ledes til Lundtofte Renseanlæg. Oplandsstørrelse= 3,03 red. ha. Der testes over en periode på ca. 1 år, således at effektiviteten overfor et stort antal regnhændelser af forskellig varighed og intensitet kan klarlægges. Der fokuseres på få måleparametre, SS og turbiditet korreleres til øvrige relevante måleparametre. • Miljøforbedring: Belastning af recipienten med suspenderet stof, næringssalte, miljøfremmede stoffer og tungmetaller fra urenet spildevand og regnvand reduceres. • Klimatilpasning: Teknologien kan anvendes i forbindelse med frakobling af vejvand fra fællessystemer som led i reduktion af klimabetingede oversvømmelser. • Forsynings sikkerhed: Mere plads i fællessystemet, dvs. mindre risiko for oversvømmelser/overløb • Bæredygtighed: Der afprøves grøn polymer.

Department of Environmental Engineering
Period: 01/02/2012 → 01/09/2013
Number of participants: 4
Acronym: DemFil
Project participant:
Eriksson, Eva (Intern)
Mikkelsen, Peter Steen (Intern)
Nielsen, Katrine (Intern)
Mørch-Madsen, Andreas (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Relations
Publications:
Demonstrationsanlæg for Filtrering af vejvand for udledning til ferskvandsområde
Project
Modeling the impact of soakaways on urban water flooding

Department of Environmental Engineering
Period: 01/02/2012 → 29/02/2016
Number of participants: 8
Phd Student:
Locatelli, Luca (Intern)
Supervisor:
Ambjørg-Nielsen, Karsten (Intern)
Helwigh, Ole Mark (Ekstern)
Mikkelsen, Peter Steen (Intern)
Main Supervisor:
Binning, Philip John (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Stovin, Virginia (Ekstern)
Troldborg, Lars (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Forbedret Rensning Og Desinfektion af Overløbsvand (FRODO)

Department of Environmental Engineering
Period: 30/01/2012 → 30/01/2014
Number of participants: 3
Acronym: MoreDesiCSO
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Mikkelsen, Peter Steen (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Relations
Activities:
Design of Chemical Disinfection of Combined Sewer Overflows (CSO) by Peracetic Acid & Performic Acids
IP06 DesiCSO - Desinfektion af "Combined Sewer Overflow", CSO

Analysis of Requirments and Design og Epidemiological Studies in Cohorts og Nanomaterial Workers
Analysis of Requirments and Design og Epidemiological Studies in Cohorts og Nanomaterial Workers

Department of Environmental Engineering
Environmental Effects and Risk Evaluation of Engineered Nanoparticle

The objective of the project Environmental Effects and Risk Evaluation of Engineered Nanoparticles (EnvNano) is to elucidate the particle specific properties that govern the ecotoxicological effects of engineered nanoparticles and in this way shift the paradigm for environmental risk assessment of nanomaterials. While current activities in the emerging field of nano-ecotoxicology and environmental risk assessment of nanomaterials are based on the assumption that the methodologies developed for chemicals can be adapted to be applicable for nanomaterials, EnvNano has a completely different starting point: The behaviour of nanoparticles in suspension is fundamentally different from that of chemicals in solution. Therefore, all modifications of existing techniques that do not take this fact into account are bound to have a limited sphere of application or in the worst case to be invalid. By replacing the assumption of dissolved chemicals with a particle behaviour assumption, the traditional risk assessment paradigm will be so seriously impaired that a shift of paradigm will be needed. EnvNano is based on the following hypotheses: 1. The ecotoxicity and bioaccumulation of engineered nanoparticles will be a function of specific physical and chemical characteristics of the nanoparticles. 2. The environmental hazards of engineered nanoparticles cannot be derived from hazard identifications of the material in other forms. 3. Existing regulatory risk assessment procedures for chemicals will not be appropriate to assess the behaviour and potential harmful effects of engineered nanoparticles on the environment. These research hypotheses will be addressed in the four interacting research topics of EnvNano: Particle Characterization, Ecotoxicity, Bioaccumulation, and Framework for Risk Evaluation of Nanoparticles aimed to form the foundation for a movement from coefficient-based to kinetic-based environmental nanotoxicology and risk assessment. When successful, this will lead to significant changes in the way risk assessments of ENPs are performed. Thereby potential problematic ENPs may be identified at an early stage in the product development and safer alternatives may be found. In the light of the public concerns such knowledge is a prerequisite to a successful large-scale commercialization of nanotechnology.
Innovative biogas process for treating ammonia-rich wastes
One of the main causes for imbalance and low substrate utilization in Danish biogas plants is the high ammonia load. Ammonia is mainly inhibiting acetate-utilizing (acetoclastic) methanogens. There is however, another metabolic pathway, the acetate oxidation pathway, where acetate is oxidized by syntrophic acetate oxidizing bacteria (SAO) to hydrogen and carbon dioxide, followed by hydrogenotrophic methanogenesis, which is much less liable to ammonia inhibition. Up to now, six SAO bacteria have been identified and five of them were classified as acetogenic bacteria. Acetogenic SAO bacteria are following the reductive Wood-Ljungdahl pathway to produce acetate as basic end-product. Acetogenic SAO bacteria, under high ammonia conditions, use reversed Wood-Ljungdahl pathway to syntrophically convert acetate to methane in association with hydrogenotrophic methanogens. These findings are a strong indication that reversed Wood-Ljungdahl pathway of SAO bacteria has significant role in methanogenesis of high ammonia containing waste. In the current project we'll develop a new approach to avoid or counteract ammonia inhibition and optimize the anaerobic digestion of ammonia-rich wastes. The main objective of the project is to establish a process promoting acetate oxidation, for optimal digestion of ammonia rich waste. A pilot scale bioreactor digesting ammonia-rich wastes will implement, for further process development.

Project

Department of Environmental Engineering
Period: 01/01/2012 → 31/12/2015
Number of participants: 1
Acronym: SAO-Dom
Project participant: Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

KOMBI-cultivation: Integrated aquaculture of fish, seaweed, and mussels for feed and food
Projektets grundidé er at muliggøre en femdobling af havbrugsproduktionen i Danmark og sikre erhvervets internationale konkurrencedygtighed uden at belaste vandmiljøet med kvælstof (N), samtidig med at der udvikles et forretningsområde baseret på produktion af tang til konsum og muslinger til foder.

Department of Environmental Engineering
Period: 01/01/2012 → 31/03/2015
Number of participants: 1
Acronym: KOMBI-cultivation
Project participant: Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Regn med kvalitet
Håndtering af danske byers regnafstrømning ved hjælp af lokale løsninger kan gøre byerne klimarobuste og samtidig potentielt øge hertilhedsværdierne og forbedre vandafvandsslæbet. En stor udfordring er i midlertidig at forurenende stoffer tildøbt vores vandmiljø med regnafstrømning fra befaestede areaer af mange opfattes som en alvorlig forureningskilde til grundvand og overfladeranker. Dette komplicerer beslutninger om lokal håndtering af regnafstrømning, og afslører reel manglende viden og manglende (dokumenterede) løsninger. Spørgsmålet er hvordan vi sikrer os, at regnafstrømningen overholder relevante kvalitetskrav, således at vi ved denne praksis ikke skader hverken grundvand eller andre vandrecipienter? Formålet med nærværende projekt er gennem en række skarpe aktiviteter og produkter at løfte hele sektoren, inklusive de centrale myndigheder, på området håndtering af regnafstrømningens kvalitet, i forhold til vurdering af risiko, for overblik over metoder til rensning, og grundlag for udlednings- og nedsivningstilladelser.

Department of Environmental Engineering
Environmental Chemistry
Period: 01/01/2012 → 01/07/2014
Number of participants: 6
Acronym: Regnkval
Space technology for water management
Floods and droughts are among the most dangerous and costly natural hazards. Within just the past 12 months, catastrophic floods have affected Pakistan, Brazil and Australia, while extreme drought is presently threatening China’s grain harvest and causing a global food price hike. The aim of HydroSpace is to significantly improve the real-time forecasting of extreme hydrological events at regional scales by combining new space-borne earth observation data with advanced numerical simulation models. HydroSpace results will support management of water-related hazards and will provide the technology for a global hydrological forecasting and early warning system.

Department of Environmental Engineering
Period: 01/01/2012 → 31/12/2015
Number of participants: 1
Acronym: Hydrospace
Project Manager, organisational:
Bauer-Gottwein, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

SvømSundt
Innovationskonsortio om teknik til konstruktion af sundere svømmehaller

Department of Environmental Engineering
Period: 01/01/2012 → 01/01/2015
Number of participants: 1
Acronym: SvømSundt
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

The MacroAlgae Biorefinery
The MacroAlgae Biorefinery

Department of Environmental Engineering
Period: 01/01/2012 → 31/12/2015
Number of participants: 2
Acronym: MAB
Project participant:
Angelidaki, Irini (Intern)
Karakashev, Dimitar Borisov (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Kombinationsopdræt af havbrugfisk, tang, muslinger til foder og konsum

National Food Institute
Research Group for Bioactives – Analysis and Application
Department of Environmental Engineering
Residual Resource Engineering
Period: 15/12/2011 → 01/04/2015
Number of participants: 3
Acronym: Kombio프라트
Project participant:
Holdt, Susan Løvstad (Intern)
Silva Marinho, Goncalo (Intern)
Angelidaki, Irini (Intern)

Financing sources
Source: Public research programme (public)
Name of research programme: GUDP
Amount: 14,600,000.00 Danish Kroner
Project

Biorefinery
Department of Environmental Engineering
Period: 15/12/2011 → 26/01/2015
Number of participants: 6
Phd Student:
Gunnarsson, Ingólfr Bragi (Intern)
Supervisor:
Karakashov, Dimitar Borisov (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Dechesne, Arnaud (Intern)
Norddahl, Birgir (Ekstern)
Verstraete, Willy (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Characterisation and treatment of nano-sized and colloidal xenobiotic pollution in stormwater
Department of Environmental Engineering
Period: 15/12/2011 → 02/09/2015
Number of participants: 7
Phd Student:
Nielsen, Katrine (Intern)
Supervisor:
Baun, Anders (Intern)
Stromvall, Ann-Margret (Ekstern)
Main Supervisor:
Eriksson, Eva (Intern)
Examiner:
Lützhøft, Hans-Christian Holten (Ekstern)
Holm, Peter Engelund (Intern)
Viklander, Maria (Ekstern)
Integrated environmental and economical assessment of waste management systems

Department of Environmental Engineering
Period: 15/12/2011 → 22/03/2016
Number of participants: 5
Phd Student:
Martinez Sanchez, Verónica (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)
Examiner:
Rygaard, Martin (Intern)
Eriksson, Ola Norman (Ekstern)
Herczeg, Márton (Ekstern)

Occurrence and degradation of contaminants at the groundwater surface water interface

Department of Environmental Engineering
Period: 15/12/2011 → 29/02/2016
Number of participants: 7
Phd Student:
Brauns, Bentje (Intern)
Supervisor:
Jakobsen, Rasmus (Intern)
Song, Xianfang (Ekstern)
Main Supervisor:
Bjerg, Poul Løgstrup (Intern)
Examiner:
Albrechtsen, Hans-Jørgen (Intern)
Holm, Peter Engelund (Intern)
Liu, Suxia (Ekstern)

Resistance to gene flow in soil microbial communities

Department of Environmental Engineering
Period: 15/12/2011 → 02/09/2015
Number of participants: 6
Phd Student:
Klümper, Uli (Intern)
Supervisor:
Dechesne, Arnaud (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Albrechtsen, Hans-Jørgen (Intern)
Graham, David W. (Ekstern)
Rensing, Christopher (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Groundwater resources of the Barotse Sub-basin in the Western Province of Zambia

Department of Environmental Engineering
Period: 01/12/2011 → 01/07/2015
Number of participants: 8
Phd Student:
Chongo, Mkhuzo (Intern)
Supervisor:
Christiansen, Anders Vest (Ekstern)
Larsen, Flemming (Intern)
Njambe, Imasiku (Ekstern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Binning, Philip John (Intern)
Auken, Esben (Intern)
Dahlin, Torleif (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Intelligent Barriers: Management of Microbial Activity in Groundwater Extraction Wells for Pesticide Attenuation

Department of Environmental Engineering
Period: 01/12/2011 → 12/09/2016
Number of participants: 6
Phd Student:
Papadopoulou, Aikaterini (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Andersen, Henrik Rasmus (Intern)
Aamand, Jens (Ekstern)
Springael, Dirk (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Origin and sustainable use of fresh groundwater in Western Zambia

Department of Environmental Engineering
Period: 01/12/2011 → 23/09/2015
Number of participants: 8
Phd Student:
Banda, Kawawa Eddy (Intern)
Supervisor:
Jakobsen, Rasmus (Intern)
Larsen, Flemming (Intern)
Nyambe, Imasiku (Ekstern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Rolle, Massimo (Intern)
Post, Vincent E.A. (Ekstern)
Postma, Diederik Jan (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

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**The role of micro-niches and chemical gradients for the degradation of contaminants in groundwater**

Department of Environmental Engineering
Period: 01/12/2011 → 02/09/2015
Number of participants: 7
Phd Student:
Pedersen, Lasse (Intern)
Supervisor:
Dechesne, Arnaud (Intern)
Jakobsen, Rasmus (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Binning, Philip John (Intern)
Brandt, Kristian K. (Ekstern)
Tebbe, Christoph (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

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**Eco-toxicity of Engineered Nanoparticles - Towards Standardized Procedures for Hazard Assessment**

Department of Environmental Engineering
Period: 15/11/2011 → 01/07/2015
Number of participants: 6
Phd Student:
Cupi, Denisa (Intern)
Supervisor:
Hartmann, Nanna B. (Intern)
Main Supervisor:
Baun, Anders (Intern)
Examiner:
Lützhoft, Hans-Christian Holten (Ekstern)
Joner, Erik Jautris (Ekstern)
Winther-Nielsen, Margrethe (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

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**Risk Management of Climate Extremes in an Urban Environment**

Department of Environmental Engineering
Increased removal of the priority substances under the EU Water framework directive by enhanced biological treatment using mobile carriers.
Can the removal of PS and PHS be increased using mobile carriers, and if so, what benefit has this on the sludge quality.

Department of Environmental Engineering
Period: 01/11/2011 → 30/06/2012
Number of participants: 2
Acronym: 1178
Project participant: Olsson, Mikael Emil (Intern)
Project Manager, organisational: Eriksson, Eva (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project
New processes in anoxic groundwater systems: the anaerobic oxidation of ammonia (anammox)

Department of Environmental Engineering
Period: 01/11/2011 → 31/08/2013
Number of participants: 3
Phd Student:
Uldahl, Anne Graham (Intern)
Supervisor:
Jakobsen, Rasmus (Intern)
Main Supervisor:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Internal funding (public)

Project:
PhD

Redegørelse om sundhedseffekter af blødgøring spesielt med fokus på caries


Department of Environmental Engineering
Period: 15/10/2011 → 01/02/2012
Number of participants: 2
Acronym: sundhedseffekter - caries
Project participant:
Albrechtsen, Hans-Jørgen (Intern)

Project Manager, organisational:
Rygaard, Martin (Intern)

Financing sources
Source: Unknown

Does spreading of digested sludge on agricultural land generate an increase in the levels of organic pollutants in soil and crop?

Pre-screening of accumulation of organic pollutants in soil and crops in Southern Sweden (Malmö). The DTU contribution consists of application of “CHIAT : Chemical hazard identification and assessment tool for selection of priority pollutants”

Department of Environmental Engineering
Lund Institute of Technology
Period: 01/10/2011 → 31/03/2012
Number of participants: 2
Acronym: CHIAT-Sludge
Project participant:
Eriksson, Eva (Intern)
Hörning, Maritha (Intern)

Financing sources
Source: Unknown
**Sustainable Remediation**

Development of tool for assessment of sustainability of remediation projects

- **Department of Environmental Engineering**
  - **Period:** 01/10/2011 → 31/12/2013
  - **Number of participants:** 3
  - **Acronym:** SustRem
  - **Project ID:** 30877
  - **Project participant:**
    - Binning, Philip John (Intern)
    - Søndergaard, Gitte Lemming (Intern)
  - **Project Manager, organisational:**
    - Bjerg, Poul Legstrup (Intern)

**Financing sources**

- **Source:** Sam.arb.aftaler - Amter og kommuner
- **Name of research programme:** Ukendt
- **Amount:** 611,000.00 Danish Kroner

**Vandkvalitet og terminologi for alternativ vandforsyning; Rammeaftale Fremtidens vandhåndtering i storbyer**


- **Department of Environmental Engineering**
  - **Period:** 01/10/2011 → 30/03/2012
  - **Number of participants:** 2
  - **Acronym:** terminologi
  - **Project participant:**
    - Albrechtsen, Hans-Jørgen (Intern)
  - **Project Manager, organisational:**
    - Rygaard, Martin (Intern)

**Financing sources**

- **Source:** Unknown
- **Name of research programme:** Ukendt
- **Amount:** 0.00 Danish Kroner

**Managing flow equalised storm- and wastewater**

Department of Environmental Engineering  
**Period:** 01/09/2011 → 31/08/2014  
**Number of participants:** 3  
**Acronym:** MagiqStorm  
**Project participant:**  
Mikkelsen, Peter Steen (Intern)  
Trapp, Stefan (Intern)  
**Project Manager, organisational:**  
Lützhøft, Hans-Christian Holten (Intern)  

**Financing sources**  
**Source:** Unknown  
**Name of research programme:** Uksendt  
**Amount:** 0.00 Danish Kroner  

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**Resource Recovery from Waste Incineration Bottom Ashes**  
Department of Environmental Engineering  
**Period:** 01/09/2011 → 19/12/2014  
**Number of participants:** 6  
**Phd Student:**  
Allegrini, Elisa (Intern)  
**Supervisor:**  
Boldrin, Alessio (Intern)  
**Main Supervisor:**  
Astrup, Thomas Fruergaard (Intern)  
**Examiner:**  
Kjeldsen, Peter (Intern)  
Grosso, Mario (Ekstern)  
Hjelmar, Ole (Ekstern)  

**Financing sources**  
**Source:** Internal funding (public)  
**Name of research programme:** Eksternt finsieret virksomhed  

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**Using hydro-economic modelling to support water resources and water quality management in China**  
Department of Environmental Engineering  
**Period:** 01/09/2011 → 01/07/2015  
**Number of participants:** 8  
**Phd Student:**  
Davidsen, Claus (Intern)  
**Supervisor:**  
Liu, Suxia (Ekstern)  
Mo, Xingguo (Ekstern)  
Rosbjerg, Dan (Intern)  
**Main Supervisor:**  
Bauer-Gottwein, Peter (Intern)  
**Examiner:**  
Rygaard, Martin (Intern)  
Jia, Shaofeng (Ekstern)  
Tilmant, Amaury (Ekstern)  

**Financing sources**  
**Source:** Internal funding (public)  
**Name of research programme:** Institut stipendie (DTU) Samf.  

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Virkemidler til sikker anvendelse af nanomaterialer.
Projektet tilvejebringer ny og mere nuanceret viden om de grundlæggende behov for vejledning og virkemidler på dette område. I regeringens udspil til en ny arbejdsmiljøstrategi frem mod 2020 er der lagt op til en prioritering af et nanovidencenter med fokus på arbejdsmiljø. Indeværende projekt skaber ligeledes indput til relevante aktiviteter og tiltag under denne satsning. Projekts forventes yderligere at give viden om virksomhedernes indsamling og prioritering af arbejdsmiljørelevant viden, som kan være gavnlig inden for andre risikområder præget af videnskabelig usikkerhed og sparsom regulerings.

Department of Environmental Engineering
Period: 01/08/2011 → 31/12/2012
Number of participants: 1
Acronym: VirkNano
Project Manager, organisational: 
Baun, Anders (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,367,523.00 Danish Kroner

Chemical options for desinfection of combined sewer overflows
(Kemisk desinfektion af kloakoverløb)

Department of Environmental Engineering
Urban Water Engineering
Period: 01/07/2011 → 31/12/2012
Number of participants: 6
Acronym: DesiCSO
Project ID: 30879
Project participant:
Eriksson, Eva (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Mikkelsen, Peter Steen (Intern)
Sharma, Anitha Kumari (Intern)
Chhetri, Ravi Kumar (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Relations
Activities:
Design of Chemical Disinfection of Combined Sewer Overflows (CSO) by Peracetic Acid & Performic Acids
IP06 DesiCSO - Desinfektion af "Combined Sewer Overflow", CSO

CenteR for Environmental and Agricultural Microbiology
Collaborative research project that aims at identifying barriers to microbial degradation of pesticides and antibiotics in agricultural soils and at identifying mechanisms underpinning to the spread of antibiotic resistance genes and resistant organism in this type of systems.

Department of Environmental Engineering
Period: 01/06/2011 → 31/05/2014
Number of participants: 2
Acronym: CREAM2
Project ID: 30817
Project participant:
Heat Storage in Hot aquifers
Department of Civil Engineering
Section for Geotechnics and Geology
Center for Energy Resources Engineering
Department of Environmental Engineering
Period: 01/06/2011 → 31/05/2014
Number of participants: 3
Phd Student:
Rosenbrand, Esther (Intern)
Supervisor:
Kjøller, Claus (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)

Investigating the feasibility of phytoremediation and phytoscreening
Department of Environmental Engineering
Period: 01/06/2011 → 01/07/2015
Number of participants: 7
Phd Student:
Nielsen, Mette Algreen (Intern)
Supervisor:
Broholm, Mette Martina (Intern)
Mayer, Philipp (Intern)
Main Supervisor:
Trapp, Stefan (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Burken, Joel Gerard (Ekstern)
Larsen, Morten (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Ukendt
Amount: 3,000,000.00 Danish Kroner
Project

AFATEK
Det er samarbejdssamtalens formål at udarbejde en miljøvurdering af nye teknikker til sortering af slagger hos AFATEK. Forskningen ligger inden for følgende fagområde: Livscyklusvurdering af sortering af slagger fra affaldsforbrændingsanlæggenæ under AFATEK baseret på nye sorteringsmekanikker: 1 project management 2 recovery of metals 3 recovery of minerals 4 product development and applications 5 environment and economy

Department of Environmental Engineering
Period: 17/05/2011 → 31/12/2014
Number of participants: 1
Acronym: AFATEK
Project ID: 30875
Project Manager, organisational:
Astrup, Thomas Fruergaard (Intern)

**Financing sources**
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 1,570,000.00 Danish Kroner

**AV Miljø Deponeringsanlæg**
Det er samarbejdsaftalens formål af gennemføre et pilotstudie for benyttelse af biocover metoden til reduktion af metanimission fra AV Miljøs deponeringsanlæg

Department of Environmental Engineering
Period: 01/05/2011 → 15/12/2012
Number of participants: 1
Acronym: Biocover AV Miljø
Project ID: 30855
Project Manager, organisational:
Kjeldsen, Peter (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 882,000.00 Danish Kroner

**Bayesian methods for uncertainty analysis of extremes based on multi-model techniques**

Department of Environmental Engineering
Period: 01/04/2011 → 27/08/2014
Number of participants: 6
Phd Student:
Sunyer Pinya, Maria Antonia (Intern)
Supervisor:
Rosbjerg, Dan (Intern)
Main Supervisor:
Arnbjerg-Nielsen, Karsten (Intern)
Examiner:
Binning, Philip John (Intern)
Kilsby, Chris (Ekstern)
Refsgaard, Jens Christian (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

**Heat Storage in Hot Aquifers**

Department of Civil Engineering
Section for Geotechnics and Geology
Center for Energy Resources Engineering
Department of Informatics and Mathematical Modeling
Scientific Computing

Department of Environmental Engineering
Period: 01/03/2011 → 28/02/2012
Number of participants: 4
Project participant:
Mosegaard, Klaus (Intern)
Managing Risks of NanoMATERIALS
MARINA will address the four central themes: Materials, Exposure, Hazard, and Risk and develop beyond-state-of-the-art referential tools and integrate them for both human health and environment.

Department of Environmental Engineering
Period: 01/03/2011 → 28/02/2015
Number of participants: 3
Acronym: MARINA
Project ID: 30860
Project participant:
Hansen, Steffen Foss (Intern)
Hartmann, Nanna B. (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Ukendt
Amount: 2,115,000.00 Danish Kroner

Microbiologically coupled Fe-oxide reduction and methanogenesis – a new type of microbial consortium
Frigivelsen af CH4 (metan) og forekomsten af opløst Fe og CH4 har betydning for både klima, vandmiljø og vandforsyningen. Mikrobiel omsætning af organisk stof ved redoxprocesser sker overordnet i en sekvens: O2->O(-II), nitrat->N(0), Mn-oxid->Mn(II), Fe-oxid->Fe(II), sulfat->S(-II) og CO2->CH4, hvorved mikroorganismene kan udnytte energien bundet i det organiske stof. Der er mange modifikationer til dette forenklede billede. Fe(II) og S(-2) dannet fra Fe-oxid og sulfat bruges som elektron donor ved reduktion af nitrat, ligesom CH4 kan indgå som elektron donor for sulfat reduktion i et særligt samspil mellem bestemte mikroorganismer. Udgangspunktet for dette projekt er at flere undersøgelser tyder på at der kan opstå en anden type relation, i form af en samtidig reduktion af Fe-oxid og dannelse af methan. En faktor der kan betinget dette er at nogle Fe-oxid er så stabile at det kræver meget reducerede forhold, som dem man finder ved methandannelse, for at de overhovedet kan reduceres. De parallelt løbende processer giver mulighed for en ny type konsortium af mikroorganism som udnytter at når de to processer foregår samtidig, så vil produkterne i form af uorganisk kulstof (carbonat) og opløst Fe(II) fjerne som FeCO3 (siderit) så den energi der kan opnås ved reaktionen forbliver høj. Det er endda muligt at mikroorganismene selv medierer udfældningen af siderit. Interaktionen kan have stor betydning for methanproduktionen i rismarker, en vigtig klimakomponent, for biogas dannelse udfra slam tilsat Fe-oxid med henblik på fosfat fjernelse, for anarobe drikkevandsforekomster med methan og Fe - herunder den frigivelse af arsen fra Fe-oxid som foregår i sådanne systemer i SØ-Asien hvor > 50 mill mennesker forgiftes af deres drikkevand.
exponeringstider 2-2,5 timmar ger signifikant sämre hygieniserings än rötning vid längre exponeringstid (6h). Rötning vid 35 °C utförs parallellt med de andra testerna för att användas som referens. Inom projektet utvärderas om utrötningsning och metanproduktion ger så mycket energivinster att rötning vid högre temperatur kan motiveras. Nedbrytning av läkemedel och andra industriemikalier kan även utvärderas parallellt i en separat del av projektet (del 2).

Department of Environmental Engineering

Lund Institute of Technology
Period: 01/02/2011 – 01/04/2012
Number of participants: 1
Acronym: 1174
Project ID: 30814
Project Manager, organisational:
Eriksson, Eva (Intern)

Financing sources
Source: Samarb.-aftaler - Udenlandske offentlige og private
Name of research programme: Ukendt
Amount: 82,000.00 Danish Kroner

Relations
Publications:
Rötning av avloppsslam vid 35, 55 och 60 °C

Project

Risk based design in a changing climate
The main objective of the RiskChange project is to establish a consistent scientifically-based framework for risk-based design of critical infrastructure that includes state-of-the-art knowledge of projected changes in climate extremes.

Department of Environmental Engineering
Period: 03/01/2011 – 31/12/2014
Number of participants: 2
Acronym: RiskChange
Project ID: 30809
Project participant:
Rosbjerg, Dan (Intern)
Arnbjerg-Nielsen, Karsten (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 2,616,480.00 Danish Kroner

Risk-based design in a changing climate
The main objective of the RiskChange project is to establish a consistent scientifically-based framework for risk-based design of critical infrastructure that includes state-of-the-art knowledge of projected changes in climate extremes.

Department of Management Engineering
Systems Analysis
DTU Climate Centre
Energy Systems Analysis
Department of Environmental Engineering

Urban Water Engineering
Period: 01/01/2011 – 31/12/2014
Number of participants: 5
climate change adaptation, climate risk, extreme events, infrastructure
Acronym: RiskChange
Project participant:
Gregg, Jay Sterling (Intern)
Halsnæs, Kirsten (Intern)
Kaspersen, Per Skougaard (Intern)
Åström, Helena Lisa Alexandra (Intern)
Ambjerg-Nielsen, Karsten (Intern)

**Biological removal of iron and manganese in rapid sand filters - Process understanding of iron and manganese removal**

Department of Environmental Engineering  
Period: 01/01/2011 → 15/12/2013  
Number of participants: 3  
Phd Student: Lin, Katie (Intern)  
Supervisor: Smets, Barth F. (Intern)  
Main Supervisor: Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Institut stipendie (DTU) Samf.  
Project: PhD

**From surveillance to risk management – Risk management in the water supply**  
The goal of the project is to develop and implement risk management as part of the climate change adaptation strategy in the water supply.

Department of Environmental Engineering  
Department of Systems Biology  
Urban Water Engineering  
Period: 01/01/2011 → 31/12/2013  
Number of participants: 6  
Acronym: RiskStyr-VF  
Project ID: 30850  
Project participant: Corfitzen, Charlotte B. (Intern)  
Ambjerg-Nielsen, Karsten (Intern)  
Larsen, Sille Lyster (Intern)  
Rygaard, Martin (Intern)  
Christensen, Sarah Christine Boesgaard (Intern)  
Project Manager, organisational: Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**  
Source: Forskningsrådene - Andre  
Name of research programme: Ukendt  
Amount: 1,150,000.00 Danish Kroner

**Relations**  
Publications: Erfaringsopsamling af vandforsyningers læring i relation til Dokumenteret Drikkevandssikkerhed, monitering ogforureningssituationer

**Future water management in big cities**  
Large cities (>200 000 inhabitants) are facing a range of challenges in managing the urban water cycle. Climate change, EU Water Framework Directive, over-exploited groundwater resources and pollution makes it increasingly difficult to manage the urban water infrastructure development. This collaboration is a framework for the development of tools and methods for enlightened decision making in urban water management.

Department of Environmental Engineering
Period: 01/01/2011 → 31/12/2015
Number of participants: 2
Acronym: FVS
Project participant:
Rygaard, Martin (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Uendt
Amount: 0.00 Danish Kroner
Project

LCA model for sewage sludge - an EASEWASTE extension
Department of Environmental Engineering
Period: 01/01/2011 → 19/12/2014
Number of participants: 6
Phd Student:
Yoshida, Hiroko (Intern)
Supervisor:
Christensen, Thomas Højlund (Intern)
Main Supervisor:
Scheutz, Charlotte (Intern)
Examiner:
Damgaard, Anders (Intern)
Jönsson, Håkan (Ekstern)
Hansen, Trine Lund (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Microbial Ecological Investigation of Rapid Sand Filtration
Department of Environmental Engineering
Period: 01/01/2011 → 05/11/2014
Number of participants: 6
Phd Student:
Gülay, Arda (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Bælum, Jacob (Intern)
Schramm, Andreas (Ekstern)
Sloan, William T. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Activities:
DNA and RNA SIP reveal nitrifiers in groundwater fed biofilters
DNA and RNA SIP reveal ammonium and nitrite oxidizers in groundwater fed biofilters
Project: PhD
Model-based analysis and optimization of biological rapid sand filters at pilot and full scale

Department of Environmental Engineering
Period: 01/01/2011 → 05/11/2014
Number of participants: 8
Phd Student:
Lee, Carson Odell (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Boe-Hansen, Rasmus (Intern)
Smets, Barth F. (Intern)
Main Supervisor:
Binning, Philip John (Intern)
Examiner:
Plósz, Benedek G. (Intern)
Rietveld, Louis Cornelis (Ekstern)
Roslev, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Molecular and Microbial Analysis of Nitritation/Anammox Aggregates towards Optimization of Autotrophic Nitrogen Removal in Membrane Bioreactors

Department of Environmental Engineering
Period: 01/01/2011 → 27/05/2015
Number of participants: 6
Phd Student:
Mutlu, A. Gizem (Intern)
Supervisor:
Sin, Gürkan (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Plósz, Benedek G. (Intern)
Joss, Adriano (Ekstern)
Wilén, Britt-Marie (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Recirculation technology for future aquaculture (REFA) (38843)
An Innovation Consortia with many industrial partners. In the project, basic and applied research was performed by several partners to support the development of new and energy-efficient technologies for recirculation systems.

Some of the research issues were:
- to develop new filter technologies and energy-efficient aeration systems
- to develop process- and CFD models to improve our understanding and insight into dynamic variation in water quality parameters
- to determine the importance of particulate matter for biofilter operation (this was the DTU Aqua research package)
- to develop tools and instruments for advanced regulation and control of recirculating aquaculture systems
- to develop technologies for waste management

Twelve larger Danish companies were further partners in this project.

The project was coordinated by Danish Hydraulic Institute, Denmark.
The project was funded by the Danish Agency for Science, Technology and Innovation and the participating companies.

Department of Environmental Engineering
National Institute of Aquatic Resources
Section for Aquaculture
DHI Denmark
Aalborg University
Period: 01/01/2011 → 31/03/2015
Number of participants: 3
Research area: Aquaculture
Project participant:
Pedersen, Lars-Flemming (Intern)
Fernandes, Paulo (Intern)
Project Manager, academic:
Pedersen, Per Bovbjerg (Intern)

**Remediation stop criteria**

DTU will address the major NorthPestClean project aim of developing measurable remediation stop criteria for the cleanup of Høfde 42 based on risk assessments of the site. Specifically, DTU will provide: 1) A risk assessment for the site including i) an assessment of the post cleanup contaminant flux leaching from the site ii) an assessment of the transport pathways to the downstream receptor, here defined to be the North Sea iii) An assessment of the PEC (Predicted Environmental Concentration). PNEC (predicted No Effect Concentration) values in the North Sea and ecological assessments will be based on existing information. 2) Recommendations for remediation stop criteria for the site. These criteria will be based on the risk assessment and will define how to assess when acceptable cleanup of the site has been achieved. Points of compliance will be identified and the relevant measurement/reporting parameters defined. The points of compliance are the locations and times at which to monitor remediation outcomes.

Department of Environmental Engineering
Period: 01/01/2011 → 31/12/2013
Number of participants: 3
Acronym: NorthPestClean
Project ID: 30851
Project participant:
Kusk, Kresten Ole (Intern)
Bjerg, Poul Løgstrup (Intern)
Project Manager, organisational:
Binning, Philip John (Intern)

**Financing sources**

Source: Unknown
Name of research programme: Udkendt
Amount: 300,000.00 Danish Kroner

**Samarbejdsaftale om Samfinansieret forskning 2010-2013 med Region Hovedstaden, Koncern Miljø**

Delprojekt nr. 1: Optimering af termiske oprensingsmetoder. (termisk) Delprojekt nr. 2: Konceptuel model udvikling for vurdering/bestemmelse af DNAPL på basis af fultundersøgelses. (DNAPL)

Department of Environmental Engineering
Period: 01/01/2011 → 31/12/2013
Number of participants: 1
Acronym: DNAPL; termisk
Project ID: 30854
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

**Financing sources**

Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Udkendt
Amount: 0.00 Danish Kroner
**Tailored Improvement of Brownfield Regeneration in Europe**

Brownfield regeneration is essential for sustainable land management in European Member States. Currently, the success in brownfield regeneration is unsatisfying in terms of financial and eco-efficiency or social acceptance. Many useful and innovative technologies site clean-up as well as methods to support decision making processes exist, but they are only rarely applied using their full potential. An immense diversification of tools with little connection to each other as well as a lack of consideration of regional and cultural specificities deters end-users from application. Sometimes the non-visibility of tools is the reason that problem owners, managers, local authorities and other stakeholders do not regenerate brownfields using the best technology available. Additionally, emerging challenges, such as the urgent demand for soil remediation and the reuse of on-site infrastructures, call for the development of new and integrated solutions. This project will overcome existing barriers to brownfield regeneration by developing and providing customised problem- and target-oriented packages of approaches, technologies and tools. As a unique asset, these packages deliberately include the cultural and administrative characteristics and their regionally distinctive features. By providing a customisable toolbox specifically addressing the diverse processes that have to be dealt with during the course of a regeneration project, end-users will be enabled to find best practice based solutions. Improvement of existing means to support brownfield regeneration will be further accomplished by filling methodological core topics such as intelligent remediation in terms of technological advancements with regard to phytoremediation and partial source removal technologies. The project will deliver a tailored training and dissemination programme as part of an information centre that will transfer existing and emerging knowledge to the scientific community and end-users.

Department of Environmental Engineering  
**Period:** 01/01/2011 → 30/06/2014  
**Number of participants:** 1  
**Acronym:** TIMBRE  
**Project ID:** 30807  
**Contact person:** Rein, Arno (Intern)

**Financing sources**  
**Source:** Forsk. EU - Rammeprogram  
**Name of research programme:** Ukendt  
**Amount:** 2,400,000.00 Danish Kroner  
**Project**

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**Reducing uncertainty in future extreme precipitation**

Department of Environmental Engineering  
**Period:** 15/12/2010 → 19/12/2014  
**Number of participants:** 7  
**Phd Student:** Sørup, Hjalte Jomo Danielsen (Intern)  
**Supervisor:** Ambjerg-Nielsen, Karsten (Intern)  
**Main Supervisor:** Mikkelsen, Peter Steen (Intern)  
**Examiner:** Binning, Philip John (Intern)  
Jonas, Olsson (Ekstern)  
Thorndahl, Søren (Ekstern)

**Financing sources**  
**Source:** Internal funding (public)  
**Name of research programme:** Forskningsrådsfinansiering  
**Project:** PhD

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**Innovationskonsortiet: Byer i Vandbalance**

Konsortiets formål er at forbedre danske byers vandbalance og at styrke danske virksomheders position på det internationale marked for klimatilpasning og bæredygtig forvaltning af ferskvandsressourcen, ved 1. at udvikle et koncept for urbane vandsystemer (drikkevand, spildevand, naturlige vandelementer), der opererer på deloplandsniveau, og som imødekommer den universelle ideal-situation karakteriseret i Figur 1, for hvilken det gælder a. at byen ikke overudnytter sit hydrologiske opland, b. at byen ikke belaster det omgivende miljø med miljøskadelige stoffer, samt Figur 1: Når den aktuelle danske dagsorden (venstre cirkel) sammenholdes med den dominerende globale dagsorden (højre cirkel) for
urban vandhåndtering, ses der at være et skalamæssigt stort spænd i udfordringernes omfang, men et interessant sammenfald hvad angår temaer. Dette kan udnyttes til at definere en række fælles målsætninger under overskriften byer i vandbalance, repræsenterende værdiskabelser af relevans på begge skaler og for både danske og udenlandske markeder. c. at byen etablerer en stærk grøn struktur i og omkring byen til håndtering af vandkredsløbet, dæmpning af klimaforandringer, understøttelse af biodiversitet, og som element i byboernes velbefindende 2. at efterprøve tilhørende systemteknologier i fysiske 1:1 anlæg for følgende udvalgte aspekter

Department of Environmental Engineering
Period: 10/12/2010 → 31/12/2014
Number of participants: 2
Acronym: Byer i Vandbalance
Project ID: 30844
Project participant: 
Binning, Philip John (Intern)
Project Manager, organisational: 
Binning, Philip John (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Resins for disinfection of drinking water
SafeWater APS develops new surfaces for disinfection of drinking water. The project will develop protocols for test and documentation of effects of new surfaces at three levels. Test protocols will be used to investigate surfaces in the development process.

Department of Environmental Engineering
Number of participants: 2
Acronym: REDD
Project ID: 30811
Project participant: 
Corfitzen, Charlotte B. (Intern)
Project Manager, organisational: 
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 74,475.00 Danish Kroner
Project

DUC EOR Feasibility
chalk and shale characterization for CO2 injection experiments.

Department of Environmental Engineering
Period: 01/11/2010 → 31/12/2011
Number of participants: 2
Acronym: 1171
Project participant: 
Alam, Mohammad Monzurul (Intern)
Project Manager, organisational: 
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 590,000.00 Danish Kroner
Project

Department of Environmental Engineering
Period: 01/11/2010 → 31/03/2011
Number of participants: 2
Acronym: Tox3-6KP
Project ID: 30801
Project participant:
Bjerg, Poul Løgstrup (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Forsk. - Amter og kommuner
Name of research programme: Ukendt
Amount: 105,000.00 Danish Kroner
Project

Modelling of water quality in sewer-WWTP systems during normal and extreme condition
Department of Environmental Engineering
Period: 01/10/2010 → 04/06/2014
Number of participants: 6
Phd Student:
Ramin, Elham (Intern)
Supervisor:
Mikkelsen, Peter Steen (Intern)
Main Supervisor:
Plósz, Benedek G. (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Bentzen, Thomas Ruby (Ekstern)
Comas, Joaquim (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Pharmas - Ecological and human health risk assessments of antibiotics and anti-cancer drugs found in the environment
The presence of human pharmaceuticals in the environment is not a new issue; their presence in the aquatic environment in North America was highlighted several decades ago. In Europe, the first reports of human pharmaceuticals in the environment were published a little later. These early reports from Europe were very far-sighted in that they identified sex steroids, and in particular oestrogens, as being present in the aquatic environment, and likely to affect reproduction of fish if concentrations were high enough. Research progressed steadily during the 1980’s and 1990’s, and this progress was summarized a decade ago in two influential reviews by primarily European chemists who had been studying the presence of pharmaceuticals and personal care products in the environment. Since, an increasing interest in this area resulted in an "explosion" in the number of references. However, all this research merely documented the presence, fate and behaviour of human pharmaceuticals in the environment; it did little to address the issue of whether or not their presence constituted a hazard to either wildlife (especially aquatic organisms) and humans drinking water containing minute quantities of these pharmaceuticals. PHARMAS will focus on: • The risk to human health and the environment from anti-cancer and antibiotic drugs • It will include an assessment of the transformation products of the selected drugs • The exposure routes considered will be via water and food • Exposure will include modelling (all 27 EU countries) and direct measurements • Mixture effects will be considered • Comparison of effects of the drugs on the embryo and adults on a test fish will be
examined • Human health and environment risks evaluated • Socio-economic impact of risks evaluated

Department of Environmental Engineering
Period: 01/10/2010 → 01/10/2013
Number of participants: 2
Acronym: PHARMAS
Project ID: 30847
Project participant:
Legind, Charlotte Nielsen (Intern)
Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Relations
Publications:
Optimal choice of pH for toxicity and bioaccumulation studies of ionizing organic chemicals

BIOTREATMENT OF DRINKING WATER POLLUTED BY PESTICIDES AND OTHER MICROPOLLUTANTS
Clean drinking water is a limited resource in many countries and development of sustainable techniques to purify water polluted by pesticides and other micro-pollutants are urgent. Groundwater is an important drinking water resource in Europe, but surface waters are also used for drinking water in many countries. In general, groundwater has a higher quality than surface water and it is often distributed to the consumer without any prior advanced purification processes. Securing this unique situation requires that the groundwater remains without organic residues such as pesticides and other micro-pollutants including estrogens and pharmaceuticals. Unfortunately, such contaminants are more and more frequently detected in aquifers and surface waters in concentrations above the EU-threshold concentrations and they constitute a serious treat to our drinking water resources. The aim of BIOTREAT will be to develop much needed sustainable biotechnologies for remediating contaminated drinking water derived from either groundwater or surface water. In the present context, bioaugmentation is the introduction of specific degrading microorganisms or microbial consortia into sand-filters at waterworks or into barriers between surface water and drinking water reservoirs.

Department of Environmental Engineering
Period: 01/09/2010 → 31/08/2013
Number of participants: 1
Acronym: BIOTREAT
Project ID: 30865
Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Gad generation and emission at waste disposal sites receiving low organic waste

Department of Environmental Engineering
Period: 01/09/2010 → 01/12/2014
Number of participants: 6
Phd Student:
Mou, Zishen (Intern)
Supervisor:
Scheutz, Charlotte (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)
Examiner:
Damgaard, Anders (Intern)
Gregory, Robert G. (Ekstern)
Rintala, Jukka Antero (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Life cycle assessment of energy technologies and energy systems
Department of Environmental Engineering
Period: 01/09/2010 → 04/06/2014
Number of participants: 5
PhD Student:
Turconi, Roberto (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)
Examiner:
Scheutz, Charlotte (Intern)
Olsen, Stig Irving (Intern)
Powers, Susan E. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Model-driven process research in soil systems – minerals, organic matter, water, fluxes and biota
International Training Network on organic matter cycling in soils as affected by soil structure, water, microbes and minerals
Department of Environmental Engineering
Period: 01/09/2010 → 01/09/2013
Number of participants: 2
Acronym: ProSoil
Project participant:
Smets, Barth F. (Intern)
Dechesne, Arnaud (Intern)

Financing sources
Source: Unknown
Name of research programme: Institut stipendie (DTU) Samf.
Amount: 0.00 Danish Kroner
Project:

Nitrification in rapid sand filters-process understanding and removal of organic micropollutants
Department of Environmental Engineering
Period: 01/09/2010 → 02/04/2014
Number of participants: 7
PhD Student:
Tatari, Karolina (Intern)
Supervisor:
Nielsen, Peter Borch (Ekstern)
Smets, Barth F. (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Andersen, Henrik Rasmus (Intern)
Pettersson, Thomas (Ekstern)
Uhl, Wolfgang (Ekstern)

Financing sources
Resource and environmental assessment of recycling of construction and demolition waste (C&D waste)

Department of Environmental Engineering
Period: 01/09/2010 → 01/04/2015
Number of participants: 6
Phd Student: Butera, Stefania (Intern)
Supervisor: Christensen, Thomas Højlund (Intern)
Main Supervisor: Astrup, Thomas Fruegaard (Intern)
Examiner: Kjeldsen, Peter (Intern)
Birgisdottir, Harpa (Intern)
Polettini, Alessandra (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

The use of iron hydroxide nano-composites for chlorinated solvent remediation

Department of Environmental Engineering
Period: 01/09/2010 → 31/12/2014
Number of participants: 4
Phd Student: Kern, Kristina (Intern)
Supervisor: Fjordbøge, Annika Sidelmann (Intern)
Jakobsen, Rasmus (Intern)
Main Supervisor: Broholm, Mette Martina (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

LCA af gipsaffald
"LCA af gipsaffald" er et samarbejdsprojekt med Miljøstyrelsen, som skal danne grundlag for opstilling af behandlingskrav for håndtering af gipsaffald i Danmark. Dette gøres ved at udføre en miljøvurdering af et antal metoder til behandling af gipsaffald vha. LCA-modellen EASEWASTE. Miljøvurderingen indebærer, at der indsamles data for mængder og masseflow for gipsaffald i Danmark, samt at de involverede teknologier beskrives. På det grundlag kan potentielle miljøpåvirkninger fra teknologiernes beregnes og de miljømæssigt set mest hensigtmæssige behandlingsmetoder identificeres. lignes og

Department of Environmental Engineering
Period: 26/08/2010 → 31/12/2010
Number of participants: 2
Acronym: 1167
Project ID: 30787
Project participant: Christensen, Thomas Højlund (Intern)
Project Manager, organisational: Møller, Jacob (Intern)

Financing sources
Effect of invasion on rockphysical and petrophysical properties

Aim This project aims at developing a method for interpretation of the sonic log signal, where invasion by drilling fluid causes anomalous log readings. Background Sonic logs are used to measure acoustic velocities of formations penetrated during drilling. Together with data from other logging tools, such information is applicable for fluid identification and quantification in reservoirs. Sonic velocities also provide ties to seismic surveys (AVO, 4D analysis). An important tool in the interpretation of sonic log measurements is fluid substitution, which is a procedure developed by Gassmann (1951). Application of fluid substitution to multiple-phase saturated regions, such as the invaded region has been shown to be non-trivial, displaying hysteresis depending on formation wettability, formation fluids, and invading fluids (Cadoret et al., 1995). Hysteresis has also been found in electrical resistivity as quantified by the electrical saturation exponent (Van de Verg et al., 1999). These dual observations indicate correlation between hysteresis and homogeneity of fluid phase distribution. Previous studies have addressed systems of mixed gas and water and have led to definition of theoretical bounds for the velocity response of two-phase saturated rocks (Cadoret et al., 1995). In preliminary studies to this project, we have however shown repetitive breaching of these bounds primarily in rocks with heterogeneous pore size distributions. Breaching the bounds shifts the influence of invasion beyond the limits of the present interpretation. This motivates further quantification of the effects of invasion on sonic logs (Sørensen, 2010). Furthermore, sonic velocities and relative pore fluid related changes are frequency dependent. Sonic tools operate at much higher frequency than seismic surveys, while velocity measurements in the laboratory are conducted at even higher frequency. Proposed work This project comprises two parts. In the first part we will address the question of elastic and electrical properties of a two-phase saturated simple pore structure of quartzitic sandstone. Different saturations will be systematically studied according to a drainage and subsequent imbibition process. In the second part of the project similar procedures will be applied to greensand, in order to study the effect of a heterogeneous pore structure. All results will be discussed in context of rock-physical modeling. The results from laboratory data and rock-physical modeling will be used to formulate a strategy for improved interpretation of sonic logs in combination with other logs.

Department of Environmental Engineering
Period: 15/08/2010 → 15/08/2013
Number of participants: 1
Acronym: 1163
Project ID: 30774
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 3,517,778.00 Danish Kroner

Start and stop criteria for remedial actions. Delprojektaftale nr. 6
The project develops and test methods for estimation of start and stop criteria for remediation projects.

Department of Environmental Engineering
Period: 02/08/2010 → 31/12/2010
Number of participants: 1
Acronym: 1158
Project ID: 30781
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 115,000.00 Danish Kroner

Integrated organics pre-treatment system for new sludge management systems
INTOPRS is a system solution containing equipment for organics treatment with according design rules, rules for process implementation to existing wwp and SMS, rules for required adjustments at different types of wwp. LCA, basing on full scale experimental results will show impact of INTORPS on environmental footprint of European SMS including impact on sludge disposal.
Department of Environmental Engineering
Period: 01/08/2010 → 30/07/2013
Number of participants: 1
Acronym: INTORPS
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

**Fehmer Belt Clay (XRD)**
XRD analysis

Department of Environmental Engineering
Period: 22/07/2010 → 28/02/2011
Number of participants: 1
Acronym: 1165
Project ID: 30776
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

**Financing sources**
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 140,000.00 Danish Kroner
Project

**Innovation network for environmental Technology (Innovationsnetværk på miljøteknologi)**
Innovationsnetværket for Miljøteknologi skal være det oplagte forum for netværkets medlemmer og cleantech-branchen, når den tager initiativ til at igangsætte teknologi- og udviklingsprojekter der kræver supplerende, tværgående kompetencer og nye samarbejdspartnere, uanset om medlemmernes forretningsområde og kernekompetencer primært er på luft-, vand-, jord- eller affaldsområdet.

Department of Environmental Engineering
Period: 01/07/2010 → 01/07/2014
Number of participants: 7
Acronym: 1113
Project ID: 30856
Project participant:
Baun, Anders (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Henze, Mogens (Intern)
Bjerg, Poul Løgstrup (Intern)
Astrup, Thomas Fruergaard (Intern)
Arnbjerg-Nielsen, Karsten (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

**Financing sources**
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 180,000.00 Danish Kroner
Project

**NEEWTT - Network for Energy Efficient Wastewater Treatment Technologies**
Marie Curie Initial Training Networks (ITN) Call: FP7-PEOPLE-2010-ITN Network application including 9-12 PhD projects of which 3-5 @ DTU. The core theme is energy effectiveness in wastewater treatment through new processes.

Department of Environmental Engineering
Period: 01/07/2010 → 01/07/2014
Number of participants: 3
Acronym: NEWTT
Project participant:
Ledin, Anna (Intern)
Smets, Barth F. (Intern)
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Thalis
The objective of the research project will be to investigate the fate of emerging organic micropollutants during wastewater and sludge treatment and to study their fate in the aquatic environment. The title of the proposed research project will be "Investigation of emerging organic micropollutants fate during wastewater treatment and study of their behaviour during treated wastewater disposal into the aquatic environment". The budget of this proposal is 480.0000 Euros and its duration is 4 years. The specific objectives of this project are as follows: a) to study the fate of several emerging micropollutants such as PFCs, EDCs, pharmaceuticals, benzotriazoles in different treatment processes (activated sludge, anaerobic digestion, chlorination), b) to study the fate of these compounds in aquatic environment after treated wastewater disposal (role of photodegradation, biodegradation, sorption) and c) to investigate the formation of metabolites of selected micropollutants using LC-MS MS techniques.

Department of Environmental Engineering
Period: 01/07/2010 → 30/06/2014
Number of participants: 2
Acronym: Thalis
Project participant:
Angelidaki, Irini (Intern)
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Risikovurdering af forurenede grunde på Vasbyvej i forhold til vandressourcen og Soderup Vandværk. Delprojektaftale nr. 5
Risikovurdering af forurenede grunde på Vasbyvej i forhold til vandressourcen og Soderup Vandværk.

Department of Environmental Engineering
Period: 08/06/2010 → 31/12/2010
Number of participants: 1
Acronym: RiskVas
Project ID: 30782
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Project

CO2 opgørelse i affaldssektoren
Affaldssektoren har behov for at opgøre CO2 regnskaber for anlæg, processer, systemer, firmaer osv. Der er behov for at udvikle et fælles transparent system for opgørelse af CO2 regnskaber og synliggørelse af sektorens CO2 bidrag. Udvikle fælles data for hvorledes gevinster, der rettelig falder i andre sektorer, kan opgøres og vises i sammenhæng med affaldssektorens egne CO2 bidrag.
Environmental assessment of CO2 contamination in aquifers; Groundwater geochemical effects of CO2 from underground storage

Department of Environmental Engineering
Period: 01/06/2010 → 30/09/2013
Number of participants: 6
Phd Student:
Cahill, Aaron Graham (Intern)
Supervisor:
Jakobsen, Rasmus (Intern)
Main Supervisor:
Bjerg, Poul Løgstrup (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Oelkers, Eric H. (Ekstern)
Trautz, Robert C. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Whole gaseous emission measurements from waste treatment facilities / Gasemissionsmålinger fra affaldshåndteringssystemer

Department of Environmental Engineering
Period: 01/06/2010 → 27/08/2014
Number of participants: 6
Phd Student:
Mønster, Jacob (Intern)
Supervisor:
Kjeldsen, Peter (Intern)
Main Supervisor:
Scheutz, Charlotte (Intern)
Examiner:
Boldrin, Alessio (Intern)
Imhoff, Paul T. (Ekstern)
Oonk, Johan (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD
Non-stationary time series models of hydrologic extremes

Department of Environmental Engineering
Period: 01/05/2010 → 29/04/2015
Number of participants: 7
Phd Student:
Gregersen, Ida Bülow (Intern)
Supervisor:
Madsen, Henrik (Intern)
Rosbjerg, Dan (Intern)
Main Supervisor:
Arnbjerg-Nielsen, Karsten (Intern)
Examiner:
Christiansen, Lasse Engbo (Intern)
Berndtsson, Ronny (Ekstern)
Rauch, Wolfgang (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD

Uptake, metabolism, accumulation and toxicity of organic contaminants in wetland plants

DTU / team Stefan Trapp uses an experimental system where uptake, metabolism, accumulation and toxicity can be determined (Larsen et al. 2005). This experimental system (named "willow tree test") will be applied to contaminants found in Leuna and Bitterfeld. Parallel, mathematical models that can predict these processes will be further developed and adapted to wetlands. The models will be parameterized and calibrated using the measured data from the willow system. The models will further be parameterized for a wetland plant (Phragmites or Juncus sp.) in order to predict the processes in the constructed wetland at UFZ.

Department of Environmental Engineering
Period: 01/05/2010 → 30/04/2011
Number of participants: 1
Acronym: Wetlands
Project ID: 30763
Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Udenlandske
Name of research programme: Ukendt
Amount: 1,000,000.00 Danish Kroner
Project

Risikovurdering af forureneede grunde i forhold til grundvand og overfladevand på oplandsskala

Department of Environmental Engineering
Period: 15/04/2010 → 15/12/2015
Number of participants: 6
Phd Student:
Thomsen, Nanna Isbak (Intern)
Supervisor:
McKnight, Ursula S. (Intern)
Main Supervisor:
Binning, Philip John (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Christophersen, Mette (Intern)
Nowak, Wolfgang (Ekstern)

Financing sources
Source: Internal funding (public)
Molecular Approaches and MetaGenomic Investigations for optimizing Clean-up of PAH contaminated sites

MAGICPAH aims to explore, understand and exploit the catalytic activities of microbial communities involved in the degradation of persistent PAHs. It will integrate (meta-) genomics studies with in-situ activity assessment based on stable isotope probing particularly in complex matrices of different terrestrial and marine environments. PAH degradation under various conditions of bioavailability will be assessed as to improve rational exploitation of the catalytic properties of bacteria for the treatment and prevention of PAH pollution.

Department of Environmental Engineering
Period: 01/04/2010 → 30/09/2015
Number of participants: 2
Acronym: MagicPAH
Project ID: 30738
Project participant:
Rasmussen, Birte Kastrup (Intern)
Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 2,045,204.00 Danish Kroner

Concept proof of usability of ochre as a source of iron in wastewater treatment
Confidential

Department of Environmental Engineering
Period: 15/03/2010 → 01/02/2011
Number of participants: 3
Acronym: JuniorOchre
Project ID: 30771
Project participant:
Mikkelsen, Peter Steen (Intern)
Angelidaki, Irini (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 250,000.00 Danish Kroner

The effect of full scale SRD of a chlorinated solvent source zone in clayey till at Gl. Kongevej is evaluated. Particular focus is on the effects in the clayey till matrix, where reactions may be diffusion limited and on the effects on contaminant flux to the primary aquifer underlying the source zone.

Department of Environmental Engineering
Period: 01/02/2010 → 31/12/2010
Number of participants: 2
Acronym: 1151
Project ID: 30759
Project participant:
Broholm, Mette Martina (Intern)
Bjerg, Poul Legstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
**Groundwater quality effects of CO2 escaping from carbon storages (CO2-CS)**

WP 3: If CO2 escapes from a storage and migrates up through the geological sequence, there is a risk of contaminating aquifers used for drinking water supply. In itself, CO2 dissolved in water is not poisonous, but adding CO2 to the water will increase the acidity of the water, causing mineral dissolution in the sediments and increased adsorption of carbonate species on the mineral surfaces. A decrease in groundwater pH may lead to the mobilization Ni and other trace metals (Kjøller et al.), adsorption of carbonate species may displace other oxyanions like arsenate and arsenite, phosphate or selenate (Appelo et al. 2002; CD-Music) bound to the sediment grains. Dissolution of minerals may release undesirable components into the groundwater and may lead to the formation of preferential flow paths, lowering transit times of any pollutant. It is the objective of this WP to investigate the effect that highly CO2 charged waters (PCO2 = 1 atm) and its interaction with the sediment may have on the groundwater composition. First a series of column experiments will be carried out with common aquifer sediments (non calcareous sand, calcareous sand and limestone), the sediments will be leached by CO2 charged groundwater in order to study the release of contaminants. Subsequently, push-pull tests in the aquifers will be carried out, by injecting and later retrieving CO2 charged and tracer marked groundwater (Assayag et al., 2009) and through water analysis identify the geochemical processes occurring. Repetitions will reveal whether the ongoing geochemical reactions are directly modifying the permeability/porosity of the rocks. Push-pull tests will be supplemented by a dipole test in a shallow aquifer. Sediment cores are taken before CO2 charged water is circulated through the aquifer while the geochemical effects are monitored in water samples. When circulation is stopped, new sediment cores will enable direct studies of the effects on the sediment. Column and field results will be modelled with reactive transport models considering mineral dissolution, redox processes and surface complexation in order to obtain a quantitative understanding of the problems involved.

Department of Environmental Engineering  
Period: 01/02/2010 → 31/01/2013  
Number of participants: 1  
Acronym: coogwat  
Project ID: 30770  
Project Manager, organisational: Jakobsen, Rasmus (Intern)

**Financing sources**

Source: Forskningsrådene - Andre  
Name of research programme: Ukendt  
Amount: 1,860,081.00 Danish Kroner

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**Multi-objective management of multi-reservoir systems using Artificial Intelligence**


Department of Environmental Engineering  
Period: 01/02/2010 → 31/01/2012  
Number of participants: 2  
Acronym: 1042  
Project participant: Rosbjerg, Dan (Intern)  
Bauer-Gottwein, Peter (Intern)

**Financing sources**

Source: Unknown  
Name of research programme: Ukendt  
Amount: 0.00 Danish Kroner
Værktøjer til brug for risikovurdering og prioritering af grundvandstruede forureninger. Delprojekt 4

Der vil i projektet blive præciseret hvad den nuværende risikovurdering i DK er i forhold til vandressourcen og drikkevand. 2 risikovurderingsværktøjer sammenkobles i et integreret værktøj, som kan anvendes til beslutningsstøtte for prioritering af punktkilder på oplandsskala.

Department of Environmental Engineering
Period: 01/02/2010 → 31/12/2010
Number of participants: 4
Acronym: RiskVærk
Project ID: 30764
Project participant:
Binning, Philip John (Intern)
Søndergaard, Gitte Lemming (Intern)
Troldborg, Mads (Intern)
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 165,000.00 Danish Kroner
Project

A new framework for integrated monitoring of the environment

Monitoring is essential in order to evaluate the state and development of our environment and to take action on the anthropogenic influence (climate change, eutrophication, impacts on human health, etc.). This project will develop a new framework and innovative technologies for monitoring of the environment. The principal idea is to integrate measurements of environmental variables from in-situ and remote sensing with process-based environmental modelling to provide the best and most cost-effective estimate of the environmental state and its uncertainty in space and time. The project will integrate monitoring of environmental variables in soil, inland water bodies (groundwater, rivers, wetlands and lakes), marine waters and air in one unified system, providing the optimal basis for understanding and predicting the state of the environment in all media. The framework will address monitoring at a range of scales, from national and regional environmental monitoring programmes to the monitoring of ecosystems at local scales in order to monitor local and regional effects of environmental legislation and implementation of new environmental technologies. The framework will provide the basis for a more effective detection of trends in environmental variables caused by changes in the driving forces such as changes in the emission of nutrients and climate change, and will provide important information for assessing impacts on human health. A key issue and innovative component of the project is estimation of the uncertainty of the environmental state. Uncertainty estimation is critical and very important for impact risk assessment and decision-making and for optimising the monitoring efforts in the most cost-effective way. The developed technologies will be applied for integrated monitoring and prediction of nitrogen and phosphorus, which are key indicators of the ecological state.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2013
Number of participants: 2
Acronym: FRAME
Project participant:
Bauer-Gottwein, Peter (Intern)
Project Manager, organisational:
Rosbjerg, Dan (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Biorefinery for sustainable Reliable Economical Fuel production from energy crops. Second call.

Biorefinery systems use one species or one category of plants to produce bio-based products and energy. An advanced biorefinery system should be able to use different biomass feedstock as well as to produce a wide range of high-value products, in order to be environmental, economic and social sustainable and to have flexibility for changes. These can not be achieved by the "traditional" biorefinery systems, because one plant species is used and for this reason, the biomass supply is not secured and a limited range of bio-products are produced. Moreover, "traditional" biorefineries systems with one culture can not be eco-sustainable in contrast to an advanced polyculture biorefinery. Sustainability and polyculture
are interrelated for the following reasons: a) the diversity of crops avoids the susceptibility of monocultures to disease and pest problems, b) cropping systems that include a variety of crops replenish nitrogen (if legumes are included) and use resources such as sunlight, water, or nutrients more efficiently and c) biodiversity is protected in polyculture. Therefore, there is a need for more eco-efficient polyculture biorefinery system. Our proposed biorefinery system uses oilseed crops, as the main biomass feedstock, in combination with other species of plants, especially, from the family Leguminosae (legumes), due to the advantages that this combination offers to the sustainability of the whole system. Also, this combination will eliminate the disadvantages that separately each crop could give in a biorefinery system. Two different biorefinery systems "oilseed biorefinery" and "green biorefinery" injected with new ideas and innovative processes will be integrated into a new advance and sustainable biorefinery system, namely Eco-BioREF, to achieve a breakthrough beyond the "business as usual" scenario. The present project is aiming at the development of a sustainable, novel, technically and economically viable biorefinery for conversion of the biomass -oilseed plants and legumes- into a diverse range of biofuels, food and high-value added chemicals. This will be achieved by overcoming the identified, critical process bottlenecks in the biomass supply chain and by improving the refining section.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2013
Number of participants: 2
Acronym: 903
Project participant: Angelidaki, Irini (Intern)
Karakashev, Dimitar Borisov (Intern)

Financing sources
Source: Unknown
Name of research programme: Unknown
Amount: 0.00 Danish Kroner
Project

Design of microbial communities in membrane bioreactors: The next generation of environmental biotechnologies
The fundamental idea of the Centre’s activities is to apply a novel approach to reveal identity, function and interactions of key microorganism or groups of organisms involved in selected processes in environmental biotechnology to identify the factors that control their activity and ecology in mixed communities. These control factors will then be exploited to optimise their growth and activity (ecosystem design) through process studies in the membrane bioreactor (MBR) reactors in collaboration with industrial and public partners. MBR is a new technology in water and wastewater treatment and in other environmental and industrial biotechnologies. Three applications of the MBR technology will be studied at lab-scale and pilot-scale: 1) removal/recovery of phosphorus, 2) a new energy efficient process for nitrogen removal, and 3) removal of micropollutants. The research activities include a survey of major European MBR plants to achieve a mutual starting point for all participants. The novel approach will be applied in each case to identify selective factors for ecosystem design or addition of particular performance-enhancing bacteria (bioaugmentation). The concurrent study of membrane fouling in each system along with the development of a model to describe fouling as function of operation parameters, allows for an optimization of the MBR system with respect to microbial as well as membrane processes. This Centre will gather the world-class competencies within Denmark (universities, GTS-institutions, industries and consultants) and complement these with leading partners from abroad to create a synergy required to deliver these solutions. The Danish industry partners are positioned to rapidly implement these developments into products for the national and global market and in so doing create a billion kroner export market with spin off environmental and public health benefits.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2015
Number of participants: 1
Acronym: BIOMBR
Project ID: 30745
Project Manager, organisational: Smets, Barth F. (Intern)

Financing sources
Source: Unknown
Name of research programme: Unknown
Amount: 2,338,000.00 Danish Kroner
Project

DTU centre for recirculation technology (38159)
Despite the obvious scientific relationship and correlation between recirculation technology, specifically biofiltration, and municipal waste-water treatment only limited scientific knowledge has been interchanged between these two areas.

DTU Environment has for many years been an internationally renowned actor within biofiltration processes and kinetics in waste water treatment. Combining this stronghold with the DTU Aqua expertise in recirculating systems is the basis for
this project. Through project cooperation, student interchange and common research set-ups knowledge is exchanged and new insights developed.

In recirculation systems feed is the major input to the system, and the linkage between feed, water quality and system operation is important, yet missing knowledge, which will also be addressed by the group through a combined experimental and modeling approach.

Department of Environmental Engineering
National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/01/2010 → 31/12/2015
Number of participants: 3
Research area: Aquaculture
Project participant:
Suhr, Karin Isabel (Intern)
Project Manager, academic:
Pedersen, Per Bovbjerg (Intern)
Pedersen, Lars-Flemming (Intern)

Flexible model structure for waste-LCA modelling - The next generation of the EASEWASTE model
Department of Environmental Engineering
Period: 01/01/2010 → 18/09/2013
Number of participants: 6
Phd Student:
Clavreul, Julie (Intern)
Supervisor:
Baumeister, Hubert (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Astrup, Thomas (Intern)
Eriksson, Ola Norman (Ekstern)
Kirkeby, Janus Søgaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

High rate algal biomass production for food, feed, biochemicals and biofuels
Increased population, shortage of fossil fuels and climatic changes constitute global challenges demanding actions and strategic planning for securing access of food, feed and energy supply in the future. Therefore, alternative biomass sources are needed. Algal biomass for production of food, feed, biochemicals and biofuels offers a great potential for meeting the future challenges. Algae possess numerous possibilities that have so far not been exploited. With the proposed project we are going to: • Develop promising technologies for production of alginates, polyunsaturated fatty acids, β-carotene, and sterols that can be used as functional food. • Develop technologies for production of pigments like fucoxanthin and other high value chemicals like chlorophyll a and c, beta-carotene and other xanthophylls from brown algae. Additionally, technologies for production of other high value chemicals such as vitamins, toxins, enzymes etc. will be developed. • Develop technologies for utilisation of algae (both micro and macro algae) with high growth rates for biomass production for production of bioenergy (hydrogen, methane, ethanol, and biodiesel). • Optimise algae cultivation conditions for increased biomass production, including development of a algae cultivation rotation system. • A new concept integrating biofuel production with algae cultivation, based on recycling of CO2 from the exhaust gas from gas motors for autotrophic algae growth and recycling of process effluents as nutrients for promoting algal biomass growth will be developed. • Develop an innovative bioflocculation method for sustainable harvesting of microalgae. • Investigate algae as biofertilisers for promotion of rice, wheat growth. • Evaluate the sustainabity of utilisation of algae for food, feed and biofuels production.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2012
Number of participants: 2
Modeling the transfer of ionisable organic compounds to crops

Ionisable compounds are currently hardly covered by existing quantitative structure-activity relationship (QSAR) methods or mechanistic models for predicting their environmental fate. However, they are frequent, typical for many compound classes and advances in analytical chemistry has made them measurable and raised concerns about their presence in the environment. Compound classes that include ionisable organic compounds are among others pesticides, pharmaceuticals and detergents. These compound classes are unwarranted in the environment due to concerns about their effects on environmental and human health. One issue is their transfer to crops. This project will develop a simple and valid approach for estimating the transfer of ionisable organic compounds to crops. The assumption is that current physiology-based approaches for modelling the transfer of neutral organic compounds to plants can be combined with a newly formulated Fick-Nernst-Planck equation to develop models for ionisable compounds.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2010
Number of participants: 2
Acronym: Ion Crop Model
Project participant:
Trapp, Stefan (Intern)
Project Manager, organisational:
Legind, Charlotte Nielsen (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 4,957,776.00 Danish Kroner
Project

NanoRiskClass - et nyt risikoklassifikations system for nanomaterialer


Department of Environmental Engineering
Period: 01/01/2010 → 01/07/2010
Number of participants: 2
Acronym: NanoRiskClass
Project ID: 30790
Project participant:
Hansen, Steffen Foss (Intern)
Project Manager, organisational:
Baun, Anders (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Optimal digestion of high ammonia containing wastes

The main objective of the project is to develop a process promoting acetate oxidation, for optimal digestion of high ammonia containing wastes. More specifically with this project we are aiming to:

- Investigate the extent of acetate oxidation in full scale biogas plants; and identify the environmental conditions promoting acetate oxidation on the cost of aceticlastic methanogenesis.
- Identify best process configuration (temperature, hydraulic retention time, organic loading rate, concentration of ammonia and volatile fatty acids) promoting high syntrophic acetate oxidation activity.
- Enrich, isolate, characterize and identify acetate oxidising microorganisms.
- Find cultures with highest potential for syntrophic acetate oxidation in order to reach maximum exploitation level of the results in the energy sector.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2011
Number of participants: 2
Acronym: Ammonia
Project ID: 30795
Project participant: Angelidaki, Irini (Intern)
Project Manager, organisational: Karakashev, Dimitar Borisov (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 1,859,300.00 Danish Kroner
Project

Quantifying trade-offs between human water use and ecosystem water requirements using remote sensing driven hydrological modelling at the river basin scale


Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2011
Number of participants: 1
Acronym: 1041
Project participant: Bauer-Gottwein, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Quantitative health and microbial risk assessment for public warning during flood

Department of Environmental Engineering
Period: 01/01/2010 → 01/04/2015
Number of participants: 6
Phd Student: Andersen, Signe Tanja (Intern)
Reducing uncertainty in future extreme precipitation (RUFEP)

Current estimates of extreme precipitation impacts from climate change range from a 20-60% increase over the next decade, but are based on climate model simulations at larger spatial and temporal scales than what is relevant for typical urban drainage systems. Thus this PhD fellowship will focus on reducing the uncertainty in future projections of extreme precipitation and quantifying the spatial and temporal scaling properties of extreme precipitation characteristics from observations and climate model simulations. This calls for a strategic collaborative research collaboration mobilizing both urban water and climatology expertise, which are among the key competencies at DTU Environment and the Danish Meteorological Institute.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2014
Number of participants: 2
Acronym: 1049
Project ID: 30765
Project participant:
Arnbjerg-Nielsen, Karsten (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 2,400,000.00 Danish Kroner

Submersible Microbial Fuel Cell (SMFC) for electricity production from wastewater

MFC is a novel technology that can generate electricity directly from organic compounds. It has been known for several years that bacteria can be used to generate electricity that can be harvested in microbial fuel cells (MFCs). An innovative MFC for direct conversion of organic material to electricity has been invented at DTU-Environment, and the patent application was submitted in 2007. The main purpose of the present project is therefore to optimize the SMFC and to upscale it to a small pilot scale in order to demonstrate and validate the optimized SMFC technology for treatment of real wastewaters.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2012
Number of participants: 1
Acronym: SMFC
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Sustainable drinking water treatment biological filters

The project will cover a range of compounds and biological filter activities, but regarding the bulk compounds emphasis will be on ammonium removal (nitrification) and iron/manganese removal. Regarding organic micropollutants the activities will focus on pesticides (MCPP, BAM and Isoproturon as model compounds) and pharmaceuticals (with synthetic estrogen


17α-ethinylestradiol (EE2) as model compound). See section 6 in Project description, App D.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2013
Number of participants: 3
Acronym: DW BIOFILTERS
Project ID: 30766
Project participant:
Arvin, Erik (Intern)
Smets, Barth F. (Intern)
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 9,524,000.00 Danish Kroner

Relations
Activities:
Phosphorus limitations when ammonium removal is incomplete
Nutrient limitations in drinking water rapid sand filters with incomplete ammonium removal

The effect of varying pH on bioaccumulation of weak electrolytes

Department of Environmental Engineering
Period: 01/01/2010 → 28/02/2013
Number of participants: 6
Phd Student: Rendal, Cecilie (Intern)
Supervisor: Kusk, Kresten Ole (Intern)
Main Supervisor: Trapp, Stefan (Intern)
Examiner: Eriksson, Eva (Intern)
Backhaus, Thomas (Ekstern)
Eggen, Trine (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Water in Urban Areas - partnership for climate change adaptation and innovation
The partnership addresses the challenge of adaptation of cities to a changing climate and aims at develop, document and disseminate sustainable technologies and water management methods.

Department of Environmental Engineering
Period: 01/01/2010 → 31/12/2014
Number of participants: 2
Acronym: Vand i byer
Project ID: 30760
Project participant:
Mikkelsen, Peter Steen (Intern)
Project Manager, organisational: Ambjerg-Nielsen, Karsten (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 4,750,000.00 Danish Kroner
Undersøgelser af gasproduktion og emission på Uggerløse Losseplads

Det overordnede formål med projektet er at undersøgelse gasproduktion og emission på Uggerløse Losseplads

Department of Environmental Engineering
Period: 15/12/2009 → 15/02/2010
Number of participants: 1
Acronym: 1094
Project ID: 30754
Project Manager, organisational:
Scheutz, Charlotte (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 96,200.00 Danish Kroner

Development and delivery of an IWRM/IRBM training course

The course must address the different aspects of IWRM including: Enabling environment (policy, legislation, finance); Institutions (river basin organisation and management, role of government, private sector and water users); Management tools (water resources assessment, water resources planning, technical tools, administrative tools, financial and economic tools, conflict resolution, stakeholder involvement); Public awareness and monitoring.

Department of Environmental Engineering
Period: 01/12/2009 → 30/04/2010
Number of participants: 2
Acronym: 1071
Project ID: 30762
Project participant:
Bauer-Gottwein, Peter (Intern)
Project Manager, organisational:
Rosbjerg, Dan (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Ukendt
Amount: 50,000.00 Danish Kroner

Future climate change technologies

An assessment of emerging and future climate change technologies is needed that focus on national needs and possibilities for export of Danish technologies and services.

Department of Environmental Engineering
Urban Water Engineering
Period: 01/12/2009 → 01/07/2010
Number of participants: 8
Acronym: 1073
Project ID: 30746
Project participant:
Eriksson, Eva (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Henze, Mogens (Intern)
Binning, Philip John (Intern)
Andersen, Henrik Rasmus (Intern)
Rygaard, Martin (Intern)
Sharma, Anitha Kumari (Intern)
Project Manager, organisational:
Ambjerg-Nielsen, Karsten (Intern)
Optimization of a titration method for monitoring of VFA
ForskEL contract no. 2009-1-10231
Department of Environmental Engineering
Period: 01/11/2009 → 31/10/2010
Number of participants: 2
Acronym: Titration-VFA
Project ID: 30736
Project participant:

Boe, Kanokwan (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)

Ozonation of swimming pool water
Department of Environmental Engineering
Period: 01/11/2009 → 31/07/2010
Number of participants: 1
Acronym: 949
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Renere teknologi til håndtering og rensning af separat regnvand
Department of Environmental Engineering
Period: 01/11/2009 → 31/10/2011
Number of participants: 1
Acronym: 965
Project Manager, organisational:
Ambjerg-Nielsen, Karsten (Intern)
Foaming problems in biogas plants
Department of Environmental Engineering
Residual Resource Engineering
Period: 01/10/2009 → 30/09/2014
Number of participants: 3
foaming, biogas
Project participant:
Kougiás, Panagiotis (Intern)
Boe, Kanokwan (Intern)
Angelidaki, Irini (Intern)
Project

Centre for regional change in the Earth system
To improve climate change predictions and its impacts, there is an urgent need for better quantification of how human activities, interacting with natural processes affect climate and vice versa. CRES will establish a common Danish multidisciplinary climate research platform to target Danish and wider regional needs.

Department of Environmental Engineering
Period: 01/10/2009 → 01/10/2014
Number of participants: 1
Acronym: CRES
Project ID: 30742
Project Manager, organisational:
Ambjerg-Nielsen, Karsten (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 2,272,000.00 Danish Kroner
Project

Danish Nanosafety Center
Expression of interest to Højteknologifonden
Department of Environmental Engineering
Period: 01/10/2009 → 01/10/2011
Number of participants: 2
Acronym: Nanosafety
Project participant:
Baun, Anders (Intern)
Project Manager, organisational:
Baun, Anders (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Development of new microbial fuel cell configuration for optimization of electricity production with simultaneous wastewater treatment
Department of Environmental Engineering
Period: 01/10/2009 → 30/09/2012
Number of participants: 5
Phd Student:
Zhang, Yifeng (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)
Foaming problems in biogas plants

Biogas har været anvist som et områder hvor der er positiv samfundsøkonomisk regnskab. Udbredelse af biogas kræver dog fortsat optimering og forbedring af anlæggenes effektivitet og økonomi. Uforudsete procesudfald forekommer jævnligt i biogasanlæg, hvor processen pludselig hæmmes og biogasproduktionen ophører helt eller delvist. Ifm. et tidligere EFP projekt blev bl.a. skumning påpeget som et alvorligt problem der kan indtræde uden varsel. Skumning medfører store gasproduktionstab, ustabil biogasproces og driftsproblemer samt miljøgener. Skumningstilfælde varer ofte relativt lang tid med alvorlige økonomiske konsekvenser for anlæggene. Selvom skumningen udgør et alvorligt problem for biogasanlæg er der aldrig foretaget undersøgelser for at opbygge grundlæggende viden med henblik på at identificere årsager og mekanismer, dels for at kunne forebygge og, hvis uhældet inddræffer, hurtigt muligt at kunne genoprette processen. Det overordnede mål med projektet er at udvikle værktøjer til at forstå og undgå skumningstilfælde i biogasanlæg, der kan opnå en mere stabil drift i danske biogasanlæg. Det ansøgte projekt har følgende formål: - identificere potentielle årsager til skumning i biogasprocessen, herunder: 1) identificere potentielle affaldstyper og komponenter som fremmer skumning 2) identificere potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle potentielle 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Department of Environmental Engineering
Period: 01/10/2009 → 30/09/2012
Number of participants: 3
Acronym: Foaming
Project ID: 30735
Project participant: Boe, Kanokwan (Intern)
Karakashev, Dimitar Borisov (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Ukendt
Amount: 2,348,000.00 Danish Kroner
Project

P2M2: Physical and physiological properties of membrane-aerated and membrane-supported biofilms

Department of Environmental Engineering
Period: 01/10/2009 → 24/04/2013
Number of participants: 5
Phd Student: Pellicer i Nàcher, Carles (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Plósz, Benedek G. (Intern)
Galceran, Jesús Colprim (Ekstern)
Nielsen, Per Halkjær (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD
Regional-scale hydrological modeling and water resources management in the Zambezi River Basin

Department of Environmental Engineering
Period: 01/10/2009 → 24/04/2013
Number of participants: 5
Phd Student:
Michailovsky, Claire Irene B. (Intern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Mikkelsen, Peter Steen (Intern)
Bates, Paul David (Ekstern)
Madsen, Henrik (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Siemens Water Technology AOP
-classified

Department of Environmental Engineering
Period: 01/10/2009 → 01/10/2010
Number of participants: 1
Acronym: SAOP
Project ID: 30734
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Sustainable Environmental Technology. Application for 5 fellowships
Sustainable Environmental Technology is one of the focus areas in the Danish research strategy FORSK 2015. Sustainable environmental technology is seen as an important research area both for securing continued welfare and for potential development of Danish industry and services useful in a global context. Sustainable environmental technology thus can contribute at the domestic level as well as at the international level. At the domestic level sustainable environmental technology can help develop increased resource efficiency and recovery through improved waste management and help developing intelligent water management in cities under pressure from increased rain and storm intensities, a water resource limited by increasing groundwater pollution and by competition from protection of natural water habitats an wetlands. At the international level similar issues are developing and Danish research within sustainable environmental technology can help Danish technology and service provider to maintain and expand their international activities. The PhD fellowships will be announced within sustainable environmental technology with focus on waste and resource management, and urban water technology, which are among the key research competences of DTU Environment

Department of Environmental Engineering
Period: 01/10/2009 → 30/09/2013
Number of participants: 8
Acronym: SET 5 PhD
Project participant:
Scheutz, Charlotte (Intern)
Arvin, Erik (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Kjeldsen, Peter (Intern)
Mikkelsen, Peter Steen (Intern)
Christensen, Thomas Højlund (Intern)
Smets, Barth F. (Intern)
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

A simulation-optimization approach for coupled water-energy systems

Department of Environmental Engineering
Period: 15/09/2009 → 30/09/2013
Number of participants: 7
Phd Student:
Cardenal, Silvio Javier Pereira (Intern)
Supervisor:
Arnbjerg-Nielsen, Karsten (Intern)
Madsen, Henrik (Intern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Mikkelsen, Peter Steen (Intern)
Fosso, Olav Bjarte (Ekstern)
Pulido-Velázquez, Manuel A. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet PhD

Investigation of the potential risk posed to drinking water by man-made nanoparticles. Department of Environment, Rules and Foreign Affairs

Identify those uses likely to result in man-made nanoparticles reaching water sources and obtain estimates of quantities used, task 2

Department of Environmental Engineering
Period: 15/09/2009 → 31/12/2009
Number of participants: 1
Acronym: Rural-Foreign
Project ID: 30755
Project Manager, organisational:
Hansen, Steffen Foss (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 45,000.00 Danish Kroner
Project

Demonstration of combined thermal gasification and bio-gasification – determination of synergy effects

Biological gasification, such as at Lemvig Biogas plant, is an established technology which has been shown socioeconomically to be the most profitable method to obtain CO2 reductions compared to other biofuels. However, biogas plants can not efficiently utilize dry lignocellulosic biomasses such as wood chips etc. including the fibre fraction of manure. Thermal updraft gasification, such as at Harboøre CHP, on the other hand is a well suited technology to utilize these types of dry lignocellulosic biomasses. However, it faces some disadvantages, such as generation of tar which need to be removed before the gas (termed product gas) is suitable for gas engine CHP use. By combination of both processes, mutual synergetic advantages can be achieved, with improved energy utilization of approx 30%, by increase of the yield of manure by 20% (gasification of un-degraded biofibers), by process energy savings of thermal gasification of approx. 20% and by improved electrical efficiency in gas engine utilization of 5%. At the same time the combination can create the basis for a process that can utilize versatile types of biomasses and the possibility to vary energy production to better suit consumption variations, both on a daily and seasonal basis. The overall aim with this project is to develop an energy
effective technology for co-gasification of lignocellulosic biomass, along with wet-types of biomass. More specifically with this project we are aiming to: -Establish conversion capacity of product gas in a biogas reactor, hereby identify: a) optimal flow for product gas which is not inhibiting the biogas process; b) extend of degradation of other volatile compounds (phenols, volatile acids etc.) in the biogas process c) dynamic response of a biogas reactor upon changes in product gas flow. -Establish conditions for bioconversion of tar water in the biogas reactor (hereby, max. tolerated concentrations, necessary pre-treatment of tar water etc.). -Investigate the stability and robustness of the biogas process upon application of gasification gas and tar water. -Evaluate energy economy and stability by a combined thermal gasification and biogas process. -Demonstrate the concept at Harboøre CHP with pilot scale biogas reactor

Iron hydroxide intercalates for degradation of chlorinated solvents in sediment and groundwater

A newly discovered class of layered iron hydroxides intercalated with fatty acids (carboxylate-LIH) will be used as reactive sorbents to degrade chlorinated solvents. Soil and groundwater polluted by halogenated hydrocarbons present one of the most serious treats to drinking water resources and human health – and efficient clean-up of these sites continues as one of the major challenges in environmental technology. The project comprise engineering of the LIH particles to optimise their efficiency for degradation of chloro-alkanes and -alkenes in sediments and aquifers. We will quantify sorption and subsequent reduction kinetics and pathways depending on the formulation of LIH. Sorbent size selectivity will be induced by pillaring, while an “on/off” reactivity mechanism will be attempted using silicate “switches”. The geochemical functioning of the optimised LIH particles will be tested first in sediment batch and column studies and next in situ by pressurized geoprobe injection of LIH or LIH-oil suspensions into contaminated sediments, either in the contaminant source area and/or into the pollutant plume with subsequent monitoring of degradation products. Conceptual models based on the intrinsic sorption and reactivity properties of the LIH particles modified by flow characteristics will be developed to describe the performance of LIH for clean-up of chlorinated solvents.

Life cycle assessment of waste management: Assessing technical externalities

Department of Environmental Engineering
Period: 01/09/2009 → 18/09/2013
Number of participants: 5
Phd Student:
Brogaard, Line Kai-Sørensen (Intern)
Main Supervisor: Christensen, Thomas Højlund (Intern)
Examiner: Scheutz, Charlotte (Intern)
Eriksson, Ola Normann (Ekstern)
Olsen, Stig Irving (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD
Micro2-Managed Biofilms: Towards a New Generation of Robust Environmental Bio/Technologies

Microbes are amazingly diverse in terms of the biochemical reactions that they catalyze. This diversity can be used to create competitive biotechnological solutions to many environmental challenges. Indeed, the right combination of existing microbial reactions can usually be found to convert any unwanted pollutant into a useful or harmless end-product. There are, however, scientific and technical challenges in order to combine potentially useful microbial reactions into a workable biotechnology: A case in point is the autotrophic conversion of reduced ammonia (NH4+-N) to N2: a process which requires the cooperation between microbial groups with very different kinetics, substrate preferences, and redox requirements. We contend that biofilm-based systems, wherein microbes grow attached to surfaces, are suitable to harness these microbial potentials. In this project, we specifically aim to develop, apply and validate generic tools for the management of the microbial composition and the micro-scale structure of biofilms (micro2-management) with redox zonation. As an example, these tools will be implemented for the rapid start-up and high-rate long-term performance of membrane-supported biofilm-based reactors for autotrophic N removal.

Department of Environmental Engineering
Period: 01/09/2009 → 31/08/2012
Number of participants: 1
Acronym: Micro2Man
Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Real-time hydro-economic modeling for water resources management in the Zambezi River Basin
Developing Research Project, DFC project no. 09-043DTU

Department of Environmental Engineering
Period: 01/09/2009 → 01/09/2012
Number of participants: 1
Acronym: ZambeziRiver
Project ID: 30719
Project participant:
Bauer-Gottwein, Peter (Intern)

Financing sources
Source: Forskningsprojekter - Udenrigsministeriet (Danida)
Name of research programme: Ukendt
Amount: 2,201,141.00 Danish Kroner
Project

Enhanced degradation of pesticides in transition zones around water abstraction fields

Department of Environmental Engineering
Period: 15/08/2009 → 30/09/2013
Number of participants: 6
Phd Student:
Levi, Suzi (Intern)
Supervisor:
Bjerg, Poul Løgstrup (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Dechesne, Arnaud (Intern)
Aamand, Jens (Ekstern)
Springael, Dirk (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Marie Curie (EU-stipendium)
How microniches control the diversity of microbe-mediated redox processes in aquatic systems

Microniches can lead to a higher diversity of microbes in a given systems. The “extra” microorganisms can be pathogens that hide out in the microniches or degraders that have the right conditions for degradation in the microniches, or methanogens in system with sulfate reduction and/or Fe-oxide reduction. The project will be the first to look into the controlling mechanisms as the processes occur by using microfluidic devices and bioreporter microbial strains and modelling.

Department of Environmental Engineering
Period: 07/08/2009 → 31/12/2013
Number of participants: 3
Acronym: MIPAS
Project participant:
Jakobsen, Rasmus (Intern)
Smets, Barth F. (Intern)
Dechesne, Arnaud (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Microbially mediated redox processes in aquatic systems with micro-niches

Sub-domains in the mm-µm range are often termed micro-niches and are present in many systems e.g. porous media (oil and groundwater reservoirs), water supply and waste water systems. If reactants are exclusive to a micro-niche and reaction rates are fast compared to diffusive transport, the chemical environment in the micro-niche will be different from the bulk environment and may imply that also the microbe(s) residing in the micro-niche are different from the microbes in the bulk system. This micro-scale arrangement will significantly affect the microbial ecology of a natural or technical system and the ecosystems ability to adapt to changing conditions on a bulk scale, e.g. changing redox conditions in soils. The micro-niches may also have adverse as well as beneficial effects. Adverse effects could be sustaining pathogens by providing “hiding places” in e.g. water supply systems or housing sulfate reducing bacteria and organic matter resulting in sulfide in the supplied water. Benefits may occur when locally lowered redox conditions inside micro-niches containing reductants enable microbially mediated degradation of chlorinated ethenes that would otherwise not be degraded. These examples show that the effects of micro-niches on the microbial ecology may determine important issues such as the mobility of redox sensitive compounds in soils, supplied water quality and the success of groundwater remediation schemes. In spite of this the quantitative circumstances that make micro-niches problematic or beneficial are not known in any detail. How are the micro-niches populated, how do they sustain microbial reactions, how small can these micro-niches be and still house viable microbial populations? These are the type of questions that need to be answered if we are to exploit or avoid the effects of the micro-niches present in most systems. The project will use micro-models etched in fused silica mounted in flow cells, in vivo fluorescent protein labeling of specific microbes and advance individual based modeling to include the geochemistry of the surroundings.

Department of Environmental Engineering
Period: 03/08/2009 → 29/07/2011
Number of participants: 2
Acronym: MiMeRePaSym
Project participant:
Jakobsen, Rasmus (Intern)
Smets, Barth F. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Have-park affald: Sammenlignende vurdering af disponeringsmuligheder. Forprojekt 060609

Department of Environmental Engineering
Period: 01/08/2009 → 28/02/2010
Number of participants: 2
Acronym: Have-park affald
Project ID: 30726
Project participant:
Møller, Jacob (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Forsk. Private danske - Andre
Name of research programme: Ukendt
Amount: 210,000.00 Danish Kroner

RiskCycle
Risk-based management of chemicals and products in a circular economy at a global scale (Co-ordination action)

Department of Environmental Engineering
Period: 01/08/2009 → 31/07/2012
Number of participants: 2
Acronym: 819
Project ID: 30737
Project participant:
Christensen, Thomas Højlund (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 379,316.00 Danish Kroner

Review and assessment of organic substances in sewage sludge
Gennemgang og vurdering af organiske stoffer i slam

Department of Environmental Engineering
Period: 30/06/2009 → 30/09/2009
Number of participants: 1
Acronym: 960
Project Manager, organisational:
Eriksson, Eva (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

PhD Project 12 - Life cycle assessment of special and hazardous waste types and fractions

Department of Environmental Engineering
Period: 01/06/2009 → 26/01/2015
Number of participants: 6
Phd Student:
Bigum, Marianne Kristine Kjærgaard (Intern)
Supervisor:
Scheutz, Charlotte (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Olsen, Stig Irving (Intern)
Salhofer, Stefan (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Biologisk nedbrydning af kemikalier i renseanlæg. Afslag
Hovedformålet med projektet er at gennemføre en række systematiske optimeringsforsøg med simultan bionedbrydning af miljøfremmede stoffer i renseanlæg mhp. at dokumentere potentialerne som grundlag for at videreudvikle de eksisterende procesmodeller til optimering af nutidens og design af fremtidens renseanlæg.

Department of Environmental Engineering
Period: 01/05/2009 → 31/05/2010
Number of participants: 3
Acronym: 936
Project participant:
Ledin, Anna (Intern)
Press-Kristensen, Kåre (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Life cycle assessment of emerging waste-to-energy technologies
Department of Environmental Engineering
Period: 01/05/2009 → 27/03/2013
Number of participants: 5
Phd Student:
Tonini, Davide (Intern)
Main Supervisor:
Astrup, Thomas Fruergaard (Intern)
Examiner:
Scheutz, Charlotte (Intern)
Hellweg - SLET, Stefanie (Ekstern)
Jensen, Lars Stoumann (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Livscyklus- og risikoanalyse af alternative teknologier og ressourcer til drikkevandsforsyningen
Department of Environmental Engineering
Period: 01/05/2009 → 06/02/2013
Number of participants: 8
Phd Student:
Godskesen, Berit (Intern)
Supervisor:
Hauschild, Michael Zwicky (Intern)
Rygaard, Martin (Intern)
Zambrano, Kim Cecilia (Intern)
The role of spatial heterogeneity as a limiting factor for pesticide biodegradation in contaminated aquifers

Department of Environmental Engineering
Period: 01/05/2009 → 27/03/2013
Number of participants: 6
Phd Student:
Pazarbasi, Meric Batioglu (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Aastrup, Thomas (Intern)
Lindgaard-Jørgensen, Palle (Ekstern)
Lundie, Sven (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Unravelling the microbiological limitations for degradation of low pesticide concentrations in aquifers

Department of Environmental Engineering
Period: 01/05/2009 → 30/09/2012
Number of participants: 5
Phd Student:
Gozdereliler, Erkin (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Dechesne, Arnaud (Intern)
Martin-Laurent, Fabrice (Ekstern)
Nybroe, Ole (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Urban Runoff Design under influence of Climate Change

Department of Environmental Engineering
Period: 01/05/2009 → 21/11/2012
Number of participants: 8
Phd Student:
Zhou, Qianqian (Intern)
Supervisor:
Halsnæs, Kirsten (Intern)
Mikkelsen, Peter Steen (Intern)
Nielsen, Susanne Balslev (Intern)
Main Supervisor:
Ambjerg-Nielsen, Karsten (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Krebs, Peter (Ekstern)
Merz, Bruno (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

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**AQUA Fingerprint**
On-line detection and characterization of feacal contamination by in aquatic systems by fluorescence technology

Department of Environmental Engineering
Period: 01/04/2009 → 31/12/2010
Number of participants: 1
Acronym: AQUA_Fingerprint
Project ID: 30693
Project Manager, organisational:
Arvin, Erik (Intern)

**Financing sources**
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Ukendt
Amount: 611,882.00 Danish Kroner
Project

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**Attenuation of landfill leachate pollutants at a groundwater - surface water interface**

Department of Environmental Engineering
Period: 01/04/2009 → 22/08/2012
Number of participants: 6
Phd Student:
Milosevic, Nemanja (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Main Supervisor:
Bjerg, Poul Legstrup (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Rivett, Michael O. (Ekstern)
Tuxen, Nina (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Marie Curie (EU-stipendium)
Project: PhD

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**Biogenic Carbon in Danish Combustible Waste**

The ratio between biogenic (biomass) and fossil carbon in fuels affects the "sustainability" of the fuel and the energy technology using this fuel. Today waste contribute with a significant share of Danish renewable energy, however the current data for contents of biogenic and fossil carbon in Danish combustible waste are highly uncertain. To provide accurate accounts of national CO2 emissions, assess whether reduction targets can be met or new renewable energy projects need to be initiated, and overall to further develop the waste-to-energy sector, better carbon data has to be provided. This project combine actual full-scale measurements of carbon in off-gases with modeling approaches to provide documented sampling/measurement procedures and recommendations for implementation of upcoming CEN standards in
Clean and environmentally friendly animal waste technologies for fertilizer and energy production

This project aims to research and develop novel, environmentally friendly technologies which from livestock manure can recover the nitrogen (N) and phosphorous (P), in the form of marketable fertilizers. Energy production technology is optimally an integrated part of manure management systems and is included as an important, but minor R&D activity. Animal manure contains large amounts of plant nutrients and organic carbon, which if left untreated, may potentially pollute surface waters and is a source of greenhouse gases (GHGs), ammonia (NH3) and odour. Phosphorous (P) is a very limited global resource which has a supply horizon of 60-130 years. Continuously wasting this limited plant nutrient resource constitutes a risk to the global feed and food supply. The energy rich organic material may supply 3-4% of the Danish energy consumption. Novel technologies for sustainable management and utilisation of animal manure and biowaste are necessary because the continued increase in specialisation and scale of operation of animal farms makes it difficult to comply with new environmental regulations of waste management on limited land, and attractive due to the rapidly increasing prices on the resources of fuels and fertilisers. The vision of this project is to i) develop unit operations to treat slurry and recover plant nutrients into marketable products and ii) to integrate environmental, nutrient recovery and bioenergy technologies for animal manure and biowaste processing in a whole system approach to ensure cost-effectiveness. The project will provide verified analyses (systems modelling, life cycle assessment (LCA), environmental economics) on the impact of these new environmentally friendly bio-energy technologies. This is needed for policy making as well as when marketing on a rapidly growing world market for cleantech.
Investigation of the effect of UV treatment on the microbial quality in Odense Waters distribution system – Phase 2
The project will investigate the effect on the microbial drinking water quality of applying UV treatment with medium pressure lamps within the distribution system. A range of chemical and microbial water quality parameters will be analysed over a one year period and compared to base line levels measured over a 3-year period prior to the implementation.

Department of Environmental Engineering
Period: 23/03/2009 → 31/07/2010
Number of participants: 2
Acronym: UVOV
Project ID: 30696
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Project Manager, organisational:
Corfitzen, Charlotte B. (Intern)

Financing sources
Source: Samarb. aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 219,400.00 Danish Kroner

Flow cytometer and UV-laser for Confocal Laser Scanning Microscope
The Flow cytometer will increase our options in cell quantification and the UV-laser for the Confocal Laser Scanning Microscope will enhance our possibilities in terms of direct observations of methanogens and of using tags and labels excited by UV-light.

Department of Environmental Engineering
Period: 02/03/2009 → 31/12/2009
Number of participants: 6
Acronym: 946
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Henze, Mogens (Intern)
Jakobsen, Rasmus (Intern)
Angelidaki, Irini (Intern)
Dechesne, Arnaud (Intern)
Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Integrated hydrological ecological modelling

Department of Environmental Engineering
Period: 01/03/2009 → 19/09/2012
Number of participants: 6
Phd Student:
Loinaz, Maria Christina (Intern)
Supervisor:
Butts, Michael Brian (Intern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Binning, Philip John (Intern)
Bierkens, Marinus F. P. (Ekstern)
Bøgh, Eva (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD

**Egen vandressource projekt 5: Helhedsorienteret analyse af vandforsyningsalternativer - afsaltning**
Indsamling af erfaring vedrørende afsaltning i vandforsyning og etablering af vandforsyningsscenarier baseret på afsaltet havvand samt analyse af nødvendigt beslutningsgrundlag for indførelse af sådanne teknologier.

Department of Environmental Engineering
Period: 25/02/2009 → 31/08/2009
Number of participants: 5
Acronym: Afsaltning-A5
Project ID: 30670
Project participant:
Corfitzen, Charlotte B. (Intern)
Arvin, Erik (Intern)
Binning, Philip John (Intern)
Rygaard, Martin (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 582,359.00 Danish Kroner

**Assessment of Nanoparticle Specific Effects in Environmental Toxicity Testing - Expression of interest**
The overall aim of the proposed project is to explore those factors and mechanisms affecting the release, behaviour and uptake of current and future use engineered nanoparticles in the aquatic environment. The results will be used to develop guidance on the design and interpretation of aquatic environmental fate and effects studies.

Department of Environmental Engineering
Period: 01/02/2009 → 01/02/2011
Number of participants: 1
Acronym: NanoCEFIC
Project ID: 30717
Project Manager, organisational:
Baun, Anders (Intern)

**Financing sources**
Source: Forsk. Andre offentlige og private - Udenlandske
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

**Developing tools for optimised risk assessment of nanoparticles in humans and the environment**
FP7 application, 2 stage procedure

Department of Environmental Engineering
Period: 01/02/2009 → 01/02/2012
Number of participants: 0
Acronym: NanoValued
Project

**Sino-Danish Workshop to initiate strategic research collaboration on soil and water resources, environment and human health - expression of interest**
to be uploaded

Department of Environmental Engineering
Control of hazardous substances in the Baltic Sea Region

Pollution caused by hazardous substances still poses risks to the Baltic Sea area. Loads and impacts of some hazardous substances have been reduced considerably during the past 20-30 years, but concentrations of some other substances have increased in the marine environment. The COHIBA Project will identify the sources and inputs of the 11 hazardous substances, which are largely unknown and develop measures to reduce these substances. With HELCOM Baltic Sea Action Plan (BSAP) the Baltic Sea countries have committed themselves to achieve a "Baltic Sea with life undisturbed by hazardous substances. The overall objective of COHIBA is to support the implementation of the BSAP with regard to hazardous substances by developing joint actions to reach the goal. COHIBA will last three years (2009-2012). It’s co-financed by the European Union within the Baltic Sea Region Programme 2007-2013. It’s total budget amounts to around EUR 4.9 million.

High-performance two-step process for biological production of hydrogen and methane from organic residues

The main goal of “BioHyMeth” is to develop an innovative two-step fermentation process in which hydrogen is produced in the first step and methane in the second. The target is to obtain a mixture of hydrogen and methane by using methane to strip the hydrogen from the first step. In this way, productivity in the hydrogen fermentation is increased by eradicating the inhibition at H2 partial pressure above 20 kPa (Van Niel, Claassen, Stams, 2003) and a mixture of hydrogen and methane is the end-product. The mixture of hydrogen and methane (BioHyMeth-gas) will be a tailor-made biofuel for stationary CHP units (combined heat and power) because of significant lower NOx emission and a reduction of CO2 emission, already shown by combustion of a similar mixture of hydrogen and natural gas: the Hythane®-gas. This project builds on the extensive knowledge in anaerobic digestion, where separation into two steps has been shown to give an optimisation in organic loading rate and gas productivity (Ueno et al, 2007). Furthermore, knowledge recently acquired in hydrogen fermentation in the FP6 IP HYVOLUTION FP-6 SES 019825 will be at the foundation of this project. In BioHyMeth an alternative strategy is provided for substrates not suitable for photofermentation, which is the second fermentation step in the bioprocess in HYVOLUTION. As such, this project adds to the variety of biofuels and the increased security of energy supply at a regional level. The optimised process will be upscaled to a combined pilot plant (approximately 500 l total fermenter volumes).
biorefinery process approach focusing on 1) Field studies to investigate and optimize rapeseed crop production, harvesting, storage and transport, 2) Laboratory scale studies devoted to the rapeseed oil extraction, production of high value-added chemicals from oilseed bioprocessing, development of new enzymatic transesterification process for biodiesel production, pre-treatment and enzymatic hydrolysis of cellulose and hemicellulose for downstream bioconversion to bioethanol and biohydrogen, 3) Pilot scale study at DTU to optimize a two steps process for biohydrogen and biomethane production from the process wastewaters, 4) Supply chain analysis based on Life-Cycle – assessment methodologies for comparison of different process chains from well to product. Sensitivity analysis will be devoted to determine bottlenecks for different processes. Additionally, key emissions and/or resource consumption data related to the individual processes will be identified for further optimization of the overall biorefinery concept, 5) Demonstration of the final biorefinery concept at DONG existing infrastructure.

Department of Environmental Engineering
Period: 01/01/2009 → 31/12/2011
Number of participants: 2
Acronym: BIOREF
Project ID: 30519
Project participant:
Angelidaki, Irini (Intern)
Project Manager, organisational:
Karakashev, Dimitar Borisov (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Development of (Quantitative Structure-Activity Relationships models for nanoparticles
The purpose of this project is to develop Quantitative Structure-Activity Relationships-models for engineered nanoparticles (QSARNP) that can predict the human health and environmental effect based on inherent physico-chemical properties of nanoparticles. Based on the hypothesis that the biological effects of engineered nanoparticles are directly linked to the inherent physico-chemical properties, the aim of this project is to provide guidance to companies, material developers, and regulators to screen and rank engineered nanoparticles according to their toxicity. Within a two-year period, we will carry out research dedicated to the following objectives: To identify and select appropriate human health and environmental toxicological endpoints and nanoparticle characteristics to be used as hazard descriptors To develop and validate model(s) for estimation of the (eco)toxicity of engineered nanoparticles based on existing knowledge on physico-chemical properties and hazards documented in laboratory studies

Department of Environmental Engineering
Period: 01/01/2009 → 31/12/2011
Number of participants: 3
Acronym: QSAR-NP
Project participant:
Baun, Anders (Intern)
Kusk, Kresten Ole (Intern)
Hansen, Steffen Foss (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Effective land surface representation in water resource modelling
The overall goal of the project is to develop methodologies to quantify the relative impacts of land use and climate variability on water yields and extreme hydrological events, ie. floods and droughts, at multiple spatial scales. An important objective is to relate land use change to its position in landscape (and its spatial variations) and quantify its cumulative effects on hydrological processes at larger scale. For this purpose, new and innovative data types will be used to improve the knowledge basis required to develop efficient land surface schemes and model techniques facilitating prediction of cumulative and large-scale hydrological and atmospheric processes. The combined use of new data types and cross-disciplinary modeling approaches will facilitate 1) quantification of relationships between site-specific, spatial and cumulative hydrological processes and 2) prediction of the relative impacts of climate and land use changes on water yield and extreme hydrological events at different spatial scales. Such tools are particularly important to mitigate climate change impacts and optimize land use and water management planning in relation to ecosystem health, agricultural production, human/industrial water needs, and flood protection in urban, coastal and near-stream regions.
Efficient integrated Data and Information Technology for monitoring the environment. Rejected
The project will develop a new framework and innovative technologies for monitoring the environment. The principal idea of the proposed framework is integration of measurements of environmental variables from in-situ and remote sensing with process-based environmental modelling to provide the best (most cost-effective) estimate of the environmental state and its uncertainty in space and time. The project will develop integrated solutions that consider monitoring of environmental variables in soil, inland water bodies (groundwater, rivers, wetlands and lakes), marine waters and air in one unified system. The framework will be flexible in order to address monitoring at a range of scales, from national and regional environmental monitoring programmes to the monitoring of eco-systems at local scales. Furthermore, the framework can be used to monitor the effects of implementation of new environmental technologies, regionally as well as locally. The proposed framework is also essential for effective detection of trends in environmental variables due to changes in the driving forces such as changes in emissions or climate change. A key issue and innovative component of the project is estimation of the uncertainty of the environmental state. Provision of the uncertainty is important to optimise the monitoring efforts. The project will develop optimisation procedures that consider uncertainty and costs of the monitoring for optimal location and measurement frequency of in-situ sensors in combination with remote sensing information to provide the most cost-effective monitoring strategy. The developed technologies will be demonstrated in a regional-scale case study for integrated monitoring and modelling of nitrogen including atmospheric deposition on land and water bodies, agricultural loading of soils and transformation in hydrological media and marine waters. In addition, a number of minor case studies will demonstrate the value of monitoring and modelling at local scale for selected environmental variables and media.

Electricity assisted biological hydrogen production using single chamber membrane-free anaerobic reactor
Bio-hydrogen is a CO2-neutral energy source with very promising perspectives, as an alternative to fossil fuels for future energy production. Hydrogen can be produced from organic waste, i.e. utilizing an otherwise undesirable burden to society, as a useful raw material for production of fuel for road vehicles or for production of electricity. Biohydrogen production through conventional fermentation has a serious disadvantage, limited by a maximum hydrogen production of only 33% of the energy content in the organic material. A new method, where electricity is assisting the biological process to overcome its limitations and fully recover the energy in the organic matter in the form of hydrogen, has recently been discovered. The method is however in it infancy and requires expensive membranes which makes the application of such technology not practically feasible. Preliminary results at the DTU-Environment indicate however, that membranes-free anaerobic environment can be used for hydrogen production from organic matter. The aim with this project is to investigate possibilities for develop an efficient and economic process for electricity assisted biological hydrogen production. With the proposed project we intent to: -Disclose the fundamental biological process for the fully oxidation of organic matter to hydrogen and carbon dioxide by electrically assisted hydrogen fermentation -Evaluate the parameters important for biohydrogen production in an anaerobic reactor -Develop an innovative process configuration, with membrane-free reactors, for efficient biohydrogen production -Evaluate the process by system analysis.
Evaluation tools targeted at Water and Water Supply Technologies
Deterioration of water quality and reduced availability of water caused by anthropogenic and climate pressures require prompt actions by water managers in order to maximize the economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Technologies for e.g. waste water treatment, water saving and reduction of non-point source pollution are being developed to mitigate the deterioration of the water resources and ecosystems. Efficient selection and implementation of these technologies requires advanced tools. The aim of this research proposal is to extend, improve, adopt and test a suite of management tools targeted at evaluation of water related environmental technologies. The development of tools will consider the specific technological, hydrological and socioeconomic context of the implementation and at the same time ensure a consistent comparison of the efficiency of different technologies. The ET-WATER framework will enable use of systematic and analytical approaches in identifying appropriate and efficient water related environmental technologies required e.g. in order to fulfil goals of the Water Framework Directive or needs related to climate change adaptation, by integrating economic and hydrological tools addressing uncertainties and probabilities. Expected results include flexible water management tools based on state-of-the-art technical, hydrologic and economic knowledge aiming at identifying cost-efficient measures and implementation modalities facilitating the water and environmental management and decision-making process. The water and environmental managers at national, regional and local level and the water management industry will benefit from this development through knowledge transfer using the rich Danish experiences. The export potential of water management tools and advisory services from Denmark will increase.

Groundwater Prism
Groundwater sustains a great number of biologically diverse ecosystems, yet we only now begin to fully appreciate their inter-dependent nature. Our knowledge on how groundwater quality and quantity is affected by human activities is limited. Consequently, risk assessment strategies, the resulting formulation and implementation of regulations to protect aquifers and groundwater dependent ecosystems have to be adjusted.
Highly effective conversion of C5 and C6 sugars to ethanol by new yield type ethanol-tolerant microorganisms: challenge for sustainable 2nd generation bioethanol production from lignocellulose

A limiting factor for the full-scale utilization of lignocellulosic material for bioethanol production is the lack of wild-type (native) microorganisms that are able to efficiently ferment pentoses and hexoses with high tolerance to ethanol. Industrial application of the recombinant microbial strains for bioethanol production is still restricted by legislations with respect to human health and environment protection. High efficient microbial conversion of hexoses to ethanol is a well developed industrial process. On the contrary all known pentose utilizing wild-type microorganisms were characterized with low ethanol yields and low ethanol tolerance. The overall goal of this project is to screen and select microorganism and conditions for optimal hexose and pentose fermentation to ethanol. More specifically we aim to: -enrich, isolate and identify a number of wild-type ethanologens with high ethanol tolerance and ability for high rate fermentation of both hexoses and pentoses; -identify optimal process conditions for bioethanol production from real lignocellulosic hydrolysates; -demonstrate bioethanol production with selected microorganisms in pilot scale conditions

Impact of climate change on the quality of urban and coastal waters (diffuse pollution)

DiPol intends to make a contribution to retain sustainable and healthy urban and coastal waters despite potential adverse effects of climate change. European urban areas face a number of environmental problems such as air pollution, traffic volumes, scarcity of recreational areas, generation of large volumes of waste and waste water, and historical industrial legacies. Within the Water framework Directive (WFD, 2000) the water related problems are mapped and linked to their sources. However, the management options don’t take into account the risks in a catchment area (from urban areas to coastal zones) under extreme conditions. Solutions need to be forward-looking and anticipate future risks such as the impacts of climate change as well as contribute to national, regional and global policies (Technical Report of the EC 2007-013). Education and awareness of the link between societal behaviour and development, environmental quality and economic development is necessary for the long-term mitigation of environment and climate related problems. While direct consequences of climate change on urban development (e.g. flooding) have been addressed in a number of projects (see 3.9), secondary implications of increased urban runoff, higher contaminant loads of rivers during more frequent floods, the risks of rising ground water levels in industrialized areas and of stronger rainfalls on the contamination of urban waters has received little attention until now. Ultimately these contaminated fresh water ends up in the coastal waters. Increased introduction of contaminants into surface waters in the coastal zone may counteract sustainable urban development (human health, quality of life, economic attraction) as well as European environmental strategies such as the Water Framework Directive (WFD) and the planned European Marine Strategy. Starting from visions of school children and of the public on future environmental services (e.g. suitability of public waterways for swimming), those climate change related processes that support or endanger these visions by affecting the quality of urban and coastal waters will be in the focus of this project. They will be used to develop a plan for sustainable development in their communities. Quality-related impacts of rainfall, sea level rise, and river discharges will be investigated relative to the way they may alter the living environment and endanger the realization of these visions within the next 50 years, and measures or alternatives will be suggested to either prevent or adapt to the expected impacts. Experts on atmospheric, river and marine pollution from Norway, Sweden, Denmark, the Netherlands and Germany will work together with local administrators and regional managers to identify impediments to this sustainable development that are related to climate change. Risks due to different emission pathways (e.g. urban water run-off) will be related to each other and prioritized with regard to their impact and potential management measures. These measures will then be communicated to the public. Approaches to address and counter risks to the goals of the European Environmental policies through changes in the emission of priority substances will be introduced by the EU-Joint Research Centre into the international working group level that drafts guidance for the monitoring concepts of the WFD, and realizes the Oslo-Paris Convention on the protection of the North Sea.
INTERREG IVC
The basic idea of the project is to determine the good practices and to design the best policy, which successfully tackle the problem of waste prevention and management for the benefit of regional/local communities not only of the participating but all the EU countries. Many regional/local authorities, with weak knowledge endowments, are confronted with the challenge of supporting the Green concept in environment. However, the ability of local authorities to facilitate or underpin the necessary knowledge transfer from universities with the help of national/regional agencies definitely assists the implementation of ETAP at the participating regions. So, providing the aforementioned background, the main project objective is to enhance the interaction between universities and local authorities, with the aim of facilitating knowledge exchange that can lead not only to increased environmental consciousness but also to the adoption of actions and mechanisms through a solid action plan.

Department of Environmental Engineering
INTERREG IVC

Microbial Remediation of Contaminated Soil and Water Resources
This project aims at developing new biotechnologies for remediation of pesticide-polluted soil and water resources. Bioaugmentation technology is the introduction of specific degradative micro-organisms to treat contaminated soil or water. In this project, new bioaugmentation technologies will be developed taking advantage of novel strategies for isolation of specific microorganisms with specialized degradation capabilities. Until now, research on contaminant degradation has focused on the role of bacteria, but in this project the potential of fungi will also be studied to explore the possibility of using fungal-bacterial consortia for bioaugmentation. To prevent predation by protozoa and to secure optimal conditions for degradation, selected strains or consortia will be immobilized on specifically designed carriers. The developed bioaugmentation technologies will be evaluated at the field-scale 1) for remediation of pesticide-polluted soil to prevent leaching of the compounds to underlying aquifers, 2) for treatment of pesticide-polluted drinking water in sand filters at waterworks and 3) in reactive barriers protecting drinking water wells by degrading pesticides before they enter the waterworks. The project will bring together a consortium of national and foreign research institutions, waterworks, private companies and environmental agencies, all of which will benefit from this new constellation. Moreover, new candidates within the field of environmental biotechnology will be educated. Two postdoctoral fellows and six PhD students will be financed directly by the project and several MSc students will also participate.

Department of Environmental Engineering

The core of the proposed project is to investigate and further advance multi-objective, multi-reservoir management by use of surrogate modelling with evolutionary algorithms within a simulation-optimisation framework for optimisation of water resources systems under different climate projections. The research will focus on development of downscaling techniques and weather generators, as well as multi-fidelity and adaptive surrogate modelling techniques that use a sequence of surrogates with varying fidelity in the optimisation. Surrogate models are continuously updated by models with greater physical fidelity as the optimisation proceeds. The developed techniques will be tailored towards application in complex water resources systems, involving multiple objectives as well as multiple reservoir systems. Special emphasis will be given to develop cost-effective methods that are feasible for real-time applications, where real-time data and forecast information are used in the optimisation process. An important aspect that will be considered in the project is how to handle uncertainties and stochasticity in the optimisation process. Uncertainties are related to the inherent errors in the input data used to force the modelling system as well as errors in the modelling system itself. Stochasticity is related to the inherent stochastic nature of the meteorological variables forcing the modelling systems. Uncertainties and stochasticity are normally represented by multiple system states in an ensemble setting, which adds an additional computational challenge to the optimisation problem. The use of weather generators and surrogate modelling is seen as a viable way to solve this problem. The developed techniques will be tested and evaluated on the Red River basin reservoir system in Vietnam.

NanoSafe 2

Application to FP7

RESCOBIR-2

Removal of reduced nitrogen (organic and ammonia-N) is mandatory before discharge of treated wastewaters to receiving waters. Currently available biotechnologies are very resource intensive and can results in unwanted GHG emissions. We have previously demonstrated a novel way to attain N removal: it involves the use of aerobic and anaerobic ammonium oxidizing bacteria, which are grown together to high density on oxygen permeable membranes. The current project aims to optimize and delineate the technological capacities of the ReSCoBiR concept for N removal. By using a combination of experimental and computational tools, reactor-scale and microscale analyses, and advanced bioprocess monitoring and control methods, we will build, operate, and optimize several bioreactor modules and develop and calibrate supporting process models and control algorithms. We expect succesful technology transfer at project end.
Reuse of treated sewage
A single household sewage treatment plant is investigated for pathogens in the effluent and the possibility to disinfect the effluent with either UV and UV and ozone is investigated for purifying the wastewater to different standards of reuse.

Department of Environmental Engineering
Period: 01/01/2009 → 31/10/2009
Number of participants: 2
Acronym: 871
Project participant:
Ledin, Anna (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Strategies for chemical healthy public swimming pools
Department of Environmental Engineering
Period: 01/01/2009 → 27/03/2013
Number of participants: 6
Phd Student:
Kaarsholm, Kamilla Marie Speht (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Mosbæk, Hans (Intern)
Main Supervisor:
Andersen, Henrik Rasmus (Intern)
Examiner:
Lützhøft, Hans-Christian Holten (Intern)
Grønborg, Ole (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Uncertainty and adaptive estimation in storm- and wastewater system modelling
Department of Environmental Engineering
Period: 01/01/2009 → 02/07/2014
Number of participants: 7
Phd Student:
Borup, Morten (Intern)
Supervisor:
Grum, Morten (Intern)
Madsen, Henrik (Intern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)
Examiner:
Ambjerg-Nielsen, Karsten (Intern)
Savic, Dragan A. (Ekstern)
Weerts, Albrecht (Ekstern)

Financing sources
Source: Internal funding (public)
Inventory modelling and documentation of four landfilling technologies for ELCD using EASEWASTE
The objective is to develop inventory modelling (in-put / out-out tables) and documentation for four landfilling technologies for ELCD using EASEWASTE. ELCD is the European database for life-cycle-inventories hosted by the JRC in Ispra. The ELCD datasets will be represented as default technologies in EASEWASTE in the future

Department of Environmental Engineering
Period: 15/12/2008 → 30/04/2009
Number of participants: 2
Acronym: 918
Project ID: 30727
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)
Manfredi, Simone (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 211,950.00 Danish Kroner
Project

Environmental hazard evaluation of the SIN-list
This project aims at performing an environmental hazard assessment of the 270 compounds presently included on the SIN-list (Substitute It Now)

Department of Environmental Engineering
Period: 01/12/2008 → 30/04/2009
Number of participants: 3
Acronym: SIN-list
Project ID: 30654
Project participant:
Eriksson, Eva (Intern)
Lützhøft, Hans-Christian Holten (Intern)
Project Manager, organisational:
Ledin, Anna (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Ukendt
Amount: 75,000.00 Danish Kroner

Relations
Publications:
Second opinion on the hazards associated with the substances selected for the REACH SIN* List 1.0
Project

Miljøeffektiv TEKnologi til videregående rensning af overløbsvand og spildevand
Formålet er at skaffe ny viden og demonstere tre multifunktions-TEKnologier til rensning af overløbsvand og videregående rensning på renseanlæg, som hver især i ét anlæg kombinerer flere supplerende rensefunktioner. Det er således målet, at kombinere konventionelle renseteknologier (mikrosifiltrering, sandfiltrering og bundfældning) med udvidede funktioner, hvorved teknologiernes færre alsidighed i forhold til bl.a. flowbelastning og mindre pladsbehov. Desuden er det målet at undersøge hvilken betydning udvidelse af konventionelle renseteknologier har på rense-effekt overfor hormonforstyrrende stoffer, patogene bakterier og næringsstoffer. Dette er således, at demonstrationsprojektet giver anledning til at i flere byer etablerer renseteknologi for at mindske belastningen på bynære rekreative vandressourcer, herunder at: • flere regnbetingede spildevandsaflastninger fra kloaksystemerne rences inden det udledes • videregående rensning på renseanlæg bliver mere udbredt og der derfor udlodes mindre mængder hormonforstyrrende stoffer, patogene mikroorganism og næringsstoffer. Med projektet kommer vi nærmere, at det renseede spildevand ikke bliver blandet med renseanlægget, og at det derfor er en positiv ressource i vore recipenter. For eksempel kan det renseede spildevand ledes/pumpes til en recipient som en grundvandføring. Samtidig vil det renseede spildevand ikke belaste badevandskvaliteten, som det ellers tilsyneladet ved udløb fra mange renseanlæg. Konkret vil der i de tre demonstrations-cases opnås erfaringer med drift i stor skala og blive belyst en sammenhæng mellem belastning/kapacitet og resulterende reneffektivitet. Ligesom det overordnede mål, med at teknologiernes skal give mest miljø for pengene,
forfølges. Det er valgt at gennemføre testprogrammet for de tre teknologier på to sites (Renseanlæg Damhusåen og Egå Renseanlæg), der begge er repræsentative for store bynære anlæg, der afleder vand til recipierenter med højt rekreativt potentiale. Testresultaterne skal hjælpe forsyninger og miljømyndigheder til at identificere tekniske, miljømæssige og økonomisk relevante teknologier, der kan være med til at forbedre den kemiske og mikrobiologiske vandkvalitet i de områder, der modtager renset spildevand og overløbsvand.

Department of Environmental Engineering
Period: 01/12/2008 → 01/12/2009
Number of participants: 4
Acronym: MILTEK
Project ID: 30709

Ledin, Anna (Intern)
Qualmann, Signe (Intern)
Kruse, Susanne (Intern)

Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 252,000.00 Danish Kroner

Multi-scale hydro geological characterisation of contaminated sites in clayey till

Department of Environmental Engineering
Period: 01/12/2008 → 27/06/2012
Number of participants: 7
Phd Student:
Kessler, Timo Christian (Intern)

Supervisor:
Klint, Knud Erik (Ekstern)
Nilsson, Bertel (Ekstern)

Main Supervisor:
Bjerg, Poul Legstrup (Intern)

Examiner:
Jakobsen, Rasmus (Intern)
Piotrowski, Jan A. (Ekstern)

Therrien, René (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

On-line continuous monitoring of drinking water quality
To increase the safety for good drinking water, quality parameters should be monitored with a higher frequencies than today's spot checks. This project will investigate the possibilities for online, continuous and real-time monitoring by:
•Investigating the suitability of different online sensors e.g. turbidity, conductivity, flow, pressure or temperature to ensure good drinking water quality based on long-term time series. •Improving the interpretation of the signal from online sensors by identifying the source causing the signal. •Comparing and evaluate sensors with the goal to select the best suited sensors. •Investigating to what degree a signal represents a significant change in the drinking water quality by introduces changes to the system in connection with intensive measuring campaigns including a large range of parameters.
•Combining measuring campaigns with newly developed equipment for online ATP-measurement.

Department of Environmental Engineering
Period: 01/12/2008 → 31/01/2010
Number of participants: 2
Acronym: OKDK
Project ID: 30652

Albrechtsen, Hans-Jørgen (Intern)
Reduktion af methanemission fra AVMiljø ved opbygning af biocover system. Forstudie

Department of Environmental Engineering
Period: 01/12/2008 → 01/07/2009
Number of participants: 3
Acronym: AVMiljø-Biocover
Project ID: 30667
Project participant:
Skov, Bent Henning (Intern)
Scheutz, Charlotte (Intern)
Kjeldsen, Peter (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Ukendt
Amount: 400,275.00 Danish Kroner

SUDS Project Handbook
The project aims to improve the knowledge basis and create and overview of methods for Sustainable Urban Drainage Systems (SUDS), for implementation in Copenhagen Municipality (in Danish: LAR - Lokal Afledning af Regnvand). A SUDS-project manual will be prepared, which can be used by the Center for Park and Nature and other departments in Copenhagen Municipality as well as by their consultants and contractors. DTU Environment's contribution to the project is focused on assessing the fate of priority pollutants (PPs) in SUDS-elements based the removal processes occuring in SUDS-elements and the inherent physical-chemical properties of the PPs.

Department of Environmental Engineering
Period: 01/12/2008 → 31/08/2009
Number of participants: 3
Acronym: LAR-Håndbog
Project ID: 30715
Project participant:
Eriksson, Eva (Intern)
Vezzaro, Luca (Intern)
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 109,800.00 Danish Kroner

Relations
Publications:
Vurdering af renseeffekt for metoder til lokal rensning og afledning af regnvand
LCA-screening of 8 European waste management scenarios
Eight waste management scenarios representing various generic European approaches are screened by using EASEWASTE in collaboration with the Sustainable Landfill Foundation. The scenarios involve source separation of recyclables, MBT, incineration, composting, anaerobic digestion, RDF and landfilling.

Department of Environmental Engineering
Period: 15/11/2008 → 28/02/2009
Number of participants: 5
Acronym: 935
Project participant:
Astrup, Thomas Fruergaard (Intern)
Christensen, Thomas Højlund (Intern)
Boldrin, Alessio (Intern)
Manfredi, Simone (Intern)
Project Manager, organisational:
Møller, Jacob (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Injektionsprojekt på Vadsbyvej 2008, Delprojekt 3
Afprøvning og dokumentering af metoder (hydraulisk frakturering og geoprobeinjektion) til injektion af stoffer i moræneler.

Department of Environmental Engineering
Period: 12/11/2008 → 01/04/2009
Number of participants: 1
Acronym: InjVad
Project ID: 30597
Project Manager, organisational:
Bjerg, Poul Logstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 744,000.00 Danish Kroner

UV treatments effect on aftergrowth potential
Literature study on UV treatments effect on aftergrowth potential in drinking water distribution system in relation to Gentofte water supply

Department of Environmental Engineering
Period: 10/11/2008 → 31/01/2009
Number of participants: 2
Acronym: UV-Gentofte
Hydrogeophysical tools for the calibration and validation of coupled surface water / groundwater flow and transport models

Department of Environmental Engineering
Period: 01/11/2008 → 28/03/2012
Number of participants: 6
Phd Student: Herckenrath, Daan (Intern)
Supervisor: Auken, Esben (Intern)
Main Supervisor: Bauer-Gottwein, Peter (Intern)
Examiner: Binning, Philip John (Intern)
Jensen, Karsten Høgh (Intern)
Vereecken, Harry L.V. (Ekstern)

Optimization of bio-hydrogen production from carbohydrate rich wastes by extreme thermophilic microorganisms

Department of Environmental Engineering
Period: 01/11/2008 → 03/07/2013
Number of participants: 6
Phd Student: Tomás, Ana Faria (Intern)
Supervisor: Karakashev, Dimitar Borisov (Intern)
Main Supervisor: Angelidaki, Irini (Intern)
Examiner: Dechesne, Arnaud (Intern)
Norddahl, Birgir (Ekstern)
Verstraete, Willy (Ekstern)

National climate change adaptation webportal, input on Water
Levering af input til klimatilpasningsportalen om emnet Vand på vegne af Miljøministeriet, By- og Landskabsstyrelsen

Department of Environmental Engineering
Period: 27/10/2008 → 14/11/2008
Number of participants: 5
Acronym: Vandportal
START-funding II. Preparation of EU project proposal “Biorefinery for sustainable Reliable Economical Fuel production from energy crops” (Acronym: BioREF)

With this project we apply money for formulation, preparation and organization of an EU application under the 7th EU framework programme within “FP7, Cooperation, Theme 2, Food, Agriculture, Fisheries and Biotechnologies, area 2.3.7. BIOREFINERY joint call, call identifier FP7-2009-BIOREFINERY.

Department of Environmental Engineering
Period: 10/10/2008 → 02/12/2008
Number of participants: 3
Acronym: 896
Project ID: 30638
Project participant:
Arvin, Erik (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Henze, Mogens (Intern)
Binning, Philip John (Intern)
Project Manager, organisational:
Ambjerg-Nielsen, Karsten (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 40,000.00 Danish Kroner

Project Evaluation of soil and groundwater pollution at the Collstrup site: Summary of site investigations

The old wood preservation site close to Hillerød is heavily polluted with arsenic and chromate. Especially arsenic is leaching out from the site and affects groundwater and surface waters in the surroundings. Site investigations have been carried out over a period of 30 years. This project summarizes the knowledge obtained from the investigations.

Department of Environmental Engineering
Period: 01/10/2008 → 01/04/2009
Number of participants: 2
Acronym: Collstrup
Project ID: 30640
Project participant:
Angelidaki, Irini (Intern)
Boe, Kanokwan (Intern)
Karakashev, Dimitar Borisov (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 195,000.00 Danish Kroner

Project Remediation of TCE source zone in Skuldelev by the ZVI-Clay technology

Source zones of DNAPLs can be complicated and difficult to delineate precisely. ZVI-Clay is a technology which contain the source by soil mixing bentonite and zero valent iron (ZVI) into the source zone area. The bentonite gives an immediate flux reduction from the source while the ZVI leads to degradation of the contained TCE. The technology has never been used outside USA. This project will closely follow the degradation processes within the treated source zone and the
remedial effect on the TCE flux away from the source.

Department of Environmental Engineering
Period: 01/10/2008 → 01/06/2010
Number of participants: 2
Acronym: ZVI-Clay
Project ID: 30639
Project participant:
Fjordbøge, Annika Sidelmann (Intern)
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 753,000.00 Danish Kroner
Project

Output 4 - Capacity built through University of Zambia

The governments of Zambia and Denmark are co-operating on a Water Sector Programme in Zambia, of which the first phase is planned to be implemented in the period from 2005 to 2010 (DANIDA, 2005a). Component 3 in this programme is a support to facilitate Integrated Water Resources Management (IWRM) at the Ministry of Energy and Water Development in Lusaka. A defined Output 4 in this programme is support to Capacity built through University of Zambia (DANIDA, 2005b), and objectives which shall be achieved through collaboration between UNZA and Danish Research Institutions. A representative from UNZA has visited research institutions during two trips to Denmark, and a fact finding report defining the set-up of a twinning arrangement have been written (Nyambe and Thygesen, 2006). In May 2008 a co-operation agreement was signed between UNZA and a Danish consortium consisting of The National Geological Survey of Denmark and Greenland (GEUS) and The Technical University of Denmark. The immediate objective of Output 4 is to: •Improved and sustainable water sector performance through human capacity building at University of Zambia. This objective will be achieved through the following activities: •Establish an Integrated Water Resource Management (IWRM) Centre at UNZA. •Develop a communication strategy for marketing of the IWRM Centre •Establish one-year diploma courses on IWRM and Hydrogeology at UNZA. •Carry out a number of applied research projects, relevant for improved planning, regulation and allocation of Zambia's water resources as well as for improved water services delivery. •Support to two PhD projects at UNZA •Support to eight M.Sc. projects at UNZA. •Support to tailor made courses for 150 IWRM in-service students. •Support to faculty exchanges between UNZA and Danish research institutions. The co-operation between UNZA and GEUS/DTU includes support to the development of course curricula for the two new diploma educations and joint supervision of M.Sc. and PhD students. The latter will be done in a close co-operation with Zambian researchers and through teaching of the students in Denmark at the Geocenter in Copenhagen and at DTU. The framework of the training of the post graduate students will be a joint research programme in Zambia with participants from the involved institutions. This document describes the contents of this research programme and outlines the contents of the integrated PhD and M.Sc. projects in the programme.

Department of Environmental Engineering
Period: 01/10/2008 → 31/12/2010
Number of participants: 1
Acronym: 895
Project ID: 30665
Project Manager, organisational:
Bauer-Gottwein, Peter (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Karakterisering af membran og UV vandbehandlingsanlægget i Marselisborgcentrets varmtvandsbassin

Undersøgelsen består i, at der i en periode på ca. to måneder registreres alle relevante målte driftsparametre vedrørende vandbehandlingsanlægget i MarselisborgCentrets varmtvandsbassin. MarselisborgCentrets varmtvandsbassin udtager i perioden 15 gange prøver af bassinvandet som sendes til instituttet som foretager analyser af TOC, THM og AOX på hver prøve. I samarbejde mellem instituttet og MaC og producenten af vandbehandlingsanlægget behandles dataene mhp. at lave en massebalance for anlæggets energi, vand og kemikalieforbrug og karakterisering af vandkvaliteten i systemet.

Department of Environmental Engineering
Research Collaboration within wastewater treatment - phase 1. CONFIDENTIAL!!

Department of Environmental Engineering
Period: 12/09/2008 → 01/05/2009
Number of participants: 1
Acronym: 892
Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 600,000.00 Danish Kroner

Project

Development of e-learning courses in environmental technology and physics.

With Moodle as platform 4 e-learning courses in environmental technology and physics is developed. The 4 courses are: Drinking water treatment - Water Education, Wastewater treatment - Water Education, Kontrol af miljøfremmede stoffer i udledninger med regn og spildevand fra byer - Water Education and Fysik 1.

Department of Environmental Engineering

Department of Physics
Period: 01/09/2008 → 30/06/2011
Number of participants: 5
Acronym: IKT-støttet læring
Project ID: 30626
Project participant:
Arvin, Erik (Intern)
Mikkelsen, Peter Steen (Intern)
Rasmussen, Birte Kastrup (Intern)
Knudsen, Carsten (Intern)
Project Manager, organisational:
Eriksson, Eva (Intern)

Financing sources
Source: Uddannelse. Statslige. Andre statslige
Name of research programme: Ukendt
Amount: 900,000.00 Danish Kroner

Project

Engineered Nanoparticles - Review of Health and Environmental Safety
See attachment

Department of Environmental Engineering
Forgasning af afgasset biofibre fra biogasanlæg og udnyttelse af forgasningsgassen i biogasreaktoren

LIFELONG LEARNING ERASMUS NETWORK ESTIA-EARTH
Estia-Earth aims at increasing awareness about gender bias issues in education, informing and motivating young women, leading them to their educational and career paths, developing educational structures and implementing new interdisciplinarity-based postgraduate curricula. The main objective is to further develop the already existent Estia-Net TN (thematic network) and to focus on creating women-friendly multidisciplinary postgraduate education involving Engineering, Computers and Sciences.

Department of Environmental Engineering
Period: 01/09/2008 → 01/09/2012
Number of participants: 0
Acronym: 818

Permeable Membrane Biofilm Reactor Technology for Complete Nitrogen Removal: Study on Feasibility & Control
Develop, optimize, and demonstrate at the laboratory-scale the feasibility of a PMBR to support oxygen limited biofilms for nitrogen removal from a high-strength synthetic wastewater. Develop and calibrate a supporting process model. Infer and verify suitable measures for performance and biofilm thickness control under steady-state and dynamic operational conditions.

Department of Environmental Engineering
Period: 01/09/2008 → 28/02/2010
Number of participants: 0
Acronym: PERMBIRT

Geosmin and 2-methylisoborneol analyse in fishing farm water
I forbindelse med et projekt omkring afprøvning af udstyr til fjernelse af geosmin (CAS 16423-19-1) og 2-methylisoborneol(CAS 2371-42-8) i dambrug, som DHI udfører, analyserer DTU-miljø koncentrationen af disse to stoffer i et antal vandprøver som stammer fra et dambrug.

Department of Environmental Engineering
Period: 20/08/2008 → 30/01/2009
Number of participants: 3
Acronym: 872
Project participant:
Mosbæk, Hans (Intern)
Christensen, Nina (Intern)
Andersen, Henrik Rasmus (Intern)

Analyseudvikling - rammekontrakt med DHI
Indgåelse af rammeaftale med DHI om udvikling af nye analyser (Type 1 projekter) og analysering af prøver efter disse prøver eller specialanalyser (Type 2 projekter)

Department of Environmental Engineering
Period: 08/08/2008 → 31/12/2010
Number of participants: 4
Acronym: 870
Project participant:
Eriksson, Eva (Intern)
Mosbæk, Hans (Intern)
Lützhøft, Hans-Christian Holten (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Interactions between nanoparticles and marine algae
Application for Steno fellowship (FNU)
Department of Environmental Engineering
Period: 01/08/2008 → 01/08/2012
Number of participants: 0
Acronym: NanoFucus
Project

Collaboration with "Spildevandskomiteen": Skrift 29
Preparation of Skrift 29 based upon Spildevandskomiteens recommendations
Department of Environmental Engineering
Period: 01/07/2008 → 31/12/2008
Number of participants: 1
Acronym: Skrift29
Project ID: 30627
Project Manager, organisational:
Ambjerg-Nielsen, Karsten (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 50,000.00 Danish Kroner
Project

Development of modelling tools to assess design and performance of bioremediation of chlorinated ethenes in low permeable geologic media
Department of Environmental Engineering
Period: 01/07/2008 → 22/08/2012
Number of participants: 6
Phd Student:
Chambon, Julie Claire Claudia (Intern)
Supervisor:
Bjerg, Poul Løgstrup (Intern)
Main Supervisor:
Binning, Philip John (Intern)
Examiner:
Albrechtsen, Hans-Jørgen (Intern)
Barry, David Andrew (Ekstern)
Molson, John W. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Enhanced remediation of low permeability clayey till deposits contaminated with chlorinated solvents
Department of Environmental Engineering
Period: 01/07/2008 → 23/05/2012
Number of participants: 6
Phd Student:
Damgaard, Ida (Intern)
Supervisor:
Bjerg, Poul Løgstrup (Intern)
Main Supervisor:
Broholm, Mette Martina (Intern)
Examiner:
Jakobsen, Rasmus (Intern)
Barker, James F. (Ekstern)
Höhener, Patrick (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådss-finansiering
Project: PhD

Optimering af biogas produktion fra affald i Arktis
Department of Environmental Engineering
Period: 01/07/2008 → 30/06/2011
Number of participants: 3
Phd Student:
Jørgensen, Marianne Willemoes (Intern)
Supervisor:
Jensen, Pernille Erland (Intern)
Main Supervisor:
Angelidaki, Irini (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Recyclant COD removal in process water
Experimental determination of treatability of an industrial effluent with a high COD by advanced oxidation
Department of Environmental Engineering
Period: 01/07/2008 → 15/09/2008
Number of participants: 2
Acronym: CODbyAOP
Project ID: 30624
Project participant:
Henze, Mogens (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 40,000.00 Danish Kroner

Role of Water Connectivity On Bacterial Growth & Pollutant Removal In Unsaturated Conditions
Department of Environmental Engineering
Period: 01/07/2008 → 30/11/2011
Number of participants: 6
Phd Student:
Gülez, Gamze (Intern)
Co-operation on reuse of biological treated wastewater from Biokubes wastewater treatment units
We will help Biokube to develop and test an advanced disinfection and polishing treatment, which can be integrated into the existing biokube biological wastewater treatment units. The goal is that the water can be used for technical purposes like washing, irrigation, garden ponds, pools etc..

Department of Environmental Engineering
Period: 19/06/2008 → 30/06/2009
Number of participants: 2
Acronym: IrrigationBiokube
Project participant:
Andersen, Henrik Rasmus (Intern)
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Determining the impact of point sources of contamination on groundwater based drinking water resources

Department of Environmental Engineering
Period: 15/06/2008 → 21/09/2011
Number of participants: 6
Phd Student:
Malaguerra, Flavio (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Main Supervisor:
Binning, Philip John (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Kjær, Jeanne (Ekstern)
van Breukelen, Boris (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD

ATP-målinger til monitering af mikrobiel drikkevandskvalitet

Department of Environmental Engineering
Period: 01/06/2008 → 27/11/2013
Number of participants: 6
Phd Student:
Model driven Soil Probing, Site Assessment and Evaluation
Non-invasive evaluation of soil- and groundwater contamination using trees as indicator

Department of Environmental Engineering
Period: 01/06/2008 → 31/03/2012
Number of participants: 1
Acronym: ModelProbe
Project ID: 30645

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: UKENDT
Amount: 1,594,400.00 Danish Kroner

VietAs Phase II
A continuation of the DANIDA-ENRECA project VietAS, related to As in the groundwater of the Red River sediments near Hanoi, Vietnam

Department of Environmental Engineering
Period: 01/06/2008 → 31/12/2012
Number of participants: 2
Acronym: VietAs II
Project ID: 30649

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: UKENDT
Amount: 841,800.00 Danish Kroner

Microbiological risk assessment of urban water. Development of methods for detection and analysis of pathogens with Legionella as model organism

Department of Environmental Engineering
Period: 15/04/2008 → 21/09/2011
Number of participants: 7
Phd Student:
Krojgaard, Louise Hjelmar (Intern)
Supervisor:
Krogfelt, Karen Angeliki (Intern)
Uldum, Søren (Ekstern)
Main Supervisor: 
Albrechtsen, Hans-Jørgen (Intern)
Examiner: 
Arvin, Erik (Intern)
Ricci, Maria Luisa (Ekstern)
Roslev, Peter (Ekstern)

Financing sources 
Source: Internal funding (public) 
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet 
Project: PhD

Fuldskala demonstration og dokumentation mv. af seriedrift på gyllebaseret biogASFællesanlæg (Lemvig Biogas) 
Se attachment

Department of Environmental Engineering 
Period: 01/04/2008 → 01/06/2009 
Number of participants: 1 
Acronym: ForskEL 
Project ID: 30612 
Project Manager, organisational: 
Angelidaki, Irini (Intern)

Financing sources 
Source: Forskningsprojekter - Miljø- og Energiministeriet 
Name of research programme: Ukendt 
Amount: 242,000.00 Danish Kroner 
Project

Implementation of Easewaste at VESTFORBRÆNDING as part of the environmental management system 
VESTFORBRÆNDING, which is the largest waste management company in Denmark, has committed itself to base all 
environmental management on a life-cycle approach and has adopted the DTU model EASEWASTE as the supporting 
tool. DTU Environment contributes by setting up the waste management technologies specifically for 
VESTFORBRÆNDING and develops approaches for assessing operational problems by an LCA approach

Department of Environmental Engineering 
Period: 01/04/2008 → 30/06/2010 
Number of participants: 3 
Acronym: Implementeringsprojektet 
Project ID: 30613 
Project participant: 
Astrup, Thomas Fruergaard (Intern)
Christensen, Thomas Højlund (Intern)
Project Manager, organisational: 
Møller, Jacob (Intern)

Financing sources 
Source: Sam.arb.aftaler, Private danske - Andre virksomheder 
Name of research programme: Ukendt 
Amount: 1,638,000.00 Danish Kroner 
Project

Integrated modelling of sustainable urban stormwater systems 

Department of Environmental Engineering 
Period: 01/04/2008 → 17/10/2012 
Number of participants: 7 
Phd Student: 
Roldin, Maria Kerstin (Intern) 
Supervisor: 
Helwigh, Ole Mark (Ekstern)
Mikkelsen, Peter Steen (Intern)
The objective of the NanolnmpactNet co-ordination action is to create a widely supported scientific basis to ensure the safe and responsible development of engineered nanoparticles and nanotechnology-based materials and products, and to support the definition of regulatory measures and implementation of legislation in Europe. This framework includes a strong two-way communication, which will ensure efficient dissemination of information to the various stakeholder groups (notably the European Commission, industry and SMEs, and the general public) while at the same time obtaining input from these groups about their needs and questions. By combining excellence in research with open communication, NanolnmpactNet aims to: • Develop a framework for the (intermediate and final) critical evaluation of methods, protocols and results of research supported by the FP5, and FP6 and FP7 programmes, as well as national funding agencies. • Guide the development of best practice to ensure that studies are comparable in terms of basic parameters such as particle type, cell types, dispersion and characterisation protocols and appropriate testing methodologies. • Enhance scientific output through better cross-talk and coordination between European scientists and research projects, identifying knowledge gaps and research strategies to address them.

Department of Environmental Engineering
Period: 01/04/2008 → 31/03/2012
Number of participants: 3
Acronym: NanolnmpactNet
Project ID: 30605
Project participant:
Trapp, Stefan (Intern)
Rasmussen, Birte Kastrup (Intern)
Project Manager, organisational:
Baun, Anders (Intern)

Optimised treatment technologies to improve the operation of recirculating aquacultures
Assists in identification of relevant treatment technologies for aquacultures and identification of the need for research & development

Department of Environmental Engineering
Period: 01/04/2008 → 31/10/2008
Number of participants: 1
Acronym: RENSTEK
Project ID: 30632
Project participant:
Arvin, Erik (Intern)

Stabilisering af arsen- og kromforurenet jord med okkerslam fra vandværker
Department of Environmental Engineering
Period: 01/04/2008 → 18/09/2013
Number of participants: 6
Phd Student:
Nielsen, Sanne Skov (Intern)
Supervisor:
Jakobsen, Rasmus (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)
Examiner:
Bjerg, Poul Legstrup (Intern)
Cundy, Andrew B. (Ekstern)
Østergaard, Peter Holm (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Miljøfaglig bistand i relation til spildevand og afløb ved udarbejdelse af regeringsmateriale om "Danish Lessons - Water
See Attachment

Department of Environmental Engineering
Period: 25/02/2008 → 01/05/2008
Number of participants: 1
Acronym: Danish Lessons-Water
Project ID: 30588
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 80,000.00 Danish Kroner
Project

AVIVA - Avanceret Industriel Vandbehandling

Department of Environmental Engineering
Period: 01/02/2008 → 01/02/2012
Number of participants: 3
Acronym: AVIVA
Project participant:
Andersen, Henrik Rasmus (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Bæredygtig udyttelse af Grønlands affald

Department of Environmental Engineering
Period: 01/02/2008 → 22/06/2011
Number of participants: 6
PhD Student:
Eisted, Rasmus (Intern)
Supervisor:
Kahlig, Wolfgang (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Kirkeby, Janus Søgaard (Intern)
Persson, Kenneth M. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

DuPont 2007-2008 Unrestricted Science & Engineering Grants
Modeling pesticide residues in crops
Department of Environmental Engineering
Period: 01/02/2008 → 30/08/2008
Number of participants: 1
Acronym: 826
Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Reduction of methane emission from Klintholm landfill by use of Engineered Bio-covers
Landfills containing organic wastes produce biogas, and are significant sources of methane which contributes to climate changes. Some landfills are not or cannot be utilized for landfill gas. In these cases the gas is flared with risk of producing toxic combustion products, or is just escaping the landfill to the atmosphere. Experiments have documented that a very high methane oxidation rate can be obtained in bio-covers, high enough to significant reduce the methane emission from the landfill. Bio-covers may also be a very cost-effective supplementary method at landfills with landfill gas utilization, since the efficiency of the gas extraction system often is in the range of 50-60 %. However, the documentation of the efficiency of bio-covers has so far not been carried out in full scale. This project will demonstrate the methodology in full scale on a landfill in Denmark, Klintholm Landfill, located in Fuen.

Department of Environmental Engineering
Period: 01/02/2008 → 31/01/2010
Number of participants: 1
Acronym: BIOCOVER - Klintholm
Project ID: 30600
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 1,080,168.00 Danish Kroner
Project
**Undersøgelserprojekt om afprøvning af forskellige renseteknologier på svømmebade**

Formålet med dette projekt er at analysere effekten af en række svømmebads UV teknikker for deres evne til at reducere forekomsten af skadelige desinfektionsbiprodukter (DBP) og teknikkernes evne til at reducere organiske stoffer, der er precursors for DBP.

*Department of Environmental Engineering*  
*Period: 02/01/2008 → 31/12/2008*  
*Number of participants: 7*  
*Acronym: SwimUV*  
*Project ID: 30585*  
*Project participant:*  

Ebert, Birthe (Intern)  
Mosbæk, Hans (Intern)  
Nguyen, Sinh Hy (Intern)  
Kruse, Susanne (Intern)  
Henriksen, Karina Borgholt (Intern)  
Arvin, Erik (Intern)  
Andersen, Henrik Rasmus (Intern)

**Financing sources**  
*Source: Sam.arb.aftaler, Private danske - Andre virksomheder*  
*Name of research programme: Ukendt*  
*Amount: 650,000.00 Danish Kroner*  
*Project*

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**19K: Innovation in the municipal technical administration and public utilities - in interplay with private companies, knowledge institutions and trade networks**

A systematic focus on improved solutions is a precondition for innovation in the public sector, which is not driven by market forces like the private sector. This is in particular the case for municipal technical administrations and public utilities responsible for large and resource consuming infrastructures, which experience increasing expectations and performance demands but typically lack possibilities for developing and assessing innovative solutions. Accepting that learning is the strongest incentive for innovation in the public sector, the project aims to initiate a cross-municipal staff-driven innovation process, which is expected to result in new solutions and products as well as identification of factors that may contribute to strengthening the public innovation culture. Employing experienced researchers and consultants to facilitate the process and product developers from leading companies to bridge to the market, focus is on the Danish water supply and urban sewerage infrastructures, which due to climate change, urban growth and increasing demands to water quality are under constant pressure and where conventional solutions – even with major resource injections – cannot match the challenges. The process is anchored at the management level and communicated via trade associations.

*Department of Environmental Engineering*  
*Period: 01/01/2008 → 31/12/2009*  
*Number of participants: 2*  
*Acronym: 19K*  
*Project ID: 30758*  
*Project participant:*  

Arnbjerg-Nielsen, Karsten (Intern)  
Mikkelsen, Peter Steen (Intern)

**Financing sources**  
*Source: Forskningsprojekter - Andre ministerier og styrelser*  
*Name of research programme: Ukendt*  
*Amount: 50,000.00 Danish Kroner*  
*Project*

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**Biogeochemistry of electron transfer to iron oxides in sediments**

Iron oxides are abundant minerals in aquatic sediments, aquifer sediments, and soils. In natural environments iron easily changes oxidation state from Fe(III) to Fe(II) and this transition in many ways interrelates biotic and abiotic processes. In aquatic sediments the degradation of organic matter and pollutants is directly coupled to the reduction of iron oxides. Iron oxides may also act as a redox buffer trap for poisonous hydrogen sulfide. Adsorption to the surfaces of iron oxides in sediments controls the mobility of substances like phosphate, arsenic, nickel, lead and pesticides like glyphosat. The toxic
and eutrophic state of lakes, coastal waters and aquifers are therefore directly related to the turnover of iron oxides. The coupling between adsorption processes and redox chemistry is very important because as the iron oxide is reductively dissolved, the adsorbed substances are mobilized. Probably this is the mechanism behind the release of arsenic to groundwater which threatens the health of millions of people in SE Asia. Because of the unique importance of the turnover of iron oxides in sediments, the involved processes have been studied for decades by researchers from different disciplines. Still, surprisingly large gaps remain in our basic understanding of the processes. In particular, fundamental aspects of the pathways of electron transfer during the reduction of iron oxides are inadequately understood. We know that microbial catalysis is important, but there is a poor understanding of how microbes transfer electrons to iron oxides or, for that matter, which microbes perform this process in natural sediments. Neither do we understand in detail how the transfer of an electron from an aqueous ion to the surface of an iron oxide takes place. Recently we have discovered that aqueous Fe(II) may induce catalytic changes in the structure of solid phase Fe(III) oxides and under certain conditions also highly reactive mixed Fe(II,III) oxides may form. These findings indicate that Fe-oxides are much more dynamic phases than we previously have perceived. The implications for the turnover of iron oxides in natural sediments are at present completely unknown and this uncertainty places some serious question marks at our process understanding and models of for example eutrophication of lakes and coastal waters. The project will bring together an interdisciplinary group of scientist. The group will use new state of the art methods and an integrated approach to hopefully provide some answers. OVERALL OBJECTIVE The overall aim of the project is therefore to bring together researchers from different fields to carry out fully integrated research on sediment model systems and in the field to obtain a more detailed understanding of the mechanisms controlling the rate of iron oxide reduction in natural sediments. Particular emphasis will be put on the role of electron exchange during both abiotic iron oxide reduction and microbially catalyzed iron reduction and the interrelationships between the abiotic and biological processes.

Department of Environmental Engineering
Period: 01/01/2008 → 01/01/2011
Number of participants: 2
Acronym: EisenZweiDrei
Project ID: 30653
Project participant:
Postma, Diederik Jan (Intern)
Project Manager, organisational:
Jakobsen, Rasmus (Intern)

Financing sources
Source: Forsk. Andre statslige danske i øvrigt
Name of research programme: Ukendt
Amount: 329,366.00 Danish Kroner
Project

Centre for environmental friendly animal waste technologies for fertilizer and energy production
Summary (20 lines) The Danish production of 30 mill tonnes of animal manure contains significant amounts of plant nutrients and carbon. Manure, therefore, is a source of pollution of surface waters and a source of greenhouse gases (GHG), ammonia (NH3) and odour. Wasting plant nutrients that are a limited resource will be a risk to the global feed and food supply, i.e. phosphor (P) is a very limited resource that will be exhausted within the next 60-130 years. The energy rich organic material may contribute 3-4% of the Danish energy consumption. The centre intends to develop environmental friendly technologies that will recover the nitrogen (N) and P in form of green mineral fertilizers and produce bioenergy. The recover of N and P and energy will contribute to reduce emission of greenhouse gases (GHG), (NH3) and odour. The novel technologies are needed because animal farms are increasing their production capacity and in specialisation. Consequently, the environmental friendly use of untreated manure for plant production is no more sustainable and the industrial livestock production farms cannot comply with regulations. Thus upcoming regulations encourage new technologies for managing animal manure and biowaste. This challenge is met by this centre activities, which have the vision that environmental and bioenergy technologies for animal manure and biowaste processing will be integrated in a whole system approach, where all environmental benefits and production of fertilizers are taken into account to ensure cost-effectiveness of mitigation strategies for livestock waste management. The technologies developed will be a commodity much in demand on the global market. This centre will provide valid information (LCA, environmental economics, validation of effects) of the effect of new technologies, which is needed when selling environmentally friendly and bio-energy technologies and for policy making.

Department of Environmental Engineering
Period: 01/01/2008 → 01/09/2012
Number of participants: 0
Acronym: CEMEF
Project

Cirius - Ondrej Mikes
Cirius - Ondrej Mikes
**Discovery of new microorganisms that can effectively convert pentoses to ethanol: challenge for sustainable bioethanol production from lignocellulose**

Bioethanol is an attractive, sustainable energy source that can be used for road vehicles. Current bioethanol production processes using crops such as sugar cane and corn are well established; however, utilization of a cheaper substrate such as lignocellulose from organic wastes could make bioethanol more competitive with fossil fuels. One limiting factor for the full utilization of lignocellulose material for bioethanol production is the lack of good microorganisms that are able to efficiently ferment a broad variety of sugars (pentoses and hexoses) with high tolerance to the end product-ethanol. The overall goal of this project is to screen and select microorganism and conditions for optimal pentose fermentation to ethanol.

**"Effekter af gentagne pulseksponeringer med pesticider"**

Effekter af gentagne pulseksponeringer med pesticider
Formålet med projektet er at undersøge akutte (immobilitet/død) og kroniske (larveudvikling/reproduktion) effekter af gentagne pulseksponeringer med pesticider overfor krebsdyr for dermed at opnå en bedre forståelse af bekæmpelsesmidlernes miljøefekter under eksponeringsforhold som er mere miljørealistiske end de forhold der anvendes ved de gængse laboratorie-standardtests. De opnåede resultater fra toksicitetsstestene vil blive sammenholdt med oplysninger om miljøkoncentrationer for dermed at vurdere risikokvotienten for de undersøgte stoffer. Yderligere er det formålet at evaluere om nye modeller kan forudsige effekter svarende til de her opnåede og dermed om de kan bruges som værktøjer til risikovurdering og regulering af kortvarige og fluktuerende pesticidforureninger i vandmiljøet

Department of Environmental Engineering
Period: 01/01/2008 → 30/04/2009
Number of participants: 2
Acronym: 795
Project participant:
Baun, Anders (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Elastic, electric and physical properties of greensand
Department of Environmental Engineering
Period: 01/01/2008 → 22/06/2011
Number of participants: 5
Phd Student:
Hossain, Zakir (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Johansen, Tor Arne (Ekstern)
Knudsen, Jørgen Elgaard (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Establishing an in vitro based testing-system for hazard identification of environmental pesticide-nanoparticle interactions
Many nanoparticles are engineered to carry active chemicals across biomembranes. Nanoparticles deliberately added to pesticide formulations or occurring in fields as a result of sludge amendment, deposition or accidental events may act to enhance transport of active substances to target and no-target organisms. This project develops our understanding of the mechanisms governing transport and effects of the pesticide-nanoparticle complex in several small scale in vitro test systems relevant for human and environmental exposure (human intestinal mucosa and lung epithelia, single cell phytoplankton, Dafnia and early life stage of zebra fish). The results will be evaluated in the light of the pesticide hazard identification schemes in Denmark and the EU. The project will generate valuable knowledge and new methods for testing and assessment of pesticides

Department of Environmental Engineering
Period: 01/01/2008 → 31/12/2009
Number of participants: 1
Acronym: 794
Project Manager, organisational:
Forskeruddannelsesprogram i vandressourcer (FIVA)


Department of Environmental Engineering
Period: 01/01/2008 → 31/12/2010
Number of participants: 3
Acronym: 744
Project participant:
How to evaluate separate phase contamination (DNAPL) and contaminant flux? Delprojekt 1

Department of Environmental Engineering
Period: 01/01/2008 → 31/12/2010
Number of participants: 1
Acronym: FaseFlux
Project ID: 30597

Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Samarb - Amter og kommuner
Name of research programme: Ukendt
Amount: 3,000,000.00 Danish Kroner

Improving toxicological and ecotoxicological effect studies by implementation of new sensor technologies

Department of Environmental Engineering
Period: 01/01/2008 → 30/06/2011
Number of participants: 1
Acronym: New tox sensors
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Innovative REMediation and assessment TEChnologies for contaminated soil and groundwater

Department of Environmental Engineering
Period: 01/01/2008 → 31/12/2011
Number of participants: 2
Acronym: REMTEC
Project ID: 30604
Project participant:
Bjerg, Poul Løgstrup (Intern)

Project Manager, organisational:
Integrated European Network for biomass and waste reutilisation for Bio-products

AquaTERRE will promote the cooperation between research centres, business and other stakeholders in Europe devoted to the research, development and application of biomass and biofuel production and valorisation. It will aim integration and identify the best ones. In addition, to study the best possibilities for implementing different biomass sources in different environments to improve their utilisation. Pursuing this target, literature and data survey and current research review will be carried out. Furthermore, the scope of AquaTERRE consists also in mapping European biomass feedstock using different tools as Geographical Information System (GIS). Additionally, AquaTERRE expert members will identify economic and environmental impacts schemes to define the optimum. Life Cycle Assessment (LCA). LCA is a standardized and structured method for calculation the environmental load of a product, process or activity throughout all its phases. The implementation of a new bioproduct / biofuel in the market requires the analyses of economical, social and environmental aspects, with the objective of retaining enough information for the decision making progress. The contribution of LCA study to this project can be framed in the identification of best sources of biomass feedstock as well as other agricultural waste for the sustainable obtaining of biofuels and other added value products.

Department of Environmental Engineering

Period: 01/01/2008 → 01/01/2010
Number of participants: 2
Acronym: AQUATERRE
Project ID: 30618
Project participant:
Angelidaki, Irini (Intern)
Karakashev, Dimitar Borisov (Intern)

Methods for determining degradation of low pesticide concentrations in Danish aquifer environments

In Denmark comes ca. 98% of drinking water from groundwater. Gennem the last 10 years there have been found many contamination well, where raw water contains pesticides or degradation products and for 1% of 1% the well contains more than 25% of different pesticide concentrations in the groundwater. Generelt findes pesticeresterne i meget lave koncentrationer, hvilket påvirker den naturlige nedbrydning af dis-sæ stoffer i negativ retning, og der er i dag en særdeles mangelfuld viden omkring nedbrydningsrater for lave koncentrationer af pesticider i grundvandsmagasiner. Bestemmelse af realistiske nedbrydningsrater er centrale i forhold til regulering, risikovurdering og modellering af pesticiders skæbne i de danske grundvandsmagasiner, fordi selvfølgelig det er let at tage mål i forhold til nedbrydningsrater for lave koncentrationer af pesticider i grundvandsmagasiner. Bestemmelse af realistiske nedbrydningsrater er centrale i forhold til regulering, risikovurdering og modellering af pesticiders skæbne i de danske grundvandsmagasiner.

In-gen standardiserede metoder til bestemmelse af nedbrydningsrater for lave koncentrationer af pesticider i grundvandsmagasiner er i dag tilgængelige. Nedbrydningsrater ekstrapoleres derfor ofte med data op-nået med urealistisk høj pesticidkoncentrationer i prøver udtaget fra overfladejorden, hvor den biologiske omsætning er af en anden karakter end den, der finder sted i oligotrofe grundvandssediment. I grundvandsmagasinerne er styrende faktorer som f.eks. indhold af organisk stof, temperatur og mikrobiel aktivitet meget lavere end i rodningsjorden. Dette projekt vil sammenligne metoder udviklet i forskellige forskningslaboratorier til bestemmelse af nedbrydningsrater for lave pesticidkoncentrationer under realistiske grundvandsforhold. Sammenligningen af disse metoder har til formål at afklare, hvilke parametre der er centrale i forhold til eksperti-mental bestemmelse af sådanne nedbrydningsrater i grundvandssejder. Der vil dernæst blive gen-nemført en række undersøgelser af danske sedimenter i laboratoriet under realistiske forhold, hvor se-dimenterne udtages fra repræsentative danske grundvandsmagasiner. Projektet vil ud fra laboratorieforskning udvikle et koncept for bestemmelse af nedbrydningsrater for realistiske pesticidkoncentrationer i dansk grundvand, hvor der undersøges en række forskellige pesticider og nedbrydningsprodukter med forskellige egenskaber. Projektet vil derfor medvirke til at afklare, hvor stor den fremtidige påvirkning af den danske drikkevandsforsyning er i de betydelige grundvandsmagasiner, hvorfor vandværkerne i dag indvinder grundvand.
Microbial community structure related to process conditions: a challenge for improving performance of anaerobic digesters

Anaerobic degradation of organic matter is a complex process mediated by microbial communities. The process can be affected by many factors, including operational conditions and feed composition. The microbes mediating the process have generally been well described in terms of phylogeny and function. However, the link between microbial populations, operational parameters, and anaerobic reactors performance is not well established. This link can be used for development of strategies aiming to improve the anaerobic digestion process. Optimization of anaerobic digestion process is expecting to result in considerable reduction of environmental pollution combined with increase in renewable energy production. It will make contributions to the objectives of the overall EU research program, human society, industry, and natural sciences in general. The overall goal of the project proposed is to relate the microbial community composition to biogas reactor process parameters in order to improve anaerobic digesters performance. More specifically we will: - identify the key microorganisms mediating the anaerobic digestion in variety of biogas producing systems; - elucidate the influence of process parameters on the microbial diversity; - use structured mathematical modeling for quantitatively assessment of the link between microbial community structure and operational conditions; - identify microbial markers for best digesters performance with respect to maximal biogas production and organic matter removal; - develop and demonstrate the practical applicability of a strategy for improvement of anaerobic digestion process performance via manipulation of microbial community composition in biogas reactors. The project aims will be achieved by laboratory work and data collection through the industrial contacts of the applicant which will promote future collaboration between the applicant and cooperative partners throughout the Europe.

MistraPharma – Identification and Reduction of Environmental Risks Caused by the Use of Human Pharmaceuticals

Recommendations to improve wastewater treatment technologies. For the 30 highest ranked APIs we will evaluate the present loading of APIs, and the discharge of these compounds from the different types of Swedish wastewater treatment plants. This evaluation will form the basis for defining, evaluating and development of promising methods for removal of a APIs through wastewater treatment. In this procedure we can work with bench, pilot and, when possible, full-scale investigations. The most promising treatment technologies will be analyzed in detail concerning their costs and benefits, including any positive or negative side-effects that may be associated with their use, such as the working environment in the wastewater treatment plant, elimination or generation of additional compounds, quality changes of residual products, changes in energy use, or in the hygienic quality of the treated wastewater.
Optimised Model-based Monitoring of Water Quality in Dynamic Discharges from Urban Areas

Department of Environmental Engineering
Period: 01/01/2008 → 19/09/2012
Number of participants: 6
Phd Student: Birch, Heidi (Intern)
Supervisor: Lützhøft, Hans-Christian Holten (Intern)
Main Supervisor: Mikkelsen, Peter Steen (Intern)
Examiner: Trapp, Stefan (Intern)
Deletic, Ana (Ekstern)
Østergaard, Peter Holm (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Pesticides and nanovectors
Studies of the role of carbon-based nanoparticles on the toxicity and bioaccumulation of pesticides

Department of Environmental Engineering
Period: 01/01/2008 → 01/07/2009
Number of participants: 0
Acronym: 762
Project

Risikovurdering af området omkring Rundforbivej 76, Nærum. Fase 2
See attachment

Department of Environmental Engineering
Period: 01/01/2008 → 30/04/2008
Number of participants: 2
Acronym: RAP, fase 2
Project ID: 30587
Project participant: Troldborg, Mads (Intern)
Project Manager, organisational: Binning, Philip John (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 148,000.00 Danish Kroner
Project

RISKPOINT-Assessing the risks posed by point source contamination to groundwater and surface water resources
The Water Framework Directive considers subsurface and surface water quality and its impact on ecosystems. A major contributor to water quality problems are point contaminant sources such as industrial sites. In order to assess the risks posed by contaminated sites to groundwater and surface water resources it is necessary to understand how these resources are linked and how water flow between them affects water quality. This project will develop the monitoring and modelling tools required to quantify contaminant fluxes between ground and surface waters. The project will focus on water quality problems associated with chlorinated hydrocarbons and pesticides. It is aimed to improve the competitiveness of the consulting industry and Danish authorities in the management of water quality problems in water catch-
ments. In particular it will: 1. Develop modelling and monitoring tools for managing the impact of point sources of contamination on groundwater and surface water resources. 2. Determine the impact on water quality of the biogeochemically active zone between groundwater and surface water systems. 3. Develop tools for assessing the risk of point sources of contamination from the perspective of water supply. 4. Develop tools for quantifying the ecosystem impact of point sources of contamination.

Department of Environmental Engineering
Period: 01/01/2008 → 01/01/2012
Number of participants: 5
Acronym: RISKPOINT
Project ID: 30608
Project participant:
Bjerg, Poul Legstrup (Intern)
Binning, Philip John (Intern)
Smets, Barth F. (Intern)
Bauer-Gottwein, Peter (Intern)
Project Manager, organisational:
Binning, Philip John (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 8,299,088.00 Danish Kroner

Storm- and Wastewater Informatics
The main purpose of wastewater systems is to protect the health of the population, protect the environment and to provide welfare for society. Around the world a very high number of large and ageing wastewater systems can be found nowadays. Many of these systems are located in densely populated city areas, making it impossible or very expensive to carry out major re-design of the systems. Today’s wastewater treatment plants apply real time optimisation of the plants, where as nearly all sewer systems are static, meaning that once the sewer pipes, pumps, basin and overflows have been put in the ground, no further/very little action is taken to optimise the performance of the sewer system in real time.

Wastewater systems stress the aquatic environment and may put the health and safety of people at risk, e.g. when a mixture of rainwater and sewage floods residential areas or is discharged through overflows to receiving waters. Further, the operation of the wastewater systems is under an increasing pressure due to: 1.) The EU Water Framework Directive 2.) Increased rainfall and runoff, e.g. due to climate changes 3.) Ageing sewer systems with increased infiltration, exfiltration, structural problems and health risks. The present project addresses the problem of fragmented operation of the wastewater systems by closing the knowledge gaps within: process understanding; now- and forecasting of the current conditions in the wastewater system. Output from the project will be components for a real-time decision support system following a drop of water from the sky to the recipient. The benefits of such a real-time system are numerous and include improved water quality and reduced health risk, reduced energy consumption and operation costs, reduced flooding, increased reliability, and reduced environmental stress.

Department of Environmental Engineering
Period: 01/01/2008 → 31/12/2012
Number of participants: 5
Acronym: SWI
Project ID: 30614
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Henze, Mogens (Intern)
Mikkelsen, Peter Steen (Intern)
Smets, Barth F. (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 7,465,457.00 Danish Kroner

Relations
Activities:
Investigating the use of stochastic forecast for RTC of urban drainage systems
Publications:
Investigating the use of stochastic forecast for RTC of urban drainage systems
Project

Surface Coating Enzyme Technology
The vision is to establish a Danish world leading consortium in the field of surface coating technology by the development of ecofriendly active compounds for the use in marine antifouling systems. It is the purpose to replace existing toxic biocides by enzymes and related bioactive compounds in controlled release systems which are ready biodegradable in the environment, and besides, by development of non release bioactive coatings. BioLocus has already launched a commercial product, CoatZyme® in test marketing in Scandinavia. The product has been shown to be efficient to prevent fouling on yachts and is a polishing water based coating with enzymes as the active compound, replacing traditional biocides. The direct goal in this project is to develop 2. generation of “CoatZyme” in order to become world leading in environmentally friendly antifouling coatings for yachts.

Department of Environmental Engineering
Period: 01/01/2008 → 31/12/2010
Number of participants: 1
Acronym: 822
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukedt
Amount: 0.00 Danish Kroner
Project

Water Resources Research in Vietnam - The mobilisation of arsenic and the relation to the dynamic interaction between groundwater and surface water in the Red River Plain. (ENRECA) Phase II
DANIDA supported Research Capacity building project. The attached documents are almost in their final state. E&R signatures are needed on 1) samarbejdsaftale, 2) Letter of Support, Probably by Mogens Henze on originals in my possession after approval of THC

Department of Environmental Engineering
Period: 01/01/2008 → 31/12/2011
Number of participants: 3
Acronym: VietAs
Project participant:
Postma, Diederik Jan (Intern)
Larsen, Flemming (Intern)
Jakobsen, Rasmus (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukedt
Amount: 0.00 Danish Kroner
Project

Rock Physics and rock mechanics of greensand-effect of CO2
Palaeogene greensands are host to petroleum in the central North Sea. In the present project rock physical and petrophysical methods will be used in evaluating the effect of CO2 injection into greensand reservoir rocks.

Department of Environmental Engineering
Period: 03/12/2007 → 31/12/2010
Number of participants: 2
Acronym: 809
Project ID: 30574
Project participant:
Alam, Mohammad Monzurul (Intern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Development of method for reporting emissions from waste disposal sites to the PRTR-register

Waste disposal sites have to register gaseous and aqueous emissions exceeding specific threshold levels for a long range of compounds to the Pollutants Release and Transfer Register (PRTR). The project aims to develop methodologies for estimation of the emissions for waste disposal sites.

Department of Environmental Engineering
Period: 01/12/2007 → 31/12/2008
Number of participants: 2
Acronym: 908
Project ID: 30575
Project participant:
Scheutz, Charlotte (Intern)

Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 197,780.00 Danish Kroner
Project

PERFORMANCE IMPROVEMENT AND DATA ASSIMILATION INTO CATCHMENT MODELS FOR THE EXPLOITATION OF RIVER AND LAKE PRODUCTS FROM ALTIMETRY

This proposal is made in response to RFQ ENVI-DTEX-EOPS-SW-07-0009. The pilot system which produces river and lake heights from EnviSat Near Real Time (NRT) altimeter data, has been running successfully for some time and has already attracted a significant userbase. However, analysis of the system and outputs, together with research progression since the design of the original system and significant user feedback, has identified critical enhancements to increase the usefulness of these data, both in terms of enhanced products from the EnviSat RA-2, and by increasing the system capability to handle Jason-1 NRT data; this proposal addresses these issues. The dissemination of these products and penetration of the ‘traditional’ hydrological community can also be greatly enhanced using a two pronged approach: firstly, by increasing the capability of the web based server and the associated outreach programme, to ensure that potential users are made aware of these unique datasets and secondly, by engaging directly with the hydrological community to address what is seen as the major limitation of these data: the temporal sampling. Whilst for a large lake, crossed by several tracks, the measurement temporal repeat will only be a few days, there is a fundamental difference with river networks. Here, where the unique ability of the RA-2 to maintain lock on the underlying surface allows the measurement at multiple locations along the earth’s major rivers, the temporal sampling of 35 days is perceived as a critical constraint by the hydrological user community. Experience with satellite oceanography suggests a remedy: incorporate these data into a model, and thus integrate the measurements occurring at various locations along the river system, either directly or as constraints on the model. In the developing world, where the number of gauged catchments is continually falling and the rainfall measurements are patchy at best, these data potentially provide a critical, and in many cases the only possible information to monitor the earth’s surface inland water resources. However, the very scarcity of rainfall data creates problems for hydrologists for whom this is the primary key input. Accordingly, this proposal includes small studies from three groups of river modelers, selected from the existing userbase of R&L data users. Each group uses different hydrological modelling techniques and different proposed approaches, and five river systems have been selected for this work, chosen as presenting a range of different river types and geographical locations for which this approach is likely to be viable. One river, the Mekong, is included from two groups, to assess the impact of different hydrological approaches where the input altimeter data are identical for both. It is proposed to publish the results of this work both on the River and Lake website and as widely as possible at conferences and in the literature, to inform the wider hydrological community of viable methods for including altimeter heights in their river monitoring programmes, and stimulate a much wider market for these unique data.

Department of Environmental Engineering
Period: 01/12/2007 → 31/12/2008
Number of participants: 1
Acronym: 803
Project ID: 30633
Project Manager, organisational:
Bauer-Gottwein, Peter (Intern)

Financing sources
International Peer Review of the Okavango Delta Management Plan

Peter Bauer-Gottwein (PBG), Rudolf de Groot (RDG) and Max Finlayson (MF) propose to perform an international peer review of the Okavango Delta Management Plan (ODMP) along the lines of the terms of reference issued by the Department of Environmental Affairs (DEA), Ministry of Environment, Wildlife and Tourism, Government of Botswana. The review will be completed by November 30th, 2007 and will be delivered to the DEA in electronic form. The three experts will share the review work according to their respective expertise. •PBG has done research on the Okavango Delta for 4 years (co-funded by the Department of Water Affairs, Government of Botswana) and has published 10 peer-reviewed scientific journal articles on the system, focusing on flooding dynamics and salt transport issues. He has cooperated with a number of groundwater consultants (Water Resources Consultants, Wellfield Consulting Services, Aqualogic) in various projects focusing on water resources development in and around the Delta. •RDG has much experience with (economic) valuation of goods and services provided by wetlands and the application of the “ecosystem approach” to wetland management in, among others, the Netherlands, Spain, Ukraine, Australia, Kenya and S. Africa. •MF has undertaken research in tropical wetlands in Africa, Asia and Australia and published widely on wetland management and ecology. He is familiar with many of the guidelines on wetlands management published by the Ramsar Convention and is currently completing a project considering wetland land use and cover with sites in 8 southern African countries.

Department of Environmental Engineering
Period: 01/11/2007 → 31/12/2007
Number of participants: 1
Acronym: 798
Project ID: 30586
Project participant:
Bauer-Gottwein, Peter (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Optimization of Filters for Water Treatment by Development of new Diagnostic Tools

Department of Environmental Engineering  
Period: 01/11/2007 → 24/08/2011  
Number of participants: 6  
Phd Student: Lopato, Laure Rose (Intern)  
Supervisor: Binning, Philip John (Intern)  
Main Supervisor: Arvin, Erik (Intern)  
Examiner: Albrechtsen, Hans-Jørgen (Intern)  
Gimbel, Rolf (Ekstern)  
Grützmacher, Gesche (Ekstern)

Financing sources  
Source: Internal funding (public)  
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet  
Project: PhD

Sampling for drinking water quality in household installations (metals) - Method description (MeMet)

Drikkevandskvaliteten, der stilles til rådighed for forbrugerne, skal kunne måles ved forbrugers taphane. For uorganiske sporstoffer - metaller - er kvalitetskravet i Drikkevandsbekendtgørelsen angivet som en beregnet gennemsnitsværdi. For at sikre en sikker og repræsentativ måling af de uorganiske sporstoffer – metaller – er der behov for en velbeskrevet prøvetagningsmetode. For at opnå dette, er formålet med dette projekt, at - udvikle, definere og beskrive en prøvetagningsmetode, der er repræsentativ for et ugentligt gennemsnit af det vand, som forbrugeren indtager udforme beskrivelsen på engelsk med dansk resume sikre, at metoden er i overensstemmelse med de metoder, der udvikles inden for EU (Drikkevandsdirektivet) - dokumentere baggrunden for metodebeskrivelsen - sikre, at metoden er så simpel, robust og økonomisk som muligt - undersøge, i hvilket omfang det er muligt at opstille konverterings- eller omregningsfaktorer til andre prøvetagningsprincipper (fx henstand) og godkendelsesprocedurer for fx metalafgivelse fra enkeltkomponenter - valdtere metoden gennem målinger

Department of Environmental Engineering  
Period: 01/11/2007 → 31/08/2008  
Number of participants: 2  
Acronym: 808  
Project ID: 30578  
Project participant: Corfitzen, Charlotte B. (Intern)  
Project Manager, organisational: Albrechtsen, Hans-Jørgen (Intern)

Financing sources  
Source: Sam.arb.aftaler - Statslige danske  
Name of research programme: Ukendt  
Amount: 542,000.00 Danish Kroner  
Project

START-funding I. Preparation of international proposal"Biorefinery for sustainable Reliable Economical Fuel production from energy crops" (Acronym: BioREF)

Application for grant to organize and formulate an application for the call FP7-KBBE-2007-2A within the Program “FP7, Cooperation, Theme 2, Food, Agriculture, Fisheries and Biotechnologies” together with partners from Denmark, Greece, Ireland, Poland, Sweden, and Germany (Table 1). The project application will be based on an a first stage application that was submitted in EU with the applicant as coordinator. The final project is intended to last for a period of 4 years with a joint budget of approximately 5.5 million EUR. DTU as the coordinator is expected to receive 1 million EUR as part of the budget.

Department of Environmental Engineering
Period: 01/11/2007 → 18/02/2008
Number of participants: 2
Acronym: 796
Project ID: 30576
Project participant:
Angelidaki, Irini (Intern)
Karakashev, Dimitar Borisov (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 264,600.00 Danish Kroner
Project

Assessment of chemical oxidation in the unsaturated zone at Kærgård Plantation

Department of Environmental Engineering
Period: 11/10/2007 → 31/12/2007
Number of participants: 1
Acronym: 804
Project ID: 30566
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 13,300.00 Danish Kroner
Project

Miljøvurdering af affaldsforbrænding og alternativer
Se attachments

Department of Environmental Engineering
Period: 01/10/2007 → 30/09/2008
Number of participants: 2
Acronym: Miljøvurdering Affald DK
Project ID: 30567
Project participant:
Møller, Jacob (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 516,000.00 Danish Kroner
Project

Videreudvikling af on-line styring på Avedøre
Projektet omfatter opstilling af modeller for Avedøre Renseanlæg i simuleringsværktøjet WEST.

Department of Environmental Engineering
Period: 01/10/2007 → 31/12/2008
Number of participants: 2
Acronym: 807
Project ID: 30571
Project participant:
Lindblom, Erik Ulfson (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)
Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Ukendt
Amount: 190,000.00 Danish Kroner
Project

Miljømæssige effekter af industrielt fremstillede nanopartikler
Department of Environmental Engineering
Period: 15/09/2007 → 18/05/2011
Number of participants: 6
Phd Student:
Hartmann, Nanna B. (Intern)
Supervisor:
Binderup, Mona-Lise (Intern)
Main Supervisor:
Baun, Anders (Intern)
Examiner:
Lützhøft, Hans-Christian Holten (Intern)
Ahtiainen, Jukka Heikki (Ekstern)
Stuer-Lauridsen, Frank (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Water treatment processes in Recirculation Aquaculture Systems (RAS)
In Recirculation Aquaculture Systems (RAS) the water is recycled intensively between the fish tanks and the water treatment plant. The water treatment has to remove organic matter (COD), nitrogen, phosphorus, carbon dioxide and specific chemicals and oxygen has to be added. This project contains three subprojects: Removal of specific chemicals, 2. Integrated modelling of RAS, and 3. Monitoring of organic matter by fluorescence.

Department of Environmental Engineering
Period: 03/09/2007 → 31/12/2009
Number of participants: 1
Acronym: 937
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Framework Development for Adaptive Environmental Risk Assessment and Uncertainty Analysis for Nanomaterials
Department of Environmental Engineering
Period: 01/09/2007 → 02/03/2011
Number of participants: 5
Phd Student:
Grieger, Khara Deanne (Intern)
Main Supervisor:
Baun, Anders (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Davis, J. Michael (Ekstern)
Ledin, Anna (Intern)

Financing sources
Source: Internal funding (public)
**Framework for Real Time Control of Integrated Urban Wastewater Systems**

Department of Environmental Engineering  
Period: 01/09/2007 → 27/06/2012  
Number of participants: 7  
Phd Student:  
Breinholt, Anders (Intern)  
Supervisor:  
Grum, Morten (Intern)  
Madsen, Henrik (Intern)  
Main Supervisor:  
Mikkelsen, Peter Steen (Intern)  
Examiner:  
Bauer-Gottwein, Peter (Intern)  
Madsen, Henrik (Ekstern)  
Vanrolleghem, Peter (Intern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet  
Project: PhD

**Gas Generation and Emissions from Decomposition of Organic Wastes at Full-Scale Waste Treatment Facilities**

Department of Environmental Engineering  
Period: 01/09/2007 → 21/12/2010  
Number of participants: 6  
Phd Student:  
Andersen, Jacob Kragh (Intern)  
Supervisor:  
Christensen, Thomas Højlund (Intern)  
Main Supervisor:  
Scheutz, Charlotte (Intern)  
Examiner:  
Kjeldsen, Peter (Intern)  
Jönsson, Håkan (Ekstern)  
Kranert, Martin (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: DTU-lønnet stipendie  
Project: PhD

**Groundwater Management: Real-Time Optimisation and Control**

Department of Environmental Engineering  
Period: 01/09/2007 → 30/09/2011  
Number of participants: 7  
Phd Student:  
Hansen, Annette Kirstine (Intern)  
Supervisor:  
Bauer-Gottwein, Peter (Intern)  
Madsen, Henrik (Intern)  
Main Supervisor:  
Rosbjerg, Dan (Intern)  
Examiner:  
Mikkelsen, Peter Steen (Intern)
Optimization of Microbial Fuel Cells via Directed Bio-Electricigenesis

One of the global trends in applied energy systems R&D encompasses electricity generation using renewable sources, such as microbial biofilm-powered fuel cells, where electrical energy is directly obtained from biochemical reactions. Although this microbial ability to generate electrons has been revealed for a long time, the achieved process understanding has been insufficient to optimize microbial fuel cells (MFCs) into efficient and practical power generators.

The present proposal’s primary goal is to achieve more efficient energy conversions in MFCs, by establishing and then manipulating the relationship between properties of the microbial biofilms—which develop in the MFCs’ anodic compartment—and power generation. We contend that the biofilm structure and its architecture have a direct influence on the electric properties of the MFCs (by means of diffusional limitations and current transfer restrictions). These causal relationships will be determined.

Directed bio-electricigenesis is proposed, which consists of manipulating and controlling biofilm properties (i.e. mass transport limitation, biofilm heterogeneity and distribution control) to maximize electroactive sites and hence improve power generation. Electrochemical studies are therefore proposed to allow real time monitoring of the systems’ bio-electrochemical response and to establish the relationship between biofilm properties and electron transfer performance (e.g. the current transfer distribution), which establish current generation in the MFCs. The electrochemical response will be measured using electrochemical impedance spectroscopy (EIS) and will be analyzed using a transmission-line approach, from which the biogenically-induced current transfer distributions will be determined.

In addition, the biofilm structure and architecture heterogeneities which establish in the novel-design MFCs will be experimentally manipulated, measured using advanced microscopic techniques (i.e. confocal laser scanning microscopy) and microelectrodes, and predicted using a new Individual Based Modelling platform for Microbial Interactions (iDynoMics). In summary, this proposal will combine knowledge on microbial fuel cells, biofilm structural modelling, advanced microscopic and techniques and electrochemical monitoring to operate and investigate novel microbial fuel cells based on anodic biofilms, where biofilm structure can be predicted and manipulated in order to rigorously establish the relationships between biofilm properties and electrochemical behaviour of MFCs, leading to MFCs that can obtain significantly higher energy transfer efficiencies via directed bio-electricigenesis.

Department of Environmental Engineering
Period: 01/09/2007 → 31/08/2009
Number of participants: 2
Acronym: 761
Project participant:
Angelidaki, Irini (Intern)
Smets, Barth F. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project
Validation and Identification Methods for Individual-based Models in Microbial Ecology

Department of Environmental Engineering
Period: 01/09/2007 → 02/03/2011
Number of participants: 5
Phd Student:
Seoane, Jose Miguel (Intern)
Supervisor:
Sternberg, Claus (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Bailey, Mark Jonathan (Ekstern)
Kroer, Niels (Ekstern)

Optimal Allocation of Water and Land Resources at the Catchment Scale

Optimizing water and land use patterns is a key task of governments both in developing and developed countries. Recent years have seen a paradigm shift in the way water resources are managed. The new paradigm of integrated water resources management recognizes multiple objectives: Environmental sustainability, economic efficiency and social equity. Moreover, the economic and environmental dimensions of water resources management are key elements of the EU’s Water Framework Directive. The economic aspects of use and allocation of water resources has until now mainly been investigated through coupling of macroeconomic models with simplified hydrological models, often neglecting the important temporal and/or spatially variability of the resource. Spatially distributed hydrological and ecosystem modelling offers new opportunities to map water related externalities at the catchment scale. Remote sensing and GIS techniques enable a detailed spatial mapping of input parameter fields. This project will combine existing water resources simulation models, representing both the temporal and spatial variability of the water availability, with economic models in a catchment-scale simulation-optimization tool for science-based decision support. Its focus is the identification of optimal water and land allocation patterns. Both Pareto-optimal and economic tradeoff methods will be analyzed. The combined model will describe the major water and land-use activities in the catchment (irrigation agriculture, industry, hydropower generation etc.) including their physical and socioeconomic constraints, and the project will identify the appropriate extent of economic interactions to be internalized in the economic model in order for it to reflect the essential economic developments in the basin. Price elasticities, sensitivity to varying marked prices and sensitivity of the results to uncertainty in the input parameters will be investigated. The potential of agent-based simulation approaches to capture second-round effects of water allocation decisions in the economy may be explored. The simulation-optimization tool will enable new opportunities for cost benefit analysis of water and land management decisions. The tool will be applied to and tested on studies from Denmark, Europe and the developing world.

Department of Environmental Engineering
Period: 01/08/2007 → 31/07/2010
Number of participants: 2
Acronym: 797
Project participant:
Bauer-Gottwein, Peter (Intern)
Riegels, Niels (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project
Optimal Allocation of Water and Land Resources at the Catchment Scale

Department of Environmental Engineering
Period: 01/08/2007 → 20/04/2011
Number of participants: 7
Phd Student:
Riegels, Niels (Intern)
Supervisor:
Jensen, Roar A. (Ekstern)
Møller, Flemming (Ekstern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Ambjerg-Nielsen, Karsten (Intern)
Cai, Ximing (Ekstern)
Termansen, Mette (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Diagenesis of Upper Cretaceous Onshore and Offshore Chalk from the North Sea Area

Department of Environmental Engineering
Number of participants: 5
Phd Student:
Hjuler, Morten Leth (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Jakobsen, Rasmus (Intern)
Frykman, Peter (Intern)
Hildebrand-Habel, Tania (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Selvfinansierende (privatist)
Project: PhD

Improving Large-Scale Hydrological Models with Ground-Based and Space-Borne Time-Lapse Gravity

Department of Environmental Engineering
Period: 01/07/2007 → 21/12/2010
Number of participants: 7
Phd Student:
Christiansen, Lars (Intern)
Supervisor:
Binning, Philip John (Intern)
Rosbjerg, Dan (Intern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Fabricius, Ida Lykke (Intern)
Ferré, Ty P. A. (Ekstern)
Tscherning, Carl Christian (Ekstern)

Financing sources
Microbial Fuel Cell - used in direct Conversion of Lignocellulosic Waste to Energy

Department of Environmental Engineering  
Period: 01/07/2007 → 19/01/2011  
Number of participants: 6  
Phd Student:  
Fang, Cheng (Intern)  
Supervisor:  
Boe, Kanokwan (Intern)  
Main Supervisor:  
Angelidaki, Irini (Intern)  
Examiner:  
Karakashev, Dimitar Borisov (Intern)  
Mattiasson, Bo (Ekstern)  
Norddahl, Birgir (Ekstern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: DTU, Samfinansiering  
Project: PhD

Salt dynamics in natural and agricultural ecosystems
Salinization of soils is a major threat for natural and agricultural ecosystems on the global scale. Plants take up water and exclude salt by enzymatic action as detoxification strategy. In the long run, this increases the salinity of insufficiently drained soils and shallow aquifers. The salt and water budgets of vegetation are included in current groundwater models, but their implementation does not fit reality. A new model for salt uptake of plants shall be tested experimentally, parameterized by inverse modeling and well-designed experiments, and coupled to existing groundwater simulation models. The goal is to develop a tool to simulate, interpret and predict the evolution of ecosystems and salt budgets in arid zones, in order to optimize irrigation agriculture under saline conditions. Summarized, we aim at determining the relationship between salt and water uptake and the plant physiology for trees, grasses and food crops by well-designed experiments and inverse modeling; implementing a mathematical model for the simulation of salt and water budgets of ecosystems and agricultural systems; developing and applying a tool for interpretation and management of salinization of soils and shallow aquifers due to transpiration of vegetation.

Department of Environmental Engineering  
Period: 01/07/2007 → 30/06/2009  
Number of participants: 4  
Acronym: 735  
Project participant:  
Rosbjerg, Dan (Intern)  
Trapp, Stefan (Intern)  
Bauer-Gottwein, Peter (Intern)  
Project Manager, organisational:  
Blasone, Roberta-Serena (Intern)  

Financing sources  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 0.00 Danish Kroner  
Project

The Biofilm Matrix – A Target for Control of Biofilm Formation
Bacteria in environmental, industrial, and medical settings predominantly live in biofilms. Production by the bacteria of cell-to-cell interconnecting extracellular compounds is a prerequisite to biofilm formation. The proposed research project aims at obtaining knowledge about the mechanisms which are involved in the production of these cell-to-cell interconnecting compounds. Such knowledge will be useful for creating strategies to prevent unwanted biofilm formation, and to promote beneficial biofilm formation.
Department of Environmental Engineering
Period: 01/07/2007 → 30/06/2010
Number of participants: 1
Acronym: 729
Project participant:
Smets, Barth F. (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Veolia. Literature review on definitions, methodologies, calculations, monitoring and reporting of climate change indicators. Confidential
Collaboration with Veolia Environnement Resherche et Innovations SNC

Department of Environmental Engineering
Number of participants: 2
Acronym: 917
Project ID: 30552
Project participant:
Gentil, Emmanuel (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

**Financing sources**
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 438,750.00 Danish Kroner

Centre for biotechnological wastewater research

Department of Environmental Engineering
Period: 01/06/2007 → 31/05/2011
Number of participants: 4
Acronym: 718
Project participant:
Arvin, Erik (Intern)
Degradation of 1,1,1-TCA
Investigation of the biological potential of using stimulated reductive dechlorination as a treatment method at three Danish sites contaminated with 1,1,1-TCA.

Department of Environmental Engineering
Period: 01/05/2007 → 31/12/2007
Number of participants: 3
Acronym: 792
Project Manager, organisational:
Scheutz, Charlotte (Intern)
Broholm, Mette Martina (Intern)

Financing sources
Source: Sam.arb.aftaler - Amt og kommuner
Name of research programme: Ukendt
Amount: 926,548.00 Danish Kroner

Permeable Membrane Biofilm Reactors (PMBRs) for water treatment
Purpose of project: Review the technical/scientific state-of-the knowledge to answer the following questions, and provide experimental feasibility of biofilm growth on synthetic membranes

Department of Environmental Engineering
Period: 01/05/2007 → 31/12/2007
Number of participants: 1
Acronym: BIOFILM
Project Manager, organisational:
Lackner, Susanne (Intern)

Compaction Modeling in Hydrocarbon Reservoir
Department of Environmental Engineering
Period: 01/04/2007 → 18/05/2011
Number of participants: 5
Phd Student:
Alam, Mohammad Monzurul (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Foged, Niels Nielsen (Intern)
G. Stage, Morten (Ekstern)
Vadla Madland, Merete (Ekstern)
HYDROGRAV IMPROVING LARGE-SCALE HYDROLOGICAL MODELS WITH GROUND-BASED AND SPACE-BORNE TIMELAPSE GRAVITY SURVEYS

Temporal variations of the earth gravity field reflect, among other effects, temporal changes in total water storage (TWS) in the earth system. However, instrument accuracy has been insufficient in the past to measure the minimal changes in the gravitational acceleration due to changes in water storage. A new generation of outdoor absolute and relative gravimeters is now available (Scintrex A-10, Scintrex CG-5) which are accurate enough to monitor water storage changes in typical hydrological systems. Moreover, the Gravity Recovery and Climate Experiment (GRACE) has provided space-borne gravity measurements with unprecedented accuracy and global coverage.

Department of Environmental Engineering
Period: 01/04/2007 → 31/03/2010
Number of participants: 4
Acronym: 743
Project participant:
Rosbjerg, Dan (Intern)
Binning, Philip John (Intern)
Christiansen, Lars (Intern)
Project Manager, organisational:
Bauer-Gottwein, Peter (Intern)

Novel Approach to Reduce the Operational Cost and Sludge Production of Existing Municipal Wastewater Treatment Plants: Biological Hydrolysis

Department of Environmental Engineering
Period: 01/04/2007 → 31/03/2009
Number of participants: 1
Acronym: 810
Project participant:
Ucisik, Ahmed Süheyl (Intern)

OSIRIS Optimized Strategies for Risk Assessment of Industrial Chemicals through Integration of Non-Test and Test Information

Department of Environmental Engineering
Period: 01/04/2007 → 31/03/2011
Number of participants: 1
Acronym: OSIRIS
Project Manager, organisational:
Trapp, Stefan (Intern)
Arising in Danish Aquifers and Drinking Water
The overall aim of the project is to develop methods to reduce the concentrations of arsenic in drinking water. The developed methods must ensure a sustainable use of the groundwater resource based on the best available technology and at the same time be economically feasible. The project includes studies of arsenic in aquifers, the relationships between pumping strategies and concentrations of arsenic in pumped water and water treatment on water works. The project is conducted in a co-operation with Watertech.

Department of Environmental Engineering
Period: 15/03/2007 → 01/04/2008
Number of participants: 4
Acronym: 759
Project ID: 30550
Project participant:
Postma, Diederik Jan (Intern)
Arvin, Erik (Intern)
Jakobsen, Rasmus (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Ukendt
Amount: 1,535,000.00 Danish Kroner

A flexible and integrated energy system based on gasification of liquefied biomass and waste
The project develops a technology suitable for flexible and integrated production of power, heat and liquid fuels based on biomass and municipal waste. The process involves liquefaction of the organic materials using heat and enzymes, and gasification at high pressure. Outputs can be either heat and electricity or various liquid or gaseous fuels. The technology is evaluated in a life-cycle assessment perspective, including direct and indirect consequences for the waste management system as well as the energy system.

Department of Environmental Engineering
Period: 07/03/2007 → 07/03/2011
Number of participants: 1
Acronym: REnescience
Project ID: 30531
Project Manager, organisational:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Ukendt
Amount: 1,404,000.00 Danish Kroner

2BG: Black, blue and green - Integrated infrastructure planning as key to sustainable urban water systems
Quality in life is possible only within the frames of a healthy and sustainable environment. The ambition of 2BG is to contribute to global sustainable development by demonstrating novel ways for cities to interact with Earth’s water: from today’s «consume-and-discharge» to an integrated and recycling mode of interaction. To close the urban water cycle we need to focus on all assets of water in the city; from drinking water to ecosystem services and from industrial functions to water’s aesthetic and socio-cultural dimensions. The project aims to develop concepts, methods and tools for changing the prevailing sewer based discharge systems into self-sustaining and climate-change adapted solutions, based on infiltration of storm and wastewater at the source, combined with appropriate control of water quality and extended reuse. Thus, hydrological models that operate at and link between different sizes of affected catchments, ranging from single roof tops to groundwater aquifers, will be developed; risks related to pollutants being transported within the urban water flows will be described and mitigation options evaluated and developed further. The potential of water management techniques to make a positive contribution to the urban landscape will be elaborated. As inter-professional approaches are needed for
realizing the suggested changes in urban water systems, new spatial IT-tools and planning methods will be developed for support of collaboration between urban planners, engineers and landscape architects, as well as suitable cost-benefit tools and economic instruments to support decision makers. These will be tested and evaluated in case studies. Finally, to make the project results operational within the Danish water resource base, concepts for exchange and transfer of knowledge will be developed and tested in pilot programs, aiming at both the national market and the global markets in rapidly developing cities. The "Forest and Landscape" unit of Copenhagen University, Faculty of Life Sciences is overall project coordinator.

Department of Environmental Engineering
Period: 01/03/2007 → 31/12/2011
Number of participants: 3
Acronym: 2BG
Project ID: 30530
Project participant:
Ledin, Anna (Intern)
Binning, Philip John (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 2,298,824.00 Danish Kroner

Arsens mobilitet i kalkmagasiner
Department of Environmental Engineering
Period: 01/03/2007 → 20/04/2011
Number of participants: 7
Phd Student:
Sø, Helle Ugilt (Intern)
Supervisor:
Larsen, Flemming (Intern)
Postma, Diederik Jan (Intern)
Main Supervisor:
Jakobsen, Rasmus (Intern)
Examiner:
Fabricius, Ida Lykke (Intern)
Charlet, Laurent (Ekstern)
Østergaard, Peter Holm (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Environmental Exposure Modeling for Chemical Risk Assessment
Department of Environmental Engineering
Period: 01/03/2007 → 24/03/2010
Number of participants: 5
Phd Student:
Franco, Antonio (Intern)
Main Supervisor:
Trapp, Stefan (Intern)
Examiner:
Baun, Anders (Intern)
Wania, Frank (Ekstern)
van de Meent, Dirk (Ekstern)

Financing sources
Optimisation of Water Resources Systems using Evolutionary Algorithms with Surrogate Modelling

Department of Environmental Engineering
Period: 01/03/2007 → 30/09/2010
Number of participants: 6
Phd Student:
Gelati, Emiliano (Intern)
Supervisor:
Madsen, Henrik (Intern)
Main Supervisor:
Rosbjerg, Dan (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Blöschl, Günter (Ekstern)
Uvo, Cintia Bertacchi (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Evaluation of the permeable reactive barrier at the Vapokon site 7 years after construction
The permeable reactive barrier (PRB) at the Vapokon site is treating groundwater contaminated with a whole range of chlorinated compounds. The efficiency of the PRB is evaluated by a mass flux approach and by taking cores of the reactive material which are analyzed for physical, chemical and microbial parameters.

Department of Environmental Engineering
Period: 01/02/2007 → 30/06/2007
Number of participants: 1
Acronym: Vapokon2007
Project ID: 30533
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Sam arb aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 205,472.00 Danish Kroner
Project

Full-chain and UNcertainty Approaches for Assessing Health Risks in FUture ENvironmental Scenarios
Human exposure and health assessment

Department of Environmental Engineering
Period: 01/02/2007 → 31/01/2011
Number of participants: 1
Acronym: 2-FUN
Project ID: 30527
Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 983,400.00 Danish Kroner
Project
Selection of organic priority pollutants in ReVAQ-project - stage 2 continued project development and testing in Eslöv

Vilka organiska ämnen ska vi fokuserar på inom ReVAQ projektet för att uppnå en bättre kvalitet på slammet? Projektet har fokus på organiska ämnen som kommer från industrierna och hur man ska gå till väga för att välja ut de ämnen vars förekomst i avloppsvattnet som man i första hand bör reducera. Denna etapp kommer att ta utgångspunkt i de erfarenheter som vi fick genom etapp 1 där Käppala verkets industriellst bearbetades. Metoden som användes (se nedan) kommer att kompletteras och testas på Eslövs reningsverk.

Department of Environmental Engineering
Period: 01/02/2007 → 31/12/2007
Number of participants: 2
Acronym: ReVAQ-stage 2
Project participant:
Ledin, Anna (Intern)
Eriksson, Eva (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Val av fokus ämnen för miljögiftsarbetet i Stockholm – etapp 2 kombination av resultat från etapp 1 med KemI´s exponeringsindex

Vilka kemiska ämnen ska miljögiftsarbetet i Stockholm fokusera på inom de närmaste åren? Kan vi reducera den långa listan med ämnen som har inneboende egenskaper som gör dem potentiellt farliga, till en kortare och mer lätt hanterlig lista genom att utnyttja KemI´s exponeringsindex?

Department of Environmental Engineering
Period: 01/02/2007 → 30/04/2007
Number of participants: 3
Acronym: Nya gifter etapp 2
Project ID: 30525
Project participant:
Ledin, Anna (Intern)
Eriksson, Eva (Intern)
Lützhøft, Hans-Christian Holten (Intern)

Financing sources
Source: Sam arb aftaler - Udenlandske offentlige og private
Name of research programme: Ukendt
Amount: 133,183.00 Danish Kroner
Project

Source-Flux-Fate Modelling of Priority Pollutants in Stormwater Systems

Department of Environmental Engineering
Period: 15/01/2007 → 20/04/2011
Number of participants: 6
Phd Student:
Vezzaro, Luca (Intern)
Supervisor:
Ledin, Anna (Intern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)
Examiner:
Plósz, Benedek G. (Intern)
Destouni, Georgia (Ekstern)
Stenstrom, Michael (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD
Upgrading the risk assessment tool JAGG to version 2.0 - external supervisor
The Danish risk assessment tool for contaminated site made by the Danish EPA is to be updated by incorporating new knowledge about governing processes and factors gained over the last decade. In collaboration with the consulting company Orbicon M&R will act as external supervisor hired by the Danish EPA to collaborate with the project holders (DHI and COWI) working on the upgrade of the risk assessment modules included in JAGG.

Department of Environmental Engineering
Period: 15/01/2007 → 15/10/2007
Number of participants: 2
Acronym: JAGG upgrade2
Project ID: 30536
Project participant:
Kjeldsen, Peter (Intern)
Bjerg, Poul Legstrup (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Ukendt
Amount: 135,060.00 Danish Kroner
Project

Upgrading the risk assessment tool JAGG to version 2.0 - unsaturated zone
The Danish risk assessment tool for contaminated site made by the Danish EPA is to be updated by incorporating new knowledge about governing processes and factors gained over the last decade. In collaboration with the consulting company NIRAS the outline for new calculation modules are constructed for estimation of the transport in the unsaturated zone of pollutants towards the underlying groundwater.

Department of Environmental Engineering
Period: 15/01/2007 → 15/10/2007
Number of participants: 4
Acronym: JAGG upgrade1
Project participant:
Binning, Philip John (Intern)
Troldborg, Mads (Intern)
Broholm, Mette Martina (Intern)
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Assessment/documentation of natural attenuation of PAHs in groundwater.
Assessment/documentation of natural attenuation of PAHs in groundwater at Ringe Tar- and Asphaltfactory, Ringe, Fyn.

Department of Environmental Engineering
Period: 01/01/2007 → 31/12/2007
Number of participants: 1
Acronym: RTA-Fyn
Project ID: 30539
Project Manager, organisational:
Bjerg, Poul Legstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Project
Biorefinery for Fuel production from energy crops

Sustainable use and production of renewable bio-resources is one of the key instruments for achieving the goal of 20% CO2 reduction that the European Community is aiming by year 2025. At the same time, decrease of fossil fuel dependency and boosting the rural development in Europe will be achieved. To gain full benefits from biomass conversion, it is important to utilise all parts of biomass in an integrated process scheme by a multi-product scheme, so-called "biorefinery". By producing multiple products (bioenergy and green chemicals), through an integrated process, the differences in biomass components and intermediates can be exploited and maximize the value derived from the biomass and thus achieve a competitive economy. This project will investigate and develop an integrated and innovative whole crop approach to produce a multi-product biofuel (ethanol, biohydrogen, methane, biodiesel) and high-value products (glucosinolates, high-quality proteins rich in lysine and methionine etc.) from oily plants based on a number of novel and mutually synergistic production methods. The evaluation criteria assisting the development of the biorefinery concept will be based on an feed forwards and backwards assessment of the economical and environmental benefits and drawbacks related to the concept. With the proposed project, we intend to: Optimise harvest, transportation logistics of oily plants to the biorefinery facilities and return the process effluents to be used as fertilisers on the agricultural soil. From the oil part of the plant, biodiesel will be produced, by a new enzymatic transesterification method. High value products such as glucosinolates, high value proteins etc. extracted from the press cake will be compared with alternative utilizations. From the straw part of the oily plant, a chain of processes will result in bioethanol production (from hexoses), biohydrogen (from pentoses) and finally, effluents from different processes will be treated by anaerobic digestion for methane production. To document the level of sustainability, identify key environmental impacts, and evaluate market implementation aspects, the individual process as well as the combined biorefinery concept will be evaluated through life cycle assessment methods as well as with respect to process economy. The results from the above research will be used to demonstrate an integrated biorefinery operation for producing biofuels and high-value products from rapeseed or oilseed with a processing/marketing link between agriculture and industry.

Coherent Energy and Environmental System Analysis

The project integrates existing energy and environmental analysis tools by combining life cycle assessment and energy system and market analysis methodologies. The project thereby aim to meet three of the major challenges of future sustainable energy systems: 1) how to integrate the transport sector, 2) how to develop future power systems suitable for the integration of distributed renewable energy sources, and 3) how to develop public regulation in an international market environment.

Department of Environmental Engineering
Coherent Energy and Environmental System Analysis

Department of Management Engineering
Department of Environmental Engineering
Department of Electrical Engineering
Electric Energy Systems
Aalborg University
University of Southern Denmark
Royal Veterinary and Agricultural University
Copenhagen Business School
Anvendt KommunalForskning
DONG Energy A/S

Enhanced oil Recovery through CO2 utilisation
With its efficient power plants located near the coast and the North Sea, Denmark has a unique position to enable development of methods to combine the utilisation of CO2 with enhanced oil recovery (EOR). The purpose of the project
is to ensure the build-up of knowledge within EOR in Denmark, to establish the necessary research platform to attract European research funds, to train candidates within the area and thus assist in supporting the establishment of new knowledge jobs and business ensuring that Denmark solves a CO2 problem and at the same time increases the recovery of oil and gas in the North Sea, which has a large social value.

Department of Environmental Engineering
Period: 01/01/2007 → 31/12/2009
Number of participants: 1
Acronym: 781
Project ID: 30523
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Ukendt
Amount: 2,280,000.00 Danish Kroner

EU-Vandnettet
EU – Vandnettet har til formål at støtte danske virksomheders muligheder for at deltage i EU finansierede forsknings- og udviklingsprojekter. Forskningsplatformen – Vand, som er en del af Danish Water Forum har fået støtte til denne netværksdannelse fra Forsknings og Innovationsstyrelsen.

Department of Environmental Engineering
Period: 01/01/2007 → 31/12/2008
Number of participants: 2
Acronym: EU-Vandnettet
Project participant:
Binning, Philip John (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Health and Environment Integrated Methodology and Toolbox for Scenario Assessment. The contributions of landfills. EU contract GOCE Contract No. 036913
The project is large EU project modelling the health effects of environmental factors in Europe distributed with respect to geographical areas and sources. DTU Enviroment contributes with the modelling of methane and trace gas emission from landfills

Department of Environmental Engineering
Period: 01/01/2007 → 01/02/2012
Number of participants: 1
Acronym: HEIMTSA
Project ID: 30509
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 137,180.00 Danish Kroner

Influence of test conditions and exposure duration on the result of ecotoxicological tests - consequences for derivation of environmental quality

Department of Environmental Engineering
Integration of modelling, monitoring and optimisation technologies for real-time management of groundwater resources

Due to the steadily increasing pressure on the water resources worldwide there is an emergent need to develop techniques that optimise the exploitable water resources, while protecting it from contamination and preventing over-use. The project addresses the problem of operation and management of the groundwater resources at well-fields. By optimising water withdrawal and pump scheduling economic benefits in terms of reduced operation and maintenance costs as well as environmental benefits and improved water quality can be achieved. The project aims at establishing a knowledge base and developing methodologies and prototype hardware and software technology for real-time optimisation and control that allows for adaptive and interactive management of the groundwater resources at well-fields. The developments include combination of advanced numerical hydrological and hydraulic simulation models and stochastic models of the water flow processes in the well-field with optimisation techniques for on-line, optimal control of pump scheduling and water withdrawal. In addition, real-time, on-line monitoring data are integrated with the modelling system using data assimilation to continuously update the model description and control system. A geochemical sensor array is developed to monitor cation concentrations in the groundwater for providing real-time water quality measures, thereby allowing the control system to react on water quality changes. The developed optimisation and control system is implemented with modular pump controls and integrated with a data management and decision support system. Prototypes of the developed techniques, software and hardware tools are demonstrated and tested on a selected well-field.

Department of Environmental Engineering
Period: 01/01/2007 → 31/12/2010
Number of participants: 2
Acronym: Well fields
Project ID: 30544
Project participant:
Bauer-Gottwein, Peter (Intern)
Project Manager, organisational:
Rostbjerg, Dan (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 2,241,308.00 Danish Kroner

Life-cycle assessment of biorefineries and biofuel production based on biomass resources

The project involves evaluation of environmental consequences of producing biofuels from biorefineries. This is done using a life-cycle assessment approach with specific focus on potentials for process optimizations, but also includes evaluations of the utilization of residual biomass resources for biofuel production. The project is a sub-project of a larger project (BioREF) hosted at the departments Bioenergy research group.

Department of Environmental Engineering
Period: 01/01/2007 → 31/12/2011
Number of participants: 2
Acronym: Bio.REF2
Project ID: 30520

Project participant:
Boldrin, Alessio (Intern)
Project Manager, organisational:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 1,952,866.00 Danish Kroner
Project

Overlevelse afindikatorbakterier og patogener i ledningsnet
1. Formål Der er en lang række forhold og observationer i vandforsyningerne af forekomst af indikatororganismer i ledningsnet, som ikke kan forklares med den nuværende viden. For at kunne optimere valg af materialer til ledningsnet, sikre og forbedre vandets mikrobiologiske kvalitet i distributionssystemerne og optimere strategier til ledningsnettets vedligeholdelse og renovering vil der blive undersøgt: • overlevelsen af indikatororganismer og udvalgte patogener (sygdomsfremkaldende mikroorganismer) i drikkevandsrør • betydningen af materialevalg (stål, plast) for overlevelsen • styrende faktorer for disse bakteriers overlevelse, først og fremmest samspillet med rørens biofilm i nye og brugte rør • betydningen af arbejdsprocedurer ved udskiftning af rør i ledningsnet, fx sediment i bunden af ledningsnettet, indtrængen af boremudder eller jord Det ansøgte projekt vil således under virkelighedsnære forhold give ny viden om forekomst af bakterier og overlevelsen af patogener i distributionsnet, og om hvorledes materialevalg og renoveringer indvirker på denne overlevelse. Desuden forventes projektet at bidrage til at forbedre de hygiejniske procedurer ved ledningsrenoveringer.

Department of Environmental Engineering
Period: 01/01/2007 → 28/02/2008
Number of participants: 1
Acronym: OIPL
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 0.00 Danish Kroner
Project

SENSOWAQ - Sensors for monitoring and control of water quality
Scientific summary: The vision is to construct new sensors for on-line or close to on-line measurement. Sensors are devices that detect physical, chemical or biological stimuli and transform them into signals, which can be measured or recorded. Sensor technology may provide rapid responses in contrast to traditional monitoring methods with long incubations or complex extraction and concentration procedures. The technology opens for development of miniaturised devices for on-line measurement of organic- and inorganic pollutants and microorganisms in different water bodies including groundwater, drinking water and water in industry. Unfortunately, hardly any sensors are available for measuring such water quality parameters, and the scientific challenge for this project is to identify and develop detection principles to enable detection of the very low concentrations typical for these parameters, and to transfer these detection principles to sensor platforms. Sensors can be divided into physico-chemical- and biological sensors. Biological sensors integrate a biological recognition element and a transducer capable of detecting the biological reaction and converting it into a measurable signal. Sensors for the drinking water supply will be developed for detection of selected pesticides (dichlobenil, 2,6-dichlorobenzamide (BAM), triazine and phenoxyacid herbicides), metals (copper, arsenic), specific microorganisms (e.g. Bacteroides, Enterococci, Campylobacter, E. coli, Legionella, Cryptosporidium) and microorganisms in general (suspended organisms, biofilm and corrosive organisms). The research will use and develop several detection principles: 1) immunological and aptamer technology, 2) bioluminescent/fluorescent whole cell technology, 3) DNA and RNA array technology, 4) enzyme technology, 5) ATP-detection by bioluminescence, 6) auto-fluorescent biomolecule detection, and 7) electrical resistance for corrosion measurement. Depending on the target molecules these techniques will be transferred to the appropriate sensor platforms including 1) optical fibres, 2) cantilevers, 3) automated sampling, filtering and analysis robots, and 4) DNA/RNA array-technologies. The project is divided into two main working areas (WA) focusing on development of sensors for analysis of pesticides and metals (WA1) and microbial contamination, including biocorrosive processes (WA2).

Department of Environmental Engineering
Period: 01/01/2007 → 31/12/2011
Number of participants: 3
Acronym: SENSOWAQ
The Microbial Gene Pool and Gene Transfer In Agricultural Soils: Effects on Pesticide Biodegradation

Department of Environmental Engineering
Period: 01/01/2007 → 21/04/2010
Number of participants: 6
PhD Student:
Musovic, Sanin (Intern)
Supervisor:
Sørensen, Jan (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Albrechtsen, Hans-Jørgen (Intern)
Simonet, Pascal (Ekstern)
Smalla, Kornelia (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

ATP On-line
Continued 'real time' measurement of ATP and physical parameters in drinking water

Department of Environmental Engineering
Period: 21/12/2006 → 15/02/2007
Number of participants: 1
Acronym: 784
Project ID: 30507
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 114,800.00 Danish Kroner
Project

Feasibility Study Agreement
Fortroligt

Department of Environmental Engineering
Number of participants: 1
Acronym: 780
Project ID: 30513
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)
**Coli Risk - MST**
Risk Assessment of coliform bacteria in drinking water

Department of Environmental Engineering
Period: 14/12/2006 → 31/05/2007
Number of participants: 2
Acronym: 785
Project ID: 30506
Project participant:
Corfitzen, Charlotte B. (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

**Biodegradability of sulphur and organic matter in the well water from Bad Aibling Thermal bath**
First phase: Characterize the degradability of the organic matter by OUR. Determine the distribution of easy degradable, easy hydrolysable and slowly hydrolysable COD. Investigate the effect of 3 weeks acclimatization of the activated sludge to the water. Second phase: If needed we investigate for toxicity for the water to OUR and nitrification.

Department of Environmental Engineering
Period: 11/12/2006 → 01/02/2007
Number of participants: 4
Acronym: Bad Aibling
Project ID: 30508
Project participant:
Eilersen, Ann Marie (Intern)
Schmidt, Jens Ejbye (Intern)
Sørensen, Margrethe (Intern)
Project Manager, organisational:
Andersen, Henrik Rasmus (Intern)

**Improved Anaerobic Digestion of Energy Crops**

Department of Environmental Engineering
Period: 01/12/2006 → 23/06/2010
Number of participants: 6
PhD Student:
Bruni, Emiliano (Intern)
Supervisor:
Jensen, Anders Peter (Ekstern)
Main Supervisor:
Angelidaki, Irini (Intern)
Examiner:
Baun, Anders (Intern)
Mattiasson, Bo (Ekstern)
Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Modeling concepts for the sustainable management of the Sian Ka'an Biosphere Reserve, Yucatan, Mexico
Department of Environmental Engineering
Period: 15/11/2006 → 21/04/2010
Number of participants: 6
Phd Student:
Gondwe, Bibi Ruth Neuman (Intern)
Supervisor:
Auken, Esben (Intern)
Main Supervisor:
Bauer-Gottwein, Peter (Intern)
Examiner:
Fabricius, Ida Lykke (Intern)
Birk, Steffen (Ekstern)
Jensen, Karsten Høgh (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Biogrowth - VF
LCA modelling of a combined anaerobic-aerobic proces for treatment of source-sorted organic waste mixed with a quantity of garden waste. Implementation of the model on actual problems in chosen municipalities within 'Vestforbrændings' area.
Department of Environmental Engineering
Period: 19/10/2006 → 30/04/2007
Number of participants: 1
Acronym: 783
Project ID: 30500
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 478,000.00 Danish Kroner
Project

Kvantificering af usikkerheder ved risikovurdering af grundvandsforurening fra punktkilder
Department of Environmental Engineering
Period: 15/10/2006 → 25/08/2010
Number of participants: 6
Phd Student:
Troldborg, Mads (Intern)
Supervisor:
Bjerg, Poul Legstrup (Intern)
Main Supervisor:
Binning, Philip John (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Lerner, David (Ekstern)
Refsgaard, Jens Christian (Ekstern)
Effect of Environmental Factors on Horizontal Gene Transfer in Microbial Biofilms

Department of Environmental Engineering
Period: 01/10/2006 → 11/09/2013
Number of participants: 2
Phd Student:
Lauritzen, Britta Sevelsted (Intern)
Main Supervisor:
Smets, Barth F. (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden EU-finansiering
Project: PhD

Psuedo kinetics arising from the upscaling of geochemical equilibrium

In order to ensure good groundwater quality for our drinking water supplies, it is important that we have access to modelling tools that can be used to interpret monitoring data and foresee the impacts of changed management practices. Groundwater quality models now frequently couple simulations of water flow with geochemistry. These models are typically built on an assumption of geochemical equilibrium. Such models do not seek to describe the detailed configuration of minerals, micro-organisms and other geochemically active materials in the subsurface. Instead, they rely on simulations of average properties. However, the variation is still important, because it can take time for contaminants to flow from a geochemically active region into an inactive region. Models based on average properties do not properly take this time into account, and consequently do not correctly simulate the actual geochemistry. This proposal seeks to address this problem, by developing a new theoretical basis for coupling geochemical properties with groundwater flows. The theory will show how to properly account for small scale variability. The project will implement the new theory in computer software that can be used in practice. Finally, the theory will be tested for some case studies that will be chosen from relevant geochemical problems in groundwater. For example, in Denmark, there is some concern that nickel contamination is a problem in our groundwater supplies. The project will fund a PhD student and is collaborative with Princeton University, an international leader in this area of research.

Department of Environmental Engineering
Period: 01/10/2006 → 31/12/2009
Number of participants: 0
Acronym: GEOEQ

Financing sources
Source: Forskningsrådene - STVF
**Source Control Options for Reducing Emissions of Priority Pollutants**

The overall aim of the SCOREPP project is to develop comprehensive and appropriate source control strategies that authorities, cities, water utilities and chemical industry can employ to reduce emissions of priority pollutants (PPs) from urban areas into the receiving water environment. The SCOREPP project focuses on the 33 priority substances identified in the Water Framework Directive (WFD), and specifically on the 11 priority hazardous substances. However, this list may be expanded to include emerging pollutants or reduced if appropriate model compounds can be identified, depending on the local context. The specific scientific objectives of the SCOREPP project are to identify the sources of PPs in urban areas, to identify and assess appropriate strategies for limiting the release of PPs from urban sources and for treating PPs on a variety of spatial scales. Furthermore to develop GIS-based spatial decision support tools for identification of appropriate emission control measures, to develop integrated dynamic urban scale source-and-flux models that can be used to assess the effect of source control options on PP-emissions and to optimise monitoring programmes, and to assess the direct and indirect costs, the cost-effectiveness and the wider societal implications of source control strategies. The developed approaches, models and assessments will be used to formulate a set of appropriate PP-emission reducing strategies, and a multi-criteria approach will be used to compare and evaluate these strategies in relation to their economic, societal and environmental impacts. The SCOREPP project will interact with the European chemical industry and water utility trade associations together with representatives from ministerial, regional, municipal and community organisations to ensure that these key urban stakeholders can provide input to framing the scope of the project, adapting the project outcomes and communicating the results of the project to a wide audience.

Department of Environmental Engineering  
Period: 01/10/2006 → 20/09/2009  
Number of participants: 7  
Acronym: SCOREPP  
Project ID: 30502  
Project participant:  
Mikkelsen, Peter Steen (Intern)  
Grieger, Khara Deanne (Intern)  
Lützhøft, Hans-Christian Holten (Intern)  
Eriksson, Eva (Intern)  
Ledin, Anna (Intern)  
Henze, Mogens (Intern)  
Project Manager, organisational:  
Rasmussen, Birte Kastrup (Intern)

**Financing sources**
Source: Forsk. EU - Rammeprogram  
Name of research programme: Forsk. EU - Rammeprogram  
Amount: 4,728,500.00 Danish Kroner

**Relations**
Activities:  
Balancing complexity and uncertainty in model-based estimation of micropollutant fluxes in integrated urban drainage-wastewater systems  
Project

**Waste Management Strategies of the Future: A Consistent European and National Technology Platform**

Department of Environmental Engineering  
Period: 01/10/2006 → 02/03/2011  
Number of participants: 6  
Phd Student:  
Gentil, Emmanuel (Intern)  
Supervisor:  
Hauschild, Michael Zwicky (Intern)  
Main Supervisor:  
Christensen, Thomas Højlund (Intern)  
Examiner:  
Astrup, Thomas (Intern)
Egen vandressource projekt A3: International erfaringsopsamling.
Tætbefolkede områders erfaringer med alternativ vandhåndtering og høj grad af selvforsyning.

Department of Environmental Engineering
Period: 07/09/2006 → 31/03/2007
Number of participants: 1
Acronym: KE, projekt A3
Project ID: 30493
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Oprensning af kilder til grundvandsforurening ved brug af nano- og mikroskala jempartikler

Department of Environmental Engineering
Period: 01/09/2006 → 18/05/2011
Number of participants: 6
Phd Student:
Fjordbøge, Annika Sidelmann (Intern)
Supervisor:
Baun, Anders (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)
Examiner:
Broholm, Mette Martina (Intern)
Bastiaens, Leen (Ekstern)
Tuxen, Nina (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Environmentally Sustainable Utilization of Waste Resources for Energy Production

Department of Environmental Engineering
Period: 01/08/2006 → 21/04/2010
Number of participants: 5
Phd Student:
Frergaard, Thilde (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Scheutz, Charlotte (Intern)
Olsen, Stig Irving (Intern)
Tillman, Anne-Marie (Ekstern)

Financing sources
Source: Internal funding (public)
Kortlægning af kilder til miljøskadelige stoffer i affaldet.
Der udføres en opgørelse af potentielle miljømæssige besparelser ved udsortering af 3 udvalgte affaldstyper/fraktioner tilført Århus Forbrændingsanlæg. De miljø- og energimæssige konsekvenser af udsorteringen modelleres i EASEWASTE baseret på konkrete målinger ved forbrændingstests.

Department of Environmental Engineering
Period: 01/08/2006 → 31/01/2007
Number of participants: 3
Acronym: Århus F2
Project ID: 30446
Project participant:
Astrup, Thomas Fruegaard (Intern)
Riber, Christian (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 440,000.00 Danish Kroner

Redox Stratification Controlled Biofilm Reactor: A novel bioreactor concept for environmental and biochemical engineering applications.

Department of Environmental Engineering
Period: 01/08/2006 → 31/07/2009
Number of participants: 2
Acronym: ReSCOBiR
Project ID: 30465
Project participant:
Terada, Akihiko (Intern)
Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 1,800,000.00 Danish Kroner

Waste Disposa - Getting the "End of Life" right in Life-Cycle-Assessment Modeling of Waste Management Systems

Department of Environmental Engineering
Period: 01/08/2006 → 01/07/2009
Number of participants: 5
Phd Student:
Manfredi, Simone (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Kirkeby, Janus Søgaard (Intern)
Lagerkvist, Anders (Ekstern)

Financing sources
Source: Internal funding (public)
Maximization of gaseous energy recovery by simultaneous biohydrogen production and biomethanation.

Maximization of gaseous energy recovery by simultaneous biohydrogen production and biomethanation.

Department of Environmental Engineering
Period: 03/06/2006 → 31/12/2007
Number of participants: 1
Acronym: Dansk-Indisk samarbejde
Project ID: 30491
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 25,000.00 Danish Kroner

Århus - Garden Waste
Characterisation of garden waste, description of treatment and use of garden waste and on the basis hereof modelling of the environmental impact (LCA). Experimental investigations also included as a means of obtaining central data for the environmental assessment.

Department of Environmental Engineering
Period: 01/06/2006 → 31/10/2008
Number of participants: 3
Acronym: 782
Project ID: 30501
Project participant:
Boldrin, Alessio (Intern)
Andersen, Jacob Kragh (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 610,000.00 Danish Kroner

Centre for Environmental and Agricultural Microbiology.
Modern agricultural practices introduce a variety of contaminating chemicals to surface soils through practices such as chemical pest management, manure application, and deposition of biosolids from wastewater treatment plants. In addition, diffuse pollution of residential and agricultural soils in urban areas or near traffic corridors may constitute an underestimated problem. Many of these contaminants are degraded slowly or incompletely in top soils, and may therefore leach to lower soil horizons, and ultimately contaminate aquifers. As a result, soil contamination, e.g. by pesticides, hydrocarbons, and veterinary as well as human pharmaceuticals is creating a legitimate concern in the public: Are residential soils safe? Can agricultural soils continue to generate safe crops for human consumption? Will the underlying aquifers continue to provide safe drinking waters? Microbial transformation and degradation of contaminating compounds are of major importance in soil environments. Yet, few studies have identified and quantified the true rate limiting processes of contaminant degradation at low concentrations of contaminants in undisturbed soil samples, and at the scale relevant for microbial life forms. The goals of the proposed cross-disciplinary and multiinstitutional research center are to elucidate, quantify, and ultimately find ways to control the ratelimiting processes for biodegradation of selected contaminants in soil systems.

Department of Environmental Engineering
Period: 01/06/2006 → 31/05/2011
Number of participants: 2
Acronym: CREAM
Project ID: 30479
Project participant:
Dechesne, Arnaud (Intern)
Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 4,500,000.00 Danish Kroner

Project

Nanoteknologisk uddannelseskonsortium.
Department of Environmental Engineering
Period: 01/06/2006 → 31/12/2006
Number of participants: 1
Acronym: Nanotek
Project ID: 30476
Project Manager, organisational:
Baun, Anders (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 130,000.00 Danish Kroner

Project

Kompetenceudvikling indenfor miljøteknik med tværinstitutionel samarbejdsplatform.
Department of Environmental Engineering
Period: 30/05/2006 → 31/12/2006
Number of participants: 1
Acronym: Netværk-Miljøteknik
Project ID: 30484
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,000,000.00 Danish Kroner

Project

Afværgestrategi for Kærgård Plantage.
Department of Environmental Engineering
Period: 09/05/2006 → 31/12/2006
Number of participants: 2
Acronym: Kærgård Plantage-afværge
Project ID: 30469
Project participant:
Scheutz, Charlotte (Intern)
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 46,500.00 Danish Kroner

Project

Del 2 har til formål at give en integreret vurdering af forslag til fremtidige affaldsordninger i Århus Kommune.

Department of Environmental Engineering
Period: 01/04/2006 → 30/09/2007
Number of participants: 2
Acronym: Århus Frem Affald
Project ID: 30447
Project participant:
Larsen, Anna Warberg (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 470,000.00 Danish Kroner

Improved energy efficiency and bottom ash quality for waste incinerators
The project involves test in pilot-scale of bottom ash sintering in a rotary kiln designed for waste incinerators. Ash qualities are evaluated with respect to leaching behavior as a function of rotary kiln design and operation parameters. In addition to this, the project evaluates potential improvements in furnace design with an aim to improve overall energy recovery efficiency while at the same time improving bottom ash qualities by sintering.

Department of Environmental Engineering
Period: 01/04/2006 → 30/06/2009
Number of participants: 2
Acronym: PSO-Kemiteknik
Project ID: 30496
Project participant:
Hyks, Jiri (Intern)
Project Manager, organisational:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Ukendt
Amount: 492,000.00 Danish Kroner

Technical collaboration on Fluoride remediation in Japan
1) Expert appraisal of the applicability of fluoride remediation technologies to Japanese project 2) Expert advice on the application of other remediation technologies

Department of Environmental Engineering
Period: 01/04/2006 → 31/03/2007
Number of participants: 1
Acronym: Expert-Floride remediation
Project ID: 30477
Project Manager, organisational:
Binning, Philip John (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 23,500.00 Danish Kroner

Massestrømsanalyse for miljøfremmede stoffer i afløbssystemer.
Projektets formål er at opstille en forenklet model for et afløbssystem incl. rensningsanlæg, som kan benyttes til massestrømsanalyse for relevante stoffer. Modellen udvikles på Lynetten med opland.

Department of Environmental Engineering
Period: 01/04/2006 → 30/09/2007
Number of participants: 2
Acronym: Århus Frem Affald
Project ID: 30447
Project participant:
Larsen, Anna Warberg (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 470,000.00 Danish Kroner

Improved energy efficiency and bottom ash quality for waste incinerators
The project involves test in pilot-scale of bottom ash sintering in a rotary kiln designed for waste incinerators. Ash qualities are evaluated with respect to leaching behavior as a function of rotary kiln design and operation parameters. In addition to this, the project evaluates potential improvements in furnace design with an aim to improve overall energy recovery efficiency while at the same time improving bottom ash qualities by sintering.

Department of Environmental Engineering
Period: 01/04/2006 → 30/06/2009
Number of participants: 2
Acronym: PSO-Kemiteknik
Project ID: 30496
Project participant:
Hyks, Jiri (Intern)
Project Manager, organisational:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Ukendt
Amount: 492,000.00 Danish Kroner

Technical collaboration on Fluoride remediation in Japan
1) Expert appraisal of the applicability of fluoride remediation technologies to Japanese project 2) Expert advice on the application of other remediation technologies

Department of Environmental Engineering
Period: 01/04/2006 → 31/03/2007
Number of participants: 1
Acronym: Expert-Floride remediation
Project ID: 30477
Project Manager, organisational:
Binning, Philip John (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 23,500.00 Danish Kroner

Massestrømsanalyse for miljøfremmede stoffer i afløbssystemer.
Projektets formål er at opstille en forenklet model for et afløbssystem incl. rensningsanlæg, som kan benyttes til massestrømsanalyse for relevante stoffer. Modellen udvikles på Lynetten med opland.
Department of Environmental Engineering
Period: 10/03/2006 → 31/12/2008
Number of participants: 3
Acronym: Massestrømsanalyse
Project ID: 30464
Project participant:
Lindblom, Erik Ulfson (Intern)
Henze, Mogens (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Project

Confocal Scanning Laser Microscope for Environmental Biotechnological & Microbiological Applications.
Confocal Scanning Laser Microscope for Environmental Biotechnological & Microbiological Applications.

Department of Environmental Engineering
Period: 01/03/2006 → 31/08/2007
Number of participants: 2
Acronym: Laser Microscope
Project ID: 30478
Project participant:
Musovic, Sanin (Intern)
Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,500,000.00 Danish Kroner
Project

Environmental Assessment of the Management of Garden and Yard Waste

Department of Environmental Engineering
Period: 01/03/2006 → 23/09/2009
Number of participants: 5
Phd Student:
Boldrin, Alessio (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Angelidaki, Irini (Intern)
Jensen, Lars Stoumann (Ekstern)
Kranert, Martin (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Implementation of LCA-models in Waste Management

Department of Environmental Engineering
Period: 01/03/2006 → 23/06/2010
Number of participants: 5
Phd Student:
Damgaard, Anders (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Grosso, Mario (Ekstern)
Kirkeby, Janus Søgaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Methods for enhanced delivery of in situ remediation amendments to contaminated clay till

Department of Environmental Engineering
Period: 01/03/2006 → 23/06/2010
Number of participants: 5
Phd Student:
Christiansen, Camilla Maymann (Intern)
Main Supervisor:
Bjerg, Poul Løgstrup (Intern)
Examiner:
Jakobsen, Rasmus (Intern)
Larsen, Thomas Hauerberg (Intern)
Siegrist, Robert L. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

PSO-VFA. Anvendelse af online fedtsyresensor for at kontrollere og optimere anaerob processen for lav omkostnings biogas fra gyllen.

Department of Environmental Engineering
Period: 01/03/2006 → 29/02/2008
Number of participants: 2
Acronym: PSO - VFA
Project ID: 30441
Project participant:
Boe, Kanokwan (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,660,700.00 Danish Kroner
Project

Funktionen af den reaktive væg på Vapokon grunden - 7 år efter etablering - flux af stof gennem væggen.

Department of Environmental Engineering
Period: 15/02/2006 → 31/12/2006
Number of participants: 1
Acronym: Vapokon A7Y
Project ID: 30458
Project Manager, organisational:
Kjeldsen, Peter (Intern)
Donation to a PHd-student with the purpose of encouraging and supporting the study in chalc and silica from the North Sea area.

Department of Environmental Engineering
Period: 01/02/2006 → 30/06/2006
Number of participants: 2
Acronym: BP Norway
Project participant:
Hjuler, Morten Leth (Intern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Pesticidforskningsprojekt: Statistisk analyse og biologisk tolkning af toksicitetsdata.

Department of Environmental Engineering
Period: 01/02/2006 → 31/12/2007
Number of participants: 4
Acronym: STABTOK
Project participant:
Nyholm, Niels (Intern)
Andersen, Henrik Rasmus (Intern)
Kusk, Kresten Ole (Intern)
Project Manager, organisational:
Baun, Anders (Intern)

Potentialet for membranafsaltet vand i vandforsyningen

Department of Environmental Engineering
Period: 01/02/2006 → 23/06/2010
Number of participants: 6
Phd Student:
Rygaard, Martin (Intern)
Supervisor:
Arvin, Erik (Intern)
Main Supervisor:
Binning, Philip John (Intern)
Examiner:
Henze, Mogens (Intern)
Gimbel, Rolf (Ekstern)
Oprensning af Høfde 42-depotet ved hjælp af nul-valent jern.

Formål er at vurdere nul-valent baserede teknologiers egendethed med speciel focus på kildeoprensning til fjernelse af forureningen i sediment og grundvand i og omkring Høfde 42-depotet.

Department of Environmental Engineering
Period: 24/01/2006 → 30/06/2006
Number of participants: 3
Acronym: HØFDE 42
Project participant:
Fjordbøge, Annika Sidelmann (Intern)
Kruse, Susanne (Intern)
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ubekendt
Amount: 206,014.00 Danish Kroner
Project


Pig farming is a major EU agricultural industry, with about 300 million tons of manure produced annually by the SME farmers. This is a major environmental problem, resulting in severe pollution of ground water and eutrophication of surface waters due to high nitrate, ammonia and phosphate emissions. This project provides an integrated solution using a combination of innovative technologies, thereby enabling the farmers to attain environmental compliance with the IPPC, and Waste directives. The project develops UASB technology for a digester, combined with dilution by Brammox effluent to prevent ammonia and sulphur inhibition. C-digestion with several other organic wastes will improve biogas output. The Anphos process will remove phosphate as struvite, as well as ammonia removal with precipitation of the non-digested solids. The Brammox process will be used for the first time for the removal of ammonia from the digested pig manure. PIGMAN will develop nitrification/denitrification in an activated sludge process combined with ultra filtration membranes (Biomembrane process).

Department of Environmental Engineering
WasteMan
Knops pork B.V.
ROL-KON Spolka z o.o
Hegndal svineproduktion
KAILAS&SONS LTD
Lahav Institute of Animal Research
Ghent University
Adviesburo voor milieutechniek Colsen BV
SELOR eeig
University of Ioannina
Period: 01/01/2006 → 31/12/2007
Number of participants: 3
Acronym: PIGMAN
Project ID: 30452
Project participant:
Schmidt, Jens Ejbye (Intern)
Karakashev, Dimitar Borisov (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 900,975.00 Danish Kroner

Bevilling fra Rektors Strategiske Omstillingspulje til at fremme innivationsaktiviteter på DTU, in casu EASEWASTE

Department of Environmental Engineering
Period: 01/01/2006 → 31/12/2008
Number of participants: 1
Acronym: EASEWASTE RSO
Project ID: 30455
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: [Ordinær drift UK 10]
Name of research programme: [Ordinær drift UK 10]
Amount: 1,500,000.00 Danish Kroner

Environmentally sustainable utilization of waste resources for energy production

Environmentally sustainable utilization of waste resources for energy production

Department of Environmental Engineering
Period: 01/01/2006 → 31/12/2008
Number of participants: 2
Acronym: ENSUWE
Project ID: 30449
Project participant:
Fruergaard, Thilde (Intern)
Project Manager, organisational:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 2,500,000.00 Danish Kroner

Environmentally sustainable utilization of waste resources for energy production

Environmentally sustainable utilization of waste resources for energy production

Department of Environmental Engineering
Department of Management Engineering
Residual Resource Engineering
Aalborg University
Elsam A/S
Period: 01/01/2006 → 31/12/2008
Number of participants: 3
Acronym: ENSUWE
Project ID: 1200196
Project participant:
Münster, Marie (Intern)
Fruergaard, Thilde (Intern)
Project Manager, organisational:
Astrup, Thomas (Intern)

Financing sources
Source: Public research council
Name of research programme: Forskningstyrelsen – programkomiteen for energi og miljø
Amount: 4,700,000.00 Danish Kroner

Relations
Publications:
- Comparing Waste-to-Energy technologies by applying energy system analysis
- Energy Systems Analysis of Waste to Energy Technologies by use of EnergyPLAN
- Energy system analyses of the marginal energy technology in life cycle assessments
- Importance of Flexible Use of Waste for Energy for the National Energy System
- Optimization of use of waste in the future energy system
- Long-term affected energy production of waste to energy technologies identified by use of energy system analysis
- Uncertainties related to the identification of the marginal energy technology in consequential life cycle assessments
- Afaldsteknologier CO₂-fortrængning i energisystemet
- Waste-to-energy technologies in TIMES models
- Use of waste for heat, electricity and transport—Challenges when performing energy system analysis
- Use of Waste for Heat, Electricity and Transport – Challenges when performing Energy System Analysis
- Modelling Waste-To-Energy Technologies In National Energy Systems
- Production of bio-fuel, electricity and heat through gasification of waste

Fjernelse af Mechlorprop i Kerteminde Vandværk
Formål med denne undersøgelse er at undersøge, hvordan mechlorprop tilsyneladende kan forsvinde i vandbehandlingen på Kertemine Vandforsyning, herunder hvilken betydning udskiftning af filtrene har.

Department of Environmental Engineering
Period: 01/01/2006 → 01/10/2006
Number of participants: 3
Acronym: Fyns Amt-Mechlorprop
Project ID: 30453

Project participant:
- Ferguson, Camilla Keinicke Hamilton (Intern)
- Albrechtsen, Hans-Jørgen (Intern)

Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 400,000.00 Danish Kroner

Fremtidens integrerede indsamlilng af affald

Department of Environmental Engineering
Period: 01/01/2006 → 11/11/2009
Number of participants: 5
Phd Student:
- Larsen, Anna Warberg (Intern)
Main Supervisor:
- Christensen, Thomas Højlund (Intern)
Examiner:
- Scheutz, Charlotte (Intern)
- Bilitewski, Bernd (Ekstern)
- Björklund, Anna (Ekstern)
**Interaction of nanoparticles with xenobiotic compounds**

The presence of engineered nanoparticles may influence the toxicity and bioaccumulation of xenobiotic compounds. Therefore this project is aimed at studying the interaction of carbon nanoparticles with organic contaminants using algae and crustaceans as test organisms.

Department of Environmental Engineering  
Period: 01/01/2006 → 01/01/2009  
Number of participants: 1  
Acronym: I  
Project participant:  
Baun, Anders (Intern)

**MFC-Risø: Microbial fuel cell - used in direct conversion of lignocellulosic waste to energy.**

Department of Environmental Engineering  
Forskningscenter Risø  
Period: 01/01/2006 → 31/12/2008  
Number of participants: 1  
Acronym: MFC-Risø  
Project ID: 30423  
Project Manager, organisational:  
Angelidaki, Irini (Intern)

**Mitigation of the Groundwater Arsenic Problem in Rural Areas of the Red River Flood Plain, Vietnam**

Department of Environmental Engineering  
Period: 01/01/2006 → 09/12/2009  
Number of participants: 8  
Phd Student:  
Jessen, Søren (Intern)  
Supervisor:  
Larsen, Flemming (Intern)  
Postma, Diederik Jan (Intern)  
Viet, Pham Hung (Ekstern)  
Main Supervisor:  
Jakobsen, Rasmus (Intern)  
Examiner:  
Kjeldsen, Peter (Intern)  
Kinniburgh, David G. (Ekstern)  
Østergaard, Peter Holm (Ekstern)

**Financing sources**

*Source: Internal funding (public)*  
*Name of research programme: DTU, Samfinansiering*  
*Project: PhD*

RaMAda

Department of Environmental Engineering
Period: 01/01/2006 → 31/12/2009
Number of participants: 4
Acronym: RaMAda
Project ID: 30437
Project participant:
Smets, Barth F. (Intern)
Lardon, Laurent (Intern)
Bazire, Alexis (Intern)

Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 14,254,600.00 Danish Kroner

Reduction of Greenhouse Gas Emissions from Landfills by use of Engineered Biocovers: Full Scale Studies

Department of Environmental Engineering
Period: 01/01/2006 → 26/05/2010
Number of participants: 6
Phd Student:
Fredenslund, Anders Michael (Intern)
Supervisor:
Scheutz, Charlotte (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)
Examiner:
Christensen, Thomas Højlund (Intern)
Börjesson, Gunnar (Ekstern)
Poulsen, Tjalfe (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD

Student Sponsorship Programme.
COWI A/S sponsorerer 2 studenrende.

Department of Environmental Engineering
Period: 01/01/2006 → 31/12/2007
Number of participants: 1
Acronym: Sponsorship
Project ID: 30454
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 120,000.00 Danish Kroner

PSO-ELSAM. Undersøgelse af restprodukter (slagger og flyveaske/røggasaffald) fra affaldsforbrænding.
Investigation of the correlation between waste input to MSW incinerators and residue quality. Specific waste fractions are co-incinerated at a full scale incinerator, and all emission routes are monitored.

Department of Environmental Engineering
Period: 09/12/2005 → 01/05/2009
Number of participants: 2
Acronym: PSO-Elsam
Project ID: 30428
Project participant:
Riber, Christian (Intern)
Project Manager, organisational:
Astrup, Thomas Fruegaard (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 4,482,000.00 Danish Kroner

Del 1 har til formål at opstille en model, der kan beskrive de miljømæssige og økonomiske aspekter af det nuværende affaldssystem for husholdningsaffald i Århus Kommune som et grundlag for udvikling af fremtidige affaldsordninger.

Department of Environmental Engineering
Period: 01/12/2005 → 30/04/2007
Number of participants: 2
Acronym: Århus Nu Affald
Project ID: 30448
Project participant:
Larsen, Anna Warberg (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 470,000.00 Danish Kroner

Håndtering af problemer med Arsen i grundvandet i landdistrakter på flodplanet langs den Røde Flod.

Department of Environmental Engineering
Period: 01/12/2005 → 30/11/2008
Number of participants: 2
Acronym: 602
Project ID: 30433
Project participant:
Jessen, Søren (Intern)
Project Manager, organisational:
Postma, Diederik Jan (Intern)

Financing sources
Source: Forskningsprojekter - Udenrigsministeriet (Danida)
Name of research programme: Forskningsprojekter - Udenrigsministeriet (Danida)
Amount: 1,931,210.00 Danish Kroner

En model opstilles for Århus Forbrændingsanlæg i EASEWASTE, og en vurdering af de miljø- og energimæssige forhold omkring anlægget foretages.

Department of Environmental Engineering
Period: 01/12/2005 → 30/11/2006
Number of participants: 3
Acronym: Århus F1
Project ID: 30445
Project participant:
Astrup, Thomas Fruegaard (Intern)
Riber, Christian (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 710,000.00 Danish Kroner
Project

Svømmebadsteknologi
Department of Environmental Engineering
Period: 01/12/2005 → 31/12/2005
Number of participants: 1
Project ID: 30436
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Sam arb aftaler, Private danske - Andre virksomheder
Name of research programme: Ukendt
Amount: 52,000.00 Danish Kroner
Project

ReVAQ pilotprojekt. Prioriterede organiske emner i slam.

Department of Environmental Engineering
Number of participants: 2
Acronym: ReVAQ pilotprojekt
Project ID: 30427
Project participant:
Eriksson, Eva (Intern)
Project Manager, organisational:
Ledin, Anna (Intern)

Financing sources
Source: Sam arb aftaler - Udenlandske offentlige og private
Name of research programme: Ukendt
Amount: 83,300.00 Danish Kroner
Project

Specialanalyser til vurdering af naturlig nedbrydning samt nedbrydningsforsøg, Ringe Tjære og Asfaltfabrik.

Department of Environmental Engineering
Period: 02/11/2005 → 31/12/2006
Number of participants: 2
Acronym: Fyns Amt-Tjære Del 2
Project ID: 30422
Project participant:
Broholm, Mette Martina (Intern)
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
DAN-ED: Endocrine disrupters in food and environment: exposure routes and impact on humand

Department of Environmental Engineering

Environmental Chemistry

University of Copenhagen
Period: 01/11/2005 → 31/10/2008
Number of participants: 3
Acronym: DAN-ED
Project ID: 30432
Project participant:
Andersen, Henrik Rasmus (Intern)
Eriksson, Eva (Intern)

Project Manager, organisational:
Baun, Anders (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 2,862,000.00 Danish Kroner

Project

Fondsstøtte til apparaturindkøb til projekt om reduktion af drivhusgasemission fra lossepladser
Fondsstøtte fra Brd. Hartmanns Fond til apparaturindkøb til projekt om reduktion af drivhusgasemission fra lossepladser (medfinansiering til BIOCOVER)

Department of Environmental Engineering
Period: 01/11/2005 → 31/10/2008
Number of participants: 2
Acronym: Biocover medfinansiering
Project participant:
Kjeldsen, Peter (Intern)

Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Project


Department of Environmental Engineering
Period: 25/10/2005 → 30/09/2008
Number of participants: 2
Acronym: 608
Project ID: 30425
Project participant:
Press-Kristensen, Kåre (Intern)

Project Manager, organisational:
Tjell, Jens Christian (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Undersøgelse af planters oprensningspotentiale af tungmetal- og olieforurenet jord påforsøgsstation hos KMC. Fytoremediering.

Department of Environmental Engineering

KMC
Period: 24/10/2005 → 31/05/2006
Number of participants: 2
Acronym: 580
Project ID: 30426
Project participant:
Press-Kristensen, Kåre (Intern)

Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 152,232.00 Danish Kroner

Project

Lærebog "Air Pollution - the European Perspective"

Department of Environmental Engineering
Period: 18/10/2005 → 31/10/2006
Number of participants: 1
Acronym: Lærebog Air Pollution
Project ID: 30457
Project Manager, organisational:
Tjell, Jens Christian (Intern)

Financing sources
Source: Gaver, Private danske Fonde
Name of research programme: Ukendt
Amount: 75,000.00 Danish Kroner

Project

Pilot scale experiments at Rugårdsvej, Odense, for evaluation of anaerobic dechlorination as a remedy.
Pilot scale experiment at Rugårdsvej, Odense, for evaluation of anaerobic dechlorination as a remedy. Two experiments with different injection strategies have been carried out during 2005-2006 in the upper claye till. A pilot scale experiment with recirculation was executed the underlying sandy aquifer. See project homepage for details (in Danish).

Department of Environmental Engineering
COWI A/S
GeoSyntec
Hedeselskabet
Number of participants: 1
Acronym: Fase 3, Fyns Amt
Project ID: 30419
Project Manager, organisational:
Bjerg, Poul Legstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 255,000.00 Danish Kroner

Project
Problem-Oriented Project Based Learning in Environmental Management & Technology. Contract No: MY/ASIA-LINK/002 (102-652)
Problem-Oriented Project Based Learning in Environmental Management & Technology.
Department of Environmental Engineering
Period: 01/10/2005 → 30/09/2007
Number of participants: 1
Acronym: MY/ASIA-LINK/002
Project ID: 30497
Project Manager, organisational:
Thygesen, Niels (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 245,200.00 Danish Kroner

Towards Rational Design of Redox-Stratified Biofilms: A Novel Approach for Developing Robust Biotechnologies for Nutrient Removal from Wastewaters
Department of Environmental Engineering
Period: 01/10/2005 → 01/07/2009
Number of participants: 6
Phd Student:
Lackner, Susanne (Intern)
Supervisor:
Henze, Mogens (Intern)
Main Supervisor:
Smets, Barth F. (Intern)
Examiner:
Arvin, Erik (Intern)
Casey, Eoin (Ekstern)
Nogueira, Regina (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

CHIAT - Chemical Hazard Identification and Assessment Tool
Chemical Hazard Identification and Assessment Tool
Department of Environmental Engineering
Period: 28/09/2005 → 01/03/2006
Number of participants: 2
Acronym: 596
Project ID: 30417
Project participant:
Eriksson, Eva (Intern)
Project Manager, organisational:
Ledin, Anna (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Ukendt
Amount: 66,569.00 Danish Kroner
Project

Apparaturindkøb: Photoacustic Field Gas Monitor
Apparaturindkøb: Photoacustic Field Gas Monitor
Department of Environmental Engineering
Period: 20/09/2005 → 01/05/2006
Number of participants: 1
Acronym: Biocover medfinansiering
Project ID: 30418
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financial sources
Source: Gaver, Private danske Fonde
Name of research programme: Ukendt
Amount: 75,000.00 Danish Kroner
Project

Systematic leaching data for waste incineration bottom ashes
Formål er på systematisk vis at frembringe et skalerbart datasæt for udvaskningen af udvalgte slagter

Department of Environmental Engineering
Number of participants: 2
Acronym: BA Leaching
Project ID: 30416
Project participant:
Hyks, Jiri (Intern)
Project Manager, organisational:
Astrup, Thomas Fruergaard (Intern)

Financial sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 168,000.00 Danish Kroner
Project

Nanotechnology, Innovation and the Precautionary Principle

Department of Environmental Engineering
Period: 01/09/2005 → 01/04/2009
Number of participants: 4
Phd Student:
Hansen, Steffen Foss (Intern)
Main Supervisor:
Baun, Anders (Intern)
Examiner:
Møller Christensen, Frans (Ekstern)
Owen, Richard (Ekstern)

Financial sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Stabilitet af salt-ferskvandsgrænsen i opsprækkede kalkbjergarter

Department of Environmental Engineering
Number of participants: 3
Phd Student:
Bonnesen, Ellen Prip (Intern)
Supervisor:
Larsen, Flemming (Intern)
Main Supervisor:
Jakobsen, Rasmus (Intern)
Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnnet stipendie
Project: PhD

Beslutningsstøtteværktøj vedrørende indsamling og behandling af kildesorteret dagrenovation
Department of Environmental Engineering
Period: 06/08/2005 → 01/12/2005
Number of participants: 1
Acronym: NM-model
Project ID: 30408
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 220,000.00 Danish Kroner
Project
BIOCOVER, Contribution from Miljøstyrelsen for EU Contract LIFE05 ENV/DK/000141

Department of Environmental Engineering
Period: 01/08/2005 → 31/12/2005
Number of participants: 2
Acronym: 606
Project ID: 30424
Project participant:
Fredenslund, Anders Michael (Intern)
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 200,457.00 Danish Kroner
Project
BIOCOVER, "Reduction of Greenhouse Gas Emission from European Landfills by use of Engineered Biocovers".
Landfills containing organic wastes produce biogas, and are significant sources of methane which contributes to climate changes. Some landfills are not or cannot be utilized for landfill gas. In these cases the gas is flared with risk of producing toxic combustion products, or is just escaping the landfill to the atmosphere. Experiments have documented that a very high methane oxidation rate can be obtained in bio-covers, high enough to significant reduce the methane emission from the landfill. Bio-covers may also be a very cost-effective supplementary method at landfills with landfill gas utilization, since the efficiency of the gas extraction system often is in the range of 50-60 %. However, the documentation of the efficiency of biocovers has so far not been carried out in full scale BIOCOVER is a LIFE III Environment project with the full title "Reduction of Greenhouse Gas Emissions from Landfills by use of Engineered Bio-covers". The aim of the project is to develop a methodology for reducing methane emission from covered landfills based on microbial methane oxidation in established passively vented biofilter areas, so-called bio-windows. The project will demonstrate the methodology in full scale on a landfill in Denmark, Fakse landfill, located in Southeastern Zealand.

Department of Environmental Engineering
Fasan I/S
Danish Ministry of the Environment
RenoSam
COWI A/S
Period: 01/08/2005 → 31/10/2008
Number of participants: 6
Acronym: Biocover
Project ID: 30420
Project participant:
Kjeldsen, Peter (Intern)
Fredenslund, Anders Michael (Intern)
Søndergaard, Gitte Lemming (Intern)
Scheutz, Charlotte (Intern)

Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 224,747.00 Danish Kroner

Project

TB2 Anvendelse af RGA i beton : indledende undersøgelser

Section for Construction Materials

Department of Civil Engineering

Department of Environmental Engineering

Period: 01/08/2005 → 31/03/2006
Number of participants: 4
Project ID: 25699
Project participant:
Kjeldsen, Ane Mette (Intern)
Christensen, Thomas Højlund (Intern)
Astrup, Thomas Fruegaard (Intern)

Project Manager, organisational:
Geiker, Mette Rica (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 600,000.00 Danish Kroner

Project

Analyseprogram for fjernelse af hormonforstyrrende kemikalier i biologisk renset spildevand

Department of Environmental Engineering

Hedeselskabet

Scan Research A/S

Hørsholm kommune

Period: 01/07/2005 → 31/05/2006
Number of participants: 2
Acronym: APOP-LIFE 03
Project ID: 30404
Project participant:
Andersen, Henrik Rasmus (Intern)

Project Manager, organisational:
Baun, Anders (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 385,000.00 Danish Kroner

Project
Efficiency of PFA as a desinfectant for wastewater from a treatment plant

Department of Environmental Engineering
Period: 27/06/2005 → 01/04/2006
Number of participants: 1
Acronym: 590
Project ID: 30403
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 283,500.00 Danish Kroner

Vandrensning med membraner

Department of Environmental Engineering
Period: 27/06/2005 → 01/06/2006
Number of participants: 1
Acronym: 587
Project ID: 30400
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 85,500.00 Danish Kroner

Miljøvurdering af affaldsbehandling med EASEWASTE modellen

Department of Environmental Engineering
Period: 21/06/2005 → 31/12/2006
Number of participants: 2
Acronym: 588
Project ID: 30398
Project participant:
Merrild, Hanna Kristina (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 200,000.00 Danish Kroner

Miljømæssig vurdering af træaffald i DK

Department of Environmental Engineering
Period: 01/06/2005 → 31/10/2005
Number of participants: 2
Acronym: 591
Project ID: 30399
Project participant:
Merrild, Hanna Kristina (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
The hydrology of the Sian Kaan biosphere reserve, Quintana Roo, Mexico

The Sian Ka’an Biosphere Reserve (SBKR) is located on the Caribbean Coast of the Yucatan Peninsula, in the Mexican state of Quintana Roo. This coastal wetland, about 5280 km² in size, is primarily fed by subsurface flow through the fissured limestone of the Yucatan plain. The reserve is home to a wide variety of wildlife including puma and jaguar and it hosts dozens of colonial waterbird species. SBKR encompasses different types of ecosystems, including freshwater and saltwater marshes, tropical rainforests, coastal dunes mangroves and coral reefs. Pressure on the reserve has been increasing over the years due to accelerated tourism development in the region, increased domestic water demand, contamination with agricultural fertilizers and pesticides as well as infrastructure projects, illegal hunting activities and extensive fishing. This situation calls for an integrated approach towards the management of SBKR. One of the prerequisites of integrated management is good quantitative understanding of the system’s water balance, preferably based on a numerical flow model of the region. The model should take into account the overland flow in the wetland as well as subsurface flow in the Karst aquifer. The most critical issue in this context is the identification of the recharge area where the groundwater flows into the reserve originate. Protection of this area from agricultural pollutants must be prioritized. To identify the main subsurface flow pathways and Karst conduits, and to delineate the recharge area, a high-resolution airborne geophysical survey will be employed. Target variables include the electric conductivity of the subsurface (airborne EM), its magnetic susceptibility (airborne magnetics), gamma emission intensity, brightness temperature (infrared sensing) and dielectric permittivity (microwave).

Department of Environmental Engineering

Geological Survey of Austria

Amigos de Sian Ka´an
Period: 01/05/2005 → 01/05/2006
Number of participants: 1
Acronym: 567
Project Manager, organisational:
Bauer-Gottwein, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Miljøvurdering af genanvendelse og slutdisponering af spildevandsslam


Department of Environmental Engineering

Hedeselskabet
Period: 07/04/2005 → 30/08/2005
Number of participants: 5
Acronym: 558
Project ID: 30392
Project participant:
Hansen, Trine Lund (Intern)
Baun, Anders (Intern)
Kirkeby, Janus Søgaard (Intern)
Gabriel, Søren (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 187,000.00 Danish Kroner

Department of Environmental Engineering
Københavns Energi A/S
Period: 01/04/2005 → 31/03/2006
Number of participants: 2
Acronym: A2 Grovscenarier
Project ID: 30395
Project participant:
Eilersen, Ann Marie (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 553,500.00 Danish Kroner

EMG. Inter-laboratory testing for Enhancement of Microbial Growth.
Inter-laboratory testing regarding the assessment of the microbial growth concerning construction products in contact with drinking water

Department of Environmental Engineering
Kiwa Water Research
DVGW-Technologiezentrum Wasser
Centre de Recherche D'Expertise et de Contrôle des Eaux de Paris
Thames Water Utilities Ltd
Period: 01/04/2005 → 31/12/2005
Number of participants: 2
Acronym: EMG
Project ID: 30397
Project participant:
Corfitzen, Charlotte B. (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 185,850.00 Danish Kroner

Migration of organic compounds from plastic pipes into drinking water.

Department of Environmental Engineering
Technical University of Denmark
Period: 01/04/2005 → 01/08/2008
Number of participants: 3
Acronym: 547
Project ID: 30374
Project participant:
Mosbæk, Hans (Intern)
Denberg, Martin (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Ukendt
Amount: 1,800,000.00 Danish Kroner

Project
Udvikling af innovativ proces for udnyttelse af biomasse til produktion af brint og biogas

Department of Environmental Engineering
Period: 21/03/2005 → 31/01/2006
Number of participants: 1
Acronym: 561
Project ID: 30394
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Fonde
Name of research programme: Sam.arb.aftaler, Private danske - Fonde
Amount: 750,000.00 Danish Kroner

Project
Development of microbially mediated remediation technologies and remediation of low permeable settings (AND)
Development of microbially mediated remediation technologies and remediation of low permeable settings. See project homepage for further details (in Danish)

Department of Environmental Engineering
Period: 01/03/2005 → 31/12/2006
Number of participants: 6
Acronym: Kbh. Amt, del B, Anaerob dechlorering
Project ID: 30383
Project participant:
Broholm, Mette Martina (Intern)
Christensen, Stine Brok (Intern)
Hansen, Maria Heisterberg (Intern)
Scheutz, Charlotte (Intern)
Christiansen, Camilla (Intern)
Project Manager, organisational:
Bjerg, Poul Logstrup (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 2,200,000.00 Danish Kroner

Project
Process imbalance in biogas plants and strategies for prevention and reestablishment of process stability. EFP05

Department of Environmental Engineering
Period: 01/03/2005 → 01/05/2008
Number of participants: 1
Acronym: EFP05-Biogas-ustabilitet
Project ID: 30384
Project Manager, organisational:
Angelidaki, Irini (Intern)
Risk assessment of point sources (RAP)

Chlorinated solvents originating from industrial facilities are a common pollutant in the environment, and can be a major threat to the groundwater quality. There is a need for qualified knowledge-based methods for risk assessment at such sites, in order to focus investigation and remediation efforts. The flux of contaminants from the point sources to groundwater aquifers and vapor fluxes to indoor climates are of particular interest when determining contaminant risk. Since many sources of chlorinated solvents are positioned in the unsaturated zone, a better understanding of the processes controlling the pollutant flux across the capillary fringe such as diffusion and advection will enhance the quality of a risk assessment. The project covers 3 areas: 1. Estimation of fluxes of chlorinated solvents in groundwater from point sources 2. Understanding of governing processes controlling the fate of chlorinated solvents in the unsaturated zone, including the mass transport from the unsaturated zone across the capillary fringe to the groundwater 3. Risk assessment and prioritization of point sources at regional scale. The project covers laboratory experiments, field experiments, field observations and solute transport modeling (at local and regional scale).

Department of Environmental Engineering
Københavns Amt
Period: 01/03/2005 → 31/12/2006
Number of participants: 9
Acronym: RAP
Project ID: 30382
Project participant:
Skov, Bent Henning (Intern)
Henriksen, Karina Bornholt (Intern)
Trolldborg, Mads (Intern)
Kjeldsen, Peter (Intern)
Binning, Philip John (Intern)
Sørensen, Jens Schaarup (Intern)
Kofoed, Julie Laurberg Lund (Intern)
Tuxen, Nina (Intern)
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

CONTROL-AD4H2. Control of Anaerobic Digestion Processes for Optimisation of Hydrogen Production

Hydrogen can be biological produced from organic wastes by several methods among which anaerobic fermentation is a very attractive one. However, the main obstacles in bio-hydrogen application as industrial process are the low yields and non-optimized process. This project focuses on these points studying the following main objectives: 1. Identify important parameters influencing metabolic pathways for optimal hydrogen production 2. Compare the different modelling approaches available in the literature for anaerobic digestion processes and include the hydrogen pathways. 3. Investigate process configurations for maximising energy output of combined biohydrogen (as first priority) and biogas (as second priority) in a combined treatment process. 4. Develop appropriate control laws to optimise hydrogen and biogas production.

Department of Environmental Engineering
Period: 01/02/2005 → 31/01/2006
Number of participants: 2
Acronym: CONTROL-AD4H2
Project ID: 30380
Project participant:
Steyer, Jean-Philippe (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)
Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 973,720.00 Danish Kroner

Defining Quality Indicators in Waste Management
Department of Environmental Engineering
Period: 01/02/2005 → 01/07/2009
Number of participants: 5
Phd Student: Merrild, Hanna Kristina (Intern)
Main Supervisor: Christensen, Thomas Højlund (Intern)
Examiner: Scheutz, Charlotte (Intern)
Hansen, Jens Aage (Ekstern)
Salhofer, Stefan (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Optimisation of Biohydrogen Production by In-Situ Hydrogen Extraction
Department of Environmental Engineering
Period: 01/02/2005 → 31/12/2005
Number of participants: 3
Phd Student: Siriwongrungson, Vilailuck (Ekstern)
Supervisor: Zeng, Raymond Jianxiong (Intern)
Main Supervisor: Angelidaki, Irini (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Friplads
Project: PhD

Treatment Trains for the Remediation of Aquifers Polluted MTBE and other Xenobiotic Compounds
Department of Environmental Engineering
Period: 01/02/2005 → 01/09/2008
Number of participants: 7
Phd Student: Tsitonaki, Aikaterini (Intern)
Supervisor: Mosbæk, Hans (Intern)
Smets, Barth F. (Intern)
Main Supervisor: Bjerg, Poul Løgstrup (Intern)
Examiner: Broholm, Mette Martina (Intern)
Aamand, Jens (Ekstern)
Barker, James F. (Ekstern)

Financing sources
Source: Internal funding (public)
High temperature slagging gasifier for waste.
The project concerns modification and testing of an existing slagging gasifier developed by TK Energi AS in order to verify the mechanical principle and the quality of the produced slag. Furthermore the project investigates the feasibility of the high temperature slagging gasification plant for waste.

Department of Environmental Engineering

TK Energi A/S
Period: 30/01/2005 → 31/12/2006
Number of participants: 1
Acronym: 559
Project ID: 30393
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 500,000.00 Danish Kroner
Project

Ring-testing and reproduction test.
Ring-testing of the copepod development and reproduction test with the harpacticoid copepod NITOCRA SPINIPES and the calanoid copepod ACARTIA TONSA, respectively.

Department of Environmental Engineering

Stockholm University
Period: 25/01/2005 → 31/12/2005
Number of participants: 1
Acronym: 570
Project ID: 30410
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 73,500.00 Danish Kroner
Project

MERTRAN. Importance of mobile genetic elements and conjugal gene transfer for subsurface microbial community adaptation to biotransformation of metals.

Department of Environmental Engineering

University of Copenhagen
Period: 14/01/2005 → 14/01/2007
Number of participants: 1
Acronym: MERTRAN
Project ID: 30450
Project Manager, organisational:
Smets, Barth F. (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 917,000.00 Danish Kroner
Project
**Water for Billions. Start-programmet.**

Department of Environmental Engineering  
Period: 05/01/2005 → 17/06/2005  
Number of participants: 1  
Acronym: 564  
Project ID: 30375  
Project Manager, organisational:  
Mikkelsen, Peter Steen (Intern)

**Financing sources**  
Source: Forskningsrådene - STVF  
Name of research programme: Forskningsrådene - STVF  
Amount: 98,400.00 Danish Kroner  
Project

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**Biologisk nedbrydning af miljøfremmede stoffer i renseanlæg.**

Department of Environmental Engineering  
Period: 01/01/2005 → 31/12/2008  
Number of participants: 2  
Acronym: Lynetten biologisk nedbrydning  
Project ID: 30386  
Project participant:  
Press-Kristensen, Kåre (Intern)  
Project Manager, organisational:  
Henze, Mogens (Intern)

**Financing sources**  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 405,000.00 Danish Kroner  
Project

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**Copenhagens water resources and investigation of possible future water supplies**

Formålet er både at analysere en række væsentlige vandresourceforhold samt at undersøge/udvikle en række teknologier og redskaber til brug for KE’s fremtidige evne til at levere vand i tilstrækkelige mængder og i den ønskede kvalitet. Vigtige forudsætninger for de forhold der skal samarbejdes om er at:  
• Udnyttelsen af ressourcen skal være bæredygtig  
• Klimaefekter vil kun indgå såfremt de vurderes at have effekt indenfor de næste 10 år  
Da arbejdet har langsigtet karakter baseres det ikke på at opfylde nuværende lovregler eller vandkvalitetskriterier. Gennemførelse af en del af samarbejdets forslag eller anbefalinger vil derfor i nogen grad afhænge af den fremtidige udvikling indenfor miljøforvaltningen i Danmark. Det er samarbejdets formål løbende at sikre at KE frem til 2010 har den til enhver tid fornødne viden til at kunne tage de rigtige beslutninger baseret på den bedst tilgængelige viden og den gennem projektet opbyggede erfaring.

Department of Environmental Engineering  
Københavns Energi A/S  
Period: 01/01/2005 → 01/01/2006  
Number of participants: 6  
Acronym: 531  
Project participant:  
Henze, Mogens (Intern)  
Albrechtsen, Hans-Jørgen (Intern)  
Ledin, Anna (Intern)  
Mikkelsen, Peter Steen (Intern)  
Arvin, Erik (Intern)  
Project Manager, organisational:  
Binning, Philip John (Intern)

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**Environmental Risk Assessment of Antidepressive Pharmaceuticals**
Department of Environmental Engineering
Danmarks Farmaceutiske Højskole
Period: 01/01/2005 → 20/03/2006
Number of participants: 2
Acronym: Lykkepiller
Project ID: 30371
Project participant:
Hedberg, Camilla Berg (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 65,000.00 Danish Kroner

Pesticides nedbrydning i umættet zone og i grundvandszonen
Department of Environmental Engineering
Period: 01/01/2005 → 26/05/2010
Number of participants: 5
Phd Student:
Janniche, Gry Sander (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Bjerg, Poul Løgstrup (Intern)
Aamand, Jens (Ekstern)
Elsner, Martin (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD

Aktivt kuls kapacitet til fjernelse af pesticidrester fra renset overfladevand fra Haraldsted sø.
Department of Environmental Engineering
Period: 20/12/2004 → 01/09/2005
Number of participants: 1
Acronym: 586
Project ID: 30378
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 282,800.00 Danish Kroner

Dynamic Modelling of Xenobiotik Organic Compounds in the Integrated Urban Wastewater System
Department of Environmental Engineering
Period: 15/12/2004 → 01/04/2009
Number of participants: 6
Phd Student:
Lindblom, Erik Ulfson (Intern)
Supervisor:
Henze, Mogens (Intern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)
Examiner:
Trapp, Stefan (Intern)
Bertrand-Krajewski, Jean-Luc (Ekstern)
Rauch, Wolfgang (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD

Projektets formål er at indsamle og systematisere viden om kortlægning af nuværende ressourcer og forbrug samt eksisterende renseteknologier inden for vand- og spildevand til brug i det videre projektforløb, herunder identifikation af scenarier.

Department of Environmental Engineering
Københavns Energi A/S
Period: 01/12/2004 → 31/05/2005
Number of participants: 3
Acronym: A1: Kortlægning
Project ID: 30381
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Hauger, Mikkel Boye (Intern)
Binning, Philip John (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 445,500.00 Danish Kroner
Project

Forundersøgelser i forbindelse med projekt til belysning af stimuleret in-situ reduktiv deklorering som afværgemetode overfor forurening med klorerede opløsningsmidler i moræneler på Rugårdsvej 234, O

Department of Environmental Engineering
COWI A/S
Period: 01/12/2004 → 30/06/2006
Number of participants: 4
Acronym: 548
Project ID: 30369
Project participant:
Broholm, Mette Martina (Intern)
Scheutz, Charlotte (Intern)
Begtrup, Eline (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 702,500.00 Danish Kroner
Project

Vurdering af nedbrydning og udvaskning af oliestoffer fra restforurening ved villaolietanke.

Department of Environmental Engineering
Number of participants: 1
Acronym: 537
Project ID: 30360
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 247,500.00 Danish Kroner

Project

Anvendeligheden af avancerede oxidationsprocesser til desinfektion af vand.
Formål med projektet er at udvikle et beslutningsstyrkende værktøj, til brug ved beslutningsprocesser omkring desinfektion af vand i private og offentlige virksomheder. Samtidig forventes projektet at kunne bidrage til en teknologioverførsel inden for området.

Department of Environmental Engineering
Environmental Chemistry
Rambøll Danmark A/S
Period: 01/11/2004 → 21/12/2005
Number of participants: 4
Acronym: AOP-Desinfektion
Project ID: 30373
Project participant:
Ledin, Anna (Intern)
Arvin, Erik (Intern)
Eriksson, Eva (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 200,000.00 Danish Kroner

Project

Indsamling og systematisering af den eksisterende viden om gaspotentialen i forskellige typer biomasse og afgrøder.

Department of Environmental Engineering
Period: 01/11/2004 → 30/04/2005
Number of participants: 2
Acronym: 563
Project ID: 30361
Project participant:
Hejnfelt, Anette (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 48,750.00 Danish Kroner

Project

Udarbejdelse af LIFE-proposal: "Reduction of Greenhouse Gas Emission from European Landfills by use of Engineered Biocovers”.

Department of Environmental Engineering
Period: 01/11/2004 → 15/12/2004
Number of participants: 1
Acronym: 543  
Project ID: 30366  
Project Manager, organisational:  
Kjeldsen, Peter (Intern)  

Financing sources  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 149,200.00 Danish Kroner  

Øresundsuniversitet sommer 2005. Kursus: Avanceret spildevandsrensning i storbyer  
Department of Environmental Engineering  
Period: 25/10/2004 → 01/10/2005  
Number of participants: 1  
Acronym: 584  
Project ID: 30385  
Project Manager, organisational:  
Henze, Mogens (Intern)  

Financing sources  
Source: Sam.arb. aftaler - Udenlandske offentlige og private  
Name of research programme: Sam.arb. aftaler - Udenlandske offentlige og private  
Amount: 60,000.00 Danish Kroner  

Miljøvurdering af systemer til håndtering af husholdningsaffald i Herning Kommune.  
Der opstilles systematiske databaser om affaldssystemets funktion (data fra Herning bruges) med henblik på brug i et dansk miljøvurderingsværktøj og - dette værktøj bruges til en konkret vurdering af de ressource- og miljømæssige forhold omkring affaldshåndteringen i Herning.  

Department of Environmental Engineering  
Period: 21/10/2004 → 31/12/2006  
Number of participants: 2  
Acronym: 540  
Project ID: 30357  
Project participant:  
Hansen, Trine Lund (Intern)  
Project Manager, organisational:  
Christensen, Thomas Højlund (Intern)  

Financing sources  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 785,000.00 Danish Kroner  

Use of membranes for extraction of H2 produced by fermentation  
In order to optimize hydrogen production by fermentation process it is imptant to develop technologies for effective reduction of hydrogen in the fermentation liquid. Selective membranes for extraction and removal of hydrogen during fermentation is a promising way for improving process effectivity and increasing hydrogen productivity from wastes.  

Department of Environmental Engineering  
Period: 15/10/2004 → 31/12/2007  
Number of participants: 1  
Acronym: 398  
Project Manager, organisational:  
Angelidaki, Irini (Intern)  

Financing sources  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 0.00 Danish Kroner
**Combined Biohydrogen Biomethane Production from Waste**

Department of Environmental Engineering  
Period: 01/10/2004 → 04/07/2008  
Number of participants: 7  
Phd Student: Liu, Dawei (Intern)  
Supervisor: Min, Booki (Intern)  
Zeng, Raymond Jianxiong (Intern)  
Main Supervisor: Angelidaki, Irini (Intern)  
Examiner: Schmidt, Jens Ejbye (Intern)  
Niel, Eduard W. J. van (Ekstern)  
Svensson, Bo Håkan (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Privatist  
Project: PhD

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**Hydrogen from biomass. START-programme.**  
A grant to organize and formulate an application for a "Specific Targeted Research Project (STRP)" of the 6. Framework Programme.

Department of Environmental Engineering  
Period: 01/10/2004 → 01/05/2005  
Number of participants: 1  
Acronym: BioHydro  
Project ID: 30356  
Project Manager, organisational: Angelidaki, Irini (Intern)

**Financing sources**  
Source: Forskningsrådene - STVF  
Name of research programme: Forskningsrådene - STVF  
Amount: 100,000.00 Danish Kroner  
Project

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**Kvantificering af miljøeffekter fra RGA.**  
Projektet forventes at beskæftige sig med stabiliseret, deponeret RGA og en til to genanvendelsesteknologier. De faktiske teknologier udvælges af styringsgruppen, idet relevans og tilgængelighed af relevante prøveemner er afgørende. Selve værktøjet, dvs. en sammenhængende procedure for sammenstilling af data, laboratorie-testning samt modellering er projektets hovedformål, men værdien heraf øges ved at basere sig på relevante RGA-teknologier.

Department of Environmental Engineering  
Energy Research Centre of the Netherlands  
Period: 01/10/2004 → 30/09/2007  
Number of participants: 3  
Acronym: 432  
Project ID: 30333  
Project Manager, organisational: Astrup, Thomas Fruergaard (Intern)  
Sloot, Hans van der (Ekstern)

**Financing sources**  
Source: Sam.arb.aftaler - Amter og kommuner
**Prediction of Leaching from Waste Incineration Residues**

Department of Environmental Engineering  
Period: 01/10/2004 → 01/09/2008  
Number of participants: 6  
Phd Student:  
Hyks, Jiri (Intern)  
Supervisor:  
Astrup, Thomas Fruergaard (Intern)  
Main Supervisor:  
Christensen, Thomas Højlund (Intern)  
Examiner:  
Jakobsen, Rasmus (Intern)  
Jensen, Dorthe Lærke (Intern)  
Johnson, Carola Annette (Ekstern)

**Financing sources**  
Source: Internal funding (public)
indicator chemicals from below ground into above-ground vegetation as a cheap and rapid monitoring tool for subsurface contamination. Diagnosis of the biological status and evolution models for polluted environments will be achieved through [i] the design and utilization of DNA and specifically DNA-array technology for examining the catabolic potential of any given particulate sample and [ii] the identification of protein biomarkers as descriptors of soil and groundwater conditions and biological attenuation. The progress in microbial community functional genomics and proteomics will be employed to gain a mechanistic understanding of microbial responses to chemical insults, plant/microbe interactions and microbial community adaptations that determine microbial-driven soil and groundwater attenuation processes. Such mechanistic understanding will add a considerable predictive power to the genomic and proteomic approaches. Determining the links between environmental factors and expression of degradation abilities will be crucial for strategies aiming at an optimal expression of the catalytic power of the indigenous microbial community. The robustness of diagnostic instruments for future normative applications will be validated in microcosms and used for assessment of contaminated sites under study.

Department of Environmental Engineering
De Montfort University
Centro Nacional de Biotecnología
Helmholtz Centre for Environmental Research
GBF
Ecole Polytechnique Federale de Lausanne (EPFL)
IMIC
KAP
Bionostra S.L.
Number of participants: 1
Acronym: Biotool
Project ID: 30352
Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 1,300,000.00 Danish Kroner

Reduction of Methane Emissions from Landfills by Use of Engineered Biocovers

Department of Environmental Engineering
Period: 01/09/2004 → 25/08/2010
Number of participants: 6
PhD Student:
Pedersen, Gitte Bukh (Intern)
Supervisor:
Scheutz, Charlotte (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)
Examiner:
Christensen, Thomas Højlund (Intern)
Gebert, Julia (Ekstern)
Rintala, Jukka Antero (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Disposal of refrigerators - Freezers in the US: State of the practice.

Department of Environmental Engineering
Udarbejdelse af statusnotat vedrørende forbrændingsslager.
Projektet skal skabe en udtømmende, men kort oversigt over væsentlige projekter vedr. slagger fra affaldsforbrænding, beskrive det nuværende vidensniveau mht. håndtering af forbrændingsslager, og fremhæve centrale udviklingsområder fremover. Afrapportering består af en sammenskrivning af disse forhold i et engelsksproget statusnotat.

Department of Environmental Engineering
Period: 30/08/2004 → 31/12/2004
Number of participants: 1
Acronym: 538
Project ID: 30348
Project Manager, organisational: Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 68,750.00 Danish Kroner

The main objective is to investigate and suggest methods for increasing the biogas yield in manure based biogas plants with focus on the following 3 areas: 1) to investigate different reactor configurations for biogas plants for achieving more effective biogas production and more stable operation. 2) to investigate operational procedures, aiming to selectively retain/return degradable material in the reactor. 3) to investigate methods for degradation of undegraded material, by returning without/with aftertreatment to the main reactor.

Department of Environmental Engineering
Burmeister & Wain Scandinavian Contractor A/S
Period: 01/08/2004 → 31/12/2007
Number of participants: 2
Acronym: EFP-04
Project ID: 30338
Project participant: Kaparaju, Prasad Laxmi-Narasimha (Intern)
Project Manager, organisational: Angelidaki, Irini (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Ukendt
Amount: 2,000,000.00 Danish Kroner

Reduction of hazardous compounds found in the sewage sludge by bioprocessing - DETOX.START-programme.

Department of Environmental Engineering
Period: 01/08/2004 → 01/02/2005
Number of participants: 1
Acronym: DETOX.START
Ringe Tar and Asfalt Plant. Transport and degradation of coal-tar compounds. Risk assessment.
Evaluate natural attenuation of coal-tar compounds from contamination at the site based on research conducted by E&R DTU at the site + litterature review. Risk assessment for nearby watersupply based on above and modelling performed by WaterTech.

Department of Environmental Engineering
WaterTech
Fyns Amt
Period: 01/08/2004 → 30/11/2004
Number of participants: 2
Acronym: RTA
Project participant:
Broholm, Mette Martina (Intern)
Bjerg, Poul Løgstrup (Intern)

Samtidig måling af lydhastighed og elektrisk ledningsevne af sedimenter som funktion af spændingstilstand og væskemætning.
Bevillingen er givet til anskaffelse af nyt apparatur, som monteres i eksisterende triaxialt trykapparat, således at målingerne udføres ved trykbetegelse svarende til reservoires tryk.

Department of Environmental Engineering
Department of Chemical and Biochemical Engineering
Period: 01/08/2004 → 01/06/2005
Number of participants: 3
Acronym: 441
Project ID: 30345
Project participant:
Olsen, Casper (Intern)
Stenby, Erling (Ekstern)

Water Resources Research in Vietnam - The mobilisation of arsenic and the relation to the dynamic interaction between groundwater and surface water in the Red River Plain.
The main research objective is to obtain a fundamental understanding of the processes controlling the groundwater arsenic content in the flood plain aquifers of the Red River Basin in Vietnam, through detailed hydrogeological and geochemical investigations at a field site near Hanoi. The ultimate object is to upscale this understanding to a regional scale and develop tools applicable for prediction of stream-aquifer interaction and arsenic contamination in regional flood plains.

Department of Environmental Engineering
Hanoi University of Mining and Geology
Northern Hydrogeological and Engineering Geological Division

De Nationale Geologiske Undersøgelser for Danmark og Grønland
Period: 01/08/2004 → 31/07/2007
Number of participants: 5
Acronym: ENRECA
Project ID: 30349
Project participant:
Lange, Erik Rønn (Intern)
Hansen, Ellen Zimmer (Intern)
Larsen, Flemming (Intern)
Binning, Philip John (Intern)
Project Manager, organisational:
Postma, Diederik Jan (Intern)

Financing sources
Source: Forskningsprojekter - Udenrigsministeriet (Danida)
Name of research programme: Ukendt
Amount: 1,421,000.00 Danish Kroner
Project

Belysning af konsekvenser/sammenhænge ved indtagelse/kontakt med forurenet drikkevand af varierende mikrobiologisk kvalitet.
Department of Environmental Engineering

Miljøstyrelsen
Number of participants: 5
Acronym: 440
Project ID: 30344
Project participant:
Boe-Hansen, Rasmus (Intern)
Andersen, Ulla Tolstrup (Intern)
Engelsborg, Caroline Christine (Intern)
Bagge, Linda (Ekstern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 333,014.00 Danish Kroner
Project

Fase 2B: Nikkelfrigivelse ved pyritoxidation.
Miljøstyrelsen ønsker undersøgt hvilke faktorer, der har betydning for nikkelovnelse til grundvandet i kalkmagasinerne i typeområdet ved Køge Bugt.
Department of Environmental Engineering
Period: 02/06/2004 → 31/12/2004
Number of participants: 3
Acronym: 439
Project ID: 30343
Project participant:
Jessen, Søren (Intern)
Kjøller, Claus (Intern)
Project Manager, organisational:
Larsen, Flemming (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energministeriet
Amount: 249,999.00 Danish Kroner

**AquaTerra. Integrated modelling of the river-sediment-soil groundwater system; advanced tools for the management of catchment areas and river basins in the context of global change.**
Department of Environmental Engineering
Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek
Wageningen IMARES
Université de Neuchâtel
BRGM
Consejo Superior de Investigaciones Científicas
Period: 01/06/2004 → 31/05/2009
Number of participants: 5
Acronym: AquaTerra
Project ID: 30340
Project participant:
Bjerg, Poul Løgstrup (Intern)
Lindberg, Ingrid Ellinor (Intern)
Nygaard, Bolette (Intern)
Refstrup, Mona (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**
Source: Forsk. EU - Rammeprogram
Name of research programme: Ukendt
Amount: 2,165,000.00 Danish Kroner

**Bio-hydrogen production by anaerobic fermentation of waste**
Department of Environmental Engineering
Period: 01/06/2004 → 31/05/2007
Number of participants: 3
Acronym: BioH2
Project ID: 30312
Project participant:
Zeng, Raymond Jianxiong (Intern)
Liu, Dawei (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)

**Financing sources**
Source: Forskningsrådene - STVF
Name of research programme: Ukendt
Amount: 2,400,000.00 Danish Kroner

**Improved development of QSAR model for algal toxicity**
Department of Environmental Engineering
Environmental Protection Agency
Period: 01/06/2004 → 31/12/2004
Number of participants: 3
Acronym: 437
Project ID: 30342
Project participant:
Materialer anvendt i boringer - betydning for vandkvaliteten. Første del: Mikrobiologisk vækst.
Formålet med projektet er at foretage en vurdering af materialer der anvendes til boringer og til boringsfiltrer med henblik på at afgøre, hvornår de beforder/giver anledning til mikrobiologisk vækst. Om mikroorganismer faktisk kan vokse på disse materialer afprøves af M&R DTU.

Department of Environmental Engineering
Dansk Toksikologi Center
Period: 01/06/2004 → 15/09/2004
Number of participants: 3
Acronym: 438
Project ID: 30341
Project participant:
Corfitzen, Charlotte B. (Intern)
Wessels, Stephen (Ekstern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Biologisk rensning af organiske stoffer i grundvand for PROM.
Department of Environmental Engineering
Period: 01/05/2004 → 31/08/2004
Number of participants: 1
Acronym: 435
Project ID: 30330
Project Manager, organisational:
Arvin, Erik (Intern)

Langsomfiltres effekt på drikkevands biostabilitet
En opsamling af erfaringer og gennemgang af den åbne internationale litteratur omkring praktiske erfaringer i forbindelse med biostabilisering af drikkevand ved langsom sandfiltrering.
Department of Environmental Engineering
Københavns Energi A/S
Period: 01/05/2004 → 15/07/2004
Number of participants: 2
Acronym: 426
Project ID: 30339
Project participant:
Bennedsen, Lars (Ekstern)
Udvikling af deponeringsanlægget AV-Miljø - Et dynamisk samarbejde mellem AV-Miljø og Miljø & Ressourcer DTU.
Formålet med projektet er:
- at undersøge gasemissionen fra AV-Miljø via måling af gassammensætning, gasemission og methanoxidation i afsluttede etaper, samt total gasemission fra AV-Miljø vha. storskala sporstofforsøg
- at generere overblik over nuværende perkolatkvalitet og udvaskningsbetingelser
- at etablere facilitet til storskala udvaskningstest med efterfølgende test af én affaldstype

Department of Environmental Engineering
AV Miljø
Period: 01/05/2004 → 31/12/2005
Number of participants: 5
Acronym: 433
Project participant:
Scheutz, Charlotte (Intern)
Kjeldsen, Peter (Intern)
Pedersen, Gitte Bukh (Intern)
Nedenskov, Jonas (Ekstern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 83,000.00 Danish Kroner
Project:

Development of a Flexible Bioprocess for Handling and Recycling Seasonal Industrial Wastewaters

Department of Environmental Engineering
Period: 15/04/2004 → 04/07/2008
Number of participants: 7
Phd Student:
Maya Altamira, Larisa (Intern)
Supervisor:
Baun, Anders (Intern)
Hauschild, Michael Zwicky (Intern)
Main Supervisor:
Schmidt, Jens Ejbye (Intern)
Examiner:
Eilersen, Ann Marie (Intern)
Alves, Maria M. dos Santos (Ekstern)
Petersen, Gert (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Privatist
Project: PhD

Arsenic removal in water works
After implementation of the new EU drinking water directive in Denmark, many water works can not comply with the 5 ug As/L limit for the water leaving the water works (10 ug As/L at the consumers tap). 16% of the water in the wells exceed the 5 ug As/L limit. However, a significant removal of arsenic takes place in the water works and therefore arsenic is only a problem in some of the water works among the 16%. The purpose of this project is to improve the basic knowledge of the
processes that determine the arsenic removal in water works treating groundwater. The arsenic removal is studied in the field and in laboratory systems on the basis of water samples and sand cores from sand filters. Data is analysed by PHREEQC and AQUASIM. Various modifications of existing water treatment plants are studied and the results are interpreted on the basis of the process understanding.

Department of Environmental Engineering
Number of participants: 4
Acronym: 402
Project participant:
Larsen, Flemming (Intern)
Jessen, Søren (Intern)
Mosbæk, Hans (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 360,912.00 Danish Kroner

Disinfection in swimming pools
There is increasing focus on the water quality in swimming pools because of biological and chemical health risks. At the same time, new types of swimming pools have developed, some with elevated temperatures (baby swimming) and some with more complicated hydraulics than traditional swimming pools (recreational water lands). There is a demand for reducing the concentration of chlorine and in particular harmful disinfection by-products and there is a demand for improved methods of water quality monitoring. The aim of this project is in the first place to summarize the state of the art and identify potential methods of improving the water quality, including monitoring of quality.

Department of Environmental Engineering
DHI Denmark
Danish Technological Institute
Scan Research A/S
Ejcan Aps.
Period: 01/04/2004 → 31/12/2005
Number of participants: 2
Acronym: 424
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

DTUs bidrag til koordinering og udredning.
Formålet er at sikre DTU en gennemgående rolle i koordineringen af samarbejdets projekter(Affald Danmark, RGA-samarbejde(ELSAM, AF, VF) - udføre, efter konkret aftale, mindre udrednings og sammenskrivningsopgaver

Department of Environmental Engineering
Period: 01/04/2004 → 31/03/2007
Number of participants: 3
Acronym: 429
Project ID: 30335
Project participant:
Astrup, Thomas Fruegaard (Intern)
Röttger, Ulla (Ekstern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
**Hvidbog om RGA-teknologier**

Projektet udarbejder en teknisk hvidbog over eksisterende teknologier, dvs. en mere miljøorienteret og data-specifik fremstilling end den eksisterende BAT-note. For hver teknologi sammenstilles en standardbeskrivelse på basis af foreliggende materiale. En særlig indsats gøres for at indsamle erfaringer fra de japanske termiske behandlinger.

**Department of Environmental Engineering**

**Afgod Danmark**

**Period:** 01/04/2004 → 31/12/2006  
**Number of participants:** 3  
**Acronym:** 430  
**Project ID:** 30334  
**Project participant:**  
Christensen, Thomas Højlund (Intern)  
Röttger, Ulla (Ekstern)

**Financing sources**

**Source:** Sam.arb.aftaler - Amter og kommuner  
**Name of research programme:** Sam.arb.aftaler - Amter og kommuner  
**Amount:** 674,000.00 Danish Kroner

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**Remediation of contaminated groundwater from a former industrial site by a fixed film reactor**

Contaminated groundwater from industrial sites may contain a complex mixture of compounds, including many organic chemicals. On-site remediation of the groundwater is often carried out by physical-chemical methods because their function may be more predictable. However, the cost of treatment can be high for example when the organic compounds adsorb poorly to activated carbon, which is the case for vinyl chloride. The idea behind this project is to remove general biodegradable organic matter, including those that adsorb poorly to activated carbon ahead of a subsequent sorption process. This is done with a fixed biofilm reactor where the oxygen input is done with a membrane system in order to avoid stripping of the volatile compounds to the atmosphere.

**Department of Environmental Engineering**

**Storstrøms County**

**NIRAS A/S**  
**Period:** 01/04/2004 → 31/12/2005  
**Number of participants:** 1  
**Acronym:** 425  
**Project Manager, organisational:**  
Arvin, Erik (Intern)

**Financing sources**

**Source:** Unknown  
**Name of research programme:** Ukendt  
**Amount:** 0.00 Danish Kroner

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**Vurderingsværktøj for RGA-disponering (LCA RGA).**

Characterizing stormwater runoff and developing advanced technical solutions for secondary treatment

The main objectives of the project are: 1) to characterize Danish urban storm-water, especially in terms of heavy metal, PAH, chloride and organic matter distribution 2) to study the chemical and physical processes involved during the storm-water treatment, and thus develop the most appropriate technical solution for the treatment prior to discharge.

Department of Environmental Engineering
University of Gothenburg
Period: 11/03/2004 → 10/03/2006
Number of participants: 4
Acronym: 395
Project ID: 30314
Project participant:
Eriksson, Eva (Intern)
Genc-Fuhrman, Hülya (Intern)
Mikkelsen, Peter Steen (Intern)
Ledin, Anna (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 1,600,800.00 Danish Kroner

Udvikling af organisk udvaskningstest
Department of Environmental Engineering
Period: 03/03/2004 → 31/12/2004
Number of participants: 1
Acronym: 421
Project ID: 30322
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 20,000.00 Danish Kroner

Biogas Forum Øresund. (INTERREG IIIA Øresundsregionen)
Formålet er at etablere et netværk bestående af universiteter, virksomheder, rådgivere og offentlige myndigheder for at fremmme funktionaliteten og forøge anvendelsen af biogas i regionen (Øresund) til gavn for samfundet og miljøet.

Department of Environmental Engineering
Lund University
Period: 01/03/2004 → 28/06/2006
Number of participants: 3
Acronym: 415
Project ID: 30321
Project participant:
Boe, Kanokwan (Intern)
Hejnfelt, Anette (Intern)
Angelidaki, Irini (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 1,216,715.00 Danish Kroner

Preproject: Strategies for pesticides from points sources at catchment scale
Forprojektet er et udredningsprojekt, og formålet er at give en nøjere beskrivelse af problemstillingerne og beskrive en række projekter, der kan højne vidensniveauet på området. Forprojektet er støttet af Miljøstyrelsens Teknologiudviklingspulje.

Department of Environmental Engineering
WaterTech A/S

Fyns Amt
Period: 01/03/2004 → 01/07/2004
Number of participants: 4
Acronym: 428
Project ID: 30336
Project participant:
Tuxen, Nina (Intern)
Elkjær, Lars (Ekstern)
Olesen, Ida Holm (Ekstern)
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 60,500.00 Danish Kroner

Risk assessment for uptake of organic chemicals into vegetables and fruits.
Formål med projektet er at validere og videreudvikle tidligere udviklede modelværktøj til et beslutningsstøtteværktøj, samt at udarbejde retningslinier for risikovurdering af forurenset jord, baseret på modelværktøjet.

Department of Environmental Engineering
DHI Denmark
Period: 01/03/2004 → 01/11/2004
Number of participants: 1
Acronym: 418
Project ID: 30320
Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 61,000.00 Danish Kroner

Innovationskonsortiet - Overvågning og begrænsning af mikrobiel vækst.
Department of Environmental Engineering
Aarhus Kommunale Værker
Aalborg University
Teknologisk Institut
Period: 01/02/2004 → 30/06/2007
Number of participants: 4
Acronym: BAKMAT
Project ID: 30329
Project participant:
Corfitzen, Charlotte B. (Intern)
Arvin, Erik (Intern)
Boe-Hansen, Rasmus (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Ukendt
Målesømøring af affaldsforbrændingsanlæg

Department of Environmental Engineering
Period: 01/02/2004 → 21/12/2007
Number of participants: 5
PhD Student:
Riber, Christian (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Bilitewski, Bernd (Ekstern)
Lundtorp, Kasper (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Thermodynamics of Transient and Steady-State Sub-Oxic Redox Processes Relevant to Groundwater Contamination

Department of Environmental Engineering
Period: 01/02/2004 → 18/06/2007
Number of participants: 6
PhD Student:
Heimann, Axel Colin (Intern)
Supervisor:
Blodau, Christian (Ekstern)
Main Supervisor:
Jakobsen, Rasmus (Intern)
Examiner:
Smets, Barth F. (Intern)
Sanford, Robert A. (Ekstern)
Thamdrup, Bo (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Development of new generation of ASM models (ASM3+)

Department of Environmental Engineering
Period: 01/01/2004 → 01/01/2005
Number of participants: 1
Acronym: 423
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Jernreduktion ved organisk stof i sedimenter, rater og mekanismer
Oasis-hydrophere-desert Interaction Influencing Overall Economical Development

Department of Environmental Engineering
Lund University
Period: 01/01/2004 → 31/12/2005
Number of participants: 2
Acronym: 589
Project ID: 30323
Project participant:
Pedersen, Annette Oelert (Intern)
Project Manager, organisational:
Rosbjerg, Dan (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 287,000.00 Danish Kroner

The importance of colloidal particles for heavy metal transport in urban stormwater runoff - multi function approaches to local disposal

Department of Environmental Engineering
University of Gothenburg
Chalmers University of Technology
Technische Universität Hamburg-Harburg
Period: 01/01/2004 → 31/12/2007
Number of participants: 2
Acronym: 394
Project participant:
Genc-Fuhrman, Hülya (Intern)
Project Manager, organisational:
Ledin, Anna (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Using IT&C through Web-based technologies to enhance the learning experience in higher education.
Heavy metals in residential waste and incineration bottom ashes
The project performs five full scale incineration tests (300 - 1200 tons) with residential waste of various origin in order to establish the heavy metal content of the waste. By controlling all emissions and determining their compositions the composition of the original waste can be found. In addition, the composition of individual material fractions in the waste are analyzed. The aim is to determine the contribution of residential waste and thereby indirectly the contribution by non-residential waste to the heavy metal burden of incinerator bottom ash as a basis for future improvements in source controls. The projects is funded by the National Danish EPA and the incinerator plants associated with Affald Danmark.
pulseksponeringer hovedsagelig i EU, USA og Canada.

Department of Environmental Engineering

Miljøstyrelsen
Period: 15/12/2003 → 31/03/2005
Number of participants: 2
Acronym: PestPulse
Project ID: 30303
Project participant:
slothuus, Tina (Intern)
Project Manager, organisational:
Baun, Anders (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 732,540.00 Danish Kroner

Local management of the arsenic contaminated drinking water in West Bengal
This project deals with the problem of arsenic contamination of the drinking water in West Bengal, India. Through participatory work and a broad approach to problem solutions we will introduce sustainable solutions to the problem in a number of villages. The project is managed by two Danish organisations, UBU and IGF, and E&R is doing research in the project by sending students to field work and quality assuring arsenic measurements.

Department of Environmental Engineering
Period: 01/12/2003 → 01/01/2006
Number of participants: 1
Acronym: 391
Project Manager, organisational:
Bregnhøj, Henrik (Intern)

Undersøgelse af BAMs skæbne i grundvand.

Department of Environmental Engineering
Rambøll Danmark A/S
Hedeselskabet
Period: 01/12/2003 → 31/12/2004
Number of participants: 4
Acronym: 414
Project ID: 30306
Project participant:
Clausen, Liselotte (Intern)
Janniche, Gry Sander (Intern)
Nygaard, Bolette (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 725,000.00 Danish Kroner

Validation of full life cycle test with the copepod “Acartia tonsa”
An OECD guideline for a life cycle test with the marine pelagic copepod Acartia tonsa is under development. One main purpose is testing of hormonal disrupters. A draft guideline is to verified in 2004. Prepare a new draft guideline on Acartia tonsa. Collect and compile comments on the revised draft and include where relevant (Jan 2004). Plan and co-ordinate (in co-operation with the Swedish partner) the validation ringtest (Feb-Marts 2004). Perform validation tests with one or two of the proposed reference compounds according to the revised draft (Feb-April 2004). Report the outcome of the validation to NordUtte and OECD (April/May 2004).
Department of Environmental Engineering
Stockholm University
EPA
Nordic Council of Ministers
Period: 01/12/2003 → 01/12/2005
Number of participants: 3
Acronym: 405
Project ID: 30309
Project participant:
Wollenberger, Leah (Intern)
Hedberg, Camilla Berg (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 80,000.00 Danish Kroner

DUO-Denmark exchange programme
Within the Research Network "Chemical Assessment of the Environment" a number of stipends for exchange of students and staff have been obtained. The two counterparts in this programme are The Chiang Mai University and the Prince of Songkla University in Thailand.

Department of Environmental Engineering
Chiang Mai University
Prince of Songkla University
Period: 01/11/2003 → 31/05/2004
Number of participants: 2
Acronym: 392
Project participant:
Mosbæk, Hans (Intern)
Project Manager, organisational:
Tjell, Jens Christian (Intern)

Removal of xenobiotic compounds in water works sand filters
Sand filters in conventional water works treating groundwater harbour an active and diverse flora of micro organisms that are able to remove a range of easily biodegradable organic compounds concomitantly with the removal of the usual
compounds methane, hydrogen sulphide, ammonia, iron, and manganese. The purpose of this project is to study the capacity of filters to remove gasoline compounds, BTEX, pesticides, phenols, and other biodegradable xenobiotic compounds. The study is conducted with filters that contain quartz sand and Filtralite (expanded clay) as filter materials. It has been observed that the gasoline compounds can be biodegraded effectively in the filters even in the low microgram per litre concentration range. The presences of iron, even in concentrations of 3 mg/L, did not have a significant inhibitory effect on the removal of gasoline compounds.

Department of Environmental Engineering
Period: 01/11/2003 → 31/12/2005
Number of participants: 6
Acronym: 411
Project participant:
Skov, Bent Henning (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Boe-Hansen, Rasmus (Intern)
Wolter, Uwe A. F. (Intern)
Kagstrup, Tanja (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 450,000.00 Danish Kroner

XENOMIC. Characterisation of microbial communities degrading xenobiotics. Contract nr.: MEIF-CT-2003-500956
Removal of xenobiotics under strict anaerobic conditions is now being proven and offers a great potential. At this date, only a little is known about the micro-organisms involved in such biodegradation. The aim of the project is to identify and characterize the microbial community degrading xenobiotics, such as Polycyclic Aromatic Hydrocarbons (PAHs), linear alkylbenzene sulfonate (LAS), nonylphenols and nonylphenols ethoxylate (NPE). For this, current molecular technologies are used to characterize the phylogeny of enriched cultures such as in situ hybridization, single strand chain polymorphism, cloning and sequencing. By association of these molecular techniques, we can also examine symbiosis between the different types of microbes involved.

Department of Environmental Engineering
Period: 15/10/2003 → 31/12/2005
Number of participants: 3
Acronym: XenoMic
Project ID: 30318
Project participant:
Batstone, Damien J. (Intern)
Trably, Eric (Intern)
Project Manager, organisational:
Schmidt, Jens Ejbye (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 1,420,000.00 Danish Kroner

Biological Removal of MTBE in Anaerobic Reactors
Department of Environmental Engineering
Period: 01/10/2003 → 21/12/2007
Number of participants: 6
Phd Student:
Waul, Christopher Kevin (Intern)
Supervisor:
Schmidt, Jens Ejbye (Intern)
Main Supervisor:
ELAC. European and Latin American Consortium for IST Enhanced Continued Education in Environmental Management and Planning

To achieve the overall objective the following programme components are performed. 1. A Project Management Unit (PMU) has been established to facilitate and assist meetings and to ensure that objectives and deadlines are met. 2. Sustainability of the Project work will be ensured by established Continued Education Facility units (CEF). 3. An Information Management System (IMS) will be formed for consortium members. This will serve as the basis for communication and courses. 4. Learning approaches and ICT applications will be developed and implemented in relation to stakeholders needs. 5. Courses will be implemented and offered to targeted stakeholders with adapted technologies. 6. The courses will be evaluated and revised in accordance with experience from Europe and the participating Central American countries.

Department of Environmental Engineering
Centro Internacional de Política Económica, Universidad Nacional de Costa Rica
Aalborg University
Universidad Nacional Autonoma de Nicaragua
La Universidad Centroamericana
Universidad Autonoma Metropolitana
Universidad de Barcelona
Lancaster University

Period: 01/10/2003 → 30/09/2006
Number of participants: 2
Acronym: ELAC
Project ID: 30300
Project participant: Thygesen, Niels (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 3,705,000.00 Danish Kroner

ELAC. European and Latin American consortium for IST enhanced education in environment management and planning (ELAC) ("the Operation"), corresponding to action 5 of the @LIS programme.

Department of Environmental Engineering
Aalborg University
Lancaster University
Universidad de Barcelona
Universidad Nacional de Rosario
Mechanical sorting of municipal solid waste for recovery of organic fraction.
Samarbejdsaftale med NML Combineering har til formål at gennemføre: En karakterisering af out-put fra NMLs koncept-anlæg, opstillet på Fyns Værket, Odense til sortering af dagrenovation, med henblik på dokumentation af anlæggets funktion.

Department of Environmental Engineering

NLM Combineering
Period: 01/10/2003 → 28/02/2004
Number of participants: 3
Acronym: 410
Project ID: 30302
Project participant:
Christensen, Thomas Højlund (Intern)
Hansen, Trine Lund (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 136,875.00 Danish Kroner

Petrophysical properties and architecture of reservoir bodies in Latvian Cambrian deposits

Department of Environmental Engineering

Period: 01/10/2003 → 01/01/2010
Number of participants: 1
Acronym: 374
Project Manager, organisational:
Molenaar, Nicolaas (Intern)

Petrophysical properties, depositional facies and distribution of reservoir bodies in Lithuanian Silurian carbonate ramp systems

Silurian carbonates are studied along a section from the coastal environments towards the deeper off shelf. The project aims to reconstruct the depositional facies, their geometries, the susceptibility to diagenetic processes, and the effects of diagenetic processes on petrophysical properties. Together with petrophysical characterization of the different facies, this will lead to modelling the reservoir quality and hydrocarbon prospectivity of Silurian carbonates in the Baltic region.

Department of Environmental Engineering

Lithuanian Geological Institute

Period: 01/10/2003 → 01/01/2010
Number of participants: 1
Acronym: 373
**Projekt om vandforbrug og forbrugsvariationer.**

Department of Environmental Engineering

Dansk Vand- og Spildevandsforening
Period: 01/10/2003 → 31/12/2004
Number of participants: 2
Acronym: 408
Project ID: 30301
Project participant: Boe-Hansen, Rasmus (Intern)

Project Manager, organisational: Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 124,200.00 Danish Kroner

**Project**

**Risk, source strength and variation of pesticide contamination at Sjoelund Landfill in County of Soenderjylland**
Tilvejebringelse af et øget videngrundlag for anvendelse af naturlig nedbrydning som en afværgestrategi ved pesticidpunttkilder.

Department of Environmental Engineering

County of Sønderjylland
Period: 01/10/2003 → 31/12/2004
Number of participants: 2
Acronym: 406
Project ID: 30308
Project participant: Tuxen, Nina (Intern)

Project Manager, organisational: Bjerg, Poul Legstrup (Intern)

**Financing sources**
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 150,000.00 Danish Kroner

**Project**

**Uptake of Chemicals and Metabolism Kinetics in Plants Related to Toxic Effects**

Department of Environmental Engineering

Period: 01/10/2003 → 11/06/2007
Number of participants: 6
Phd Student: Ucisik, Ahmed Süheyl (Intern)
Supervisor: Kusk, Kresten Ole (Intern)
Main Supervisor: Trapp, Stefan (Intern)
Examiner: Baun, Anders (Intern)
Forchammer, Nina Cedergreen (Ekstern)
Kästner, Matthias (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

**Adaptive Optimal Control for Reservoir Management**
Department of Environmental Engineering
Period: 01/09/2003 → 02/01/2007
Number of participants: 7
Phd Student:
Ngo, Long Le (Intern)
Supervisor:
Hoa, Trinh Quang (Ekstern)
Madsen, Henrik (Intern)
Main Supervisor:
Rosbjerg, Dan (Intern)
Examiner:
Knudsen, Jesper (Ekstern)
Khu, Soon-Thiam (Ekstern)
Loucks, Daniel P. (Ekstern)

**Application of the Environmental Flows Concept in the Evaluation of Development Projects**
Department of Environmental Engineering
Period: 01/09/2003 → 29/01/2007
Number of participants: 7
Phd Student:
Korsgaard, Louise (Intern)
Supervisor:
Jønch-Clausen, Torkil (Intern)
Schou, Jesper S. (Intern)
Main Supervisor:
Rosbjerg, Dan (Intern)
Examiner:
Bauer-Gottwein, Peter (Intern)
Bergkamp, Ger (Ekstern)
Hasler, Berit (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

**Fase 2a: Nikkelfrigivelse ved pyritoxidation.**
Miljøstyrelsen ønsker undersøgt hvilke faktorer, der har betydning for nikkelfrigivelse til grundvandet i kalkmagasinerne i typeområdet ved Kege Bugt.
Department of Environmental Engineering
Period: 01/09/2003 → 15/12/2004
Number of participants: 3
Acronym: 349
Project ID: 30290
Project participant:
Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 293,820.00 Danish Kroner
Project

Parameter Estimation and Uncertainty Assessment in Hydrological Modelling
Department of Environmental Engineering
Number of participants: 6
Phd Student:
Blasone, Roberta-Serena (Intern)
Supervisor:
Madsen, Henrik (Intern)
Main Supervisor:
Rosbjerg, Dan (Intern)
Examiner:
Binning, Philip John (Intern)
Christensen, Steen (Intern)
Montanari, Alberto (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Preparedness and Mitigation Measures to Cope with Drought in Vietnam's Central Highland
Department of Environmental Engineering
Period: 01/09/2003 → 02/01/2007
Number of participants: 7
Phd Student:
Nguyen, Tinh Dang (Intern)
Supervisor:
Kim Quang, Nguyen (Ekstern)
Uvo, Cintia Bertacchi (Ekstern)
Main Supervisor:
Rosbjerg, Dan (Intern)
Examiner:
Mikkelsen, Peter Steen (Intern)
Kundzewicz, Zbigniew W. (Ekstern)
Schumann, Andreas (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Nedbrydning af miljøfremmede stoffer i spildevand og spildevandsslam
Department of Environmental Engineering
Period: 15/08/2003 → 21/12/2007
Number of participants: 6
Phd Student:
Press-Kristensen, Kåre (Intern)
Evaluation of the M1b1 in Dan West Flank and Halfdan areas. Physical and micro textural analyses.
The main objective of this microtextural study is to improve understanding of porosity variation and preservation.

Department of Environmental Engineering
Period: 07/07/2003 → 31/12/2003
Number of participants: 3
Acronym: 407
Project ID: 30298
Diaz, Hektor Osvaldo Ampuero (Intern)
Nguyen, Sinh Hy (Intern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Sam arb aftaler, Private danske - Andre virksomheder
Name of research programme: Sam arb aftaler, Private danske - Andre virksomheder
Amount: 287,488.00 Danish Kroner
Project

Metode til at bestemme skrivekridts sammensætning og stivhed udfra geofysiske borehulsmålinger

Department of Environmental Engineering
Number of participants: 5
Phd Student:
Olsen, Casper (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Foged, Niels Tækker (Intern)
Sørensen, Alexis Hammer (Intern)
Smith, Brackin A. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Forbrændingstest med rent dagrenovation.

Department of Environmental Engineering
Period: 01/06/2003 → 30/06/2004
Number of participants: 1
Acronym: 350
Project ID: 30278
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

**Financing sources**
Source: Samarb.aftaler - Amter og kommuner  
Name of research programme: Samarb.aftaler - Amter og kommuner  
Amount: 540,000.00 Danish Krone  

**ENRECA - Water resources management in Vietnam. Preparation of Project.**
The aim of the project is to prepare an application for a research and training project in Vietnam. The project group includes three Vietnamese and three Danish institutions. The research topic is the release of arsenic from sediments controlled by the interaction between surface and ground water. The study is planned to be conducted in the Red River Plain around Hanoi.

Department of Environmental Engineering  
De Nationale Geologiske Undersøgelser for Danmark og Grønland  
DHI Denmark  
Period: 01/05/2003 → 31/12/2003  
Number of participants: 3  
Acronym: 352  
Project participant:  
Postma, Diederik Jan (Intern)  
Binning, Philip John (Intern)  
Project Manager, organisational:  
Larsen, Flemming (Intern)  

**Use of QSAR for classification and environmental evaluation of chemicals.**
Department of Environmental Engineering  
Environmental Protection Agency  
Period: 01/05/2003 → 30/05/2003  
Number of participants: 2  
Acronym: 360  
Project participant:  
Nyholm, Niels (Intern)  
Project Manager, organisational:  
Kusk, Kresten Ole (Intern)  

**Development of reproducible and ecological relevant methods for assessments of herbicide effects on natural communities of phytoplankton.**
Department of Environmental Engineering  
Environmental Protection Agency  
Period: 30/04/2003 → 01/07/2003  
Number of participants: 2  
Acronym: 361  
Project participant:  
Wollenberger, Leah (Intern)
Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 0.00 Danish Kroner

Project

Øresund Sommer University 2003.

Department of Environmental Engineering
Period: 02/04/2003 → 01/09/2003
Number of participants: 2
Acronym: 347
Project ID: 30282
Project participant: Kusk, Kresten Ole (Intern)
Project Manager, organisational: Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 20,000.00 Danish Kroner

Project

Innovative reactor configurations for biogas production

Department of Environmental Engineering
Period: 01/04/2003 → 01/04/2007
Number of participants: 1
Acronym: 399
Project Manager, organisational: Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Project

Introducing student centred oriented learning approaches (POL), higher education project, Mozambique.

Department of Environmental Engineering

The World Bank Group
Period: 01/04/2003 → 31/05/2004
Number of participants: 1
Acronym: 353
Project ID: 30275
Project Manager, organisational: Thygesen, Niels (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 555,000.00 Danish Kroner

Project
Variability of the chalk background velocity in the South Arne area
Quantification of how the chalk background velocity (the low-frequent velocity variations which define the absolute level of the chalk velocity) in the South Arne area is affected by effective stress, presence of hydrocarbons as well as porosity, composition, texture and cementation of chalk. Estimation of upper and lower bounds on chalk porosity estimated from seismic inversion based on the analysis of these factors. Evaluation of the usefulness of velocities estimated from seismic processing as a supplement to well log data for establishing chalk background velocity.

Department of Environmental Engineering

De Nationale Geologiske Undersøgelser for Danmark og Grønland
Period: 01/04/2003 → 31/03/2005
Number of participants: 5
Acronym: 348
Project ID: 30284
Project participant:
Diaz, Hektor Osvaldo Ampuero (Intern)
Nguyen, Sinh Hy (Intern)
Ødegaard (Ekstern)
Mavko, Gary (Ekstern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 450,000.00 Danish Kroner

Extension of the domain of QSAR model for algal toxicity.
See the project: "A QSAR-based model for prediction of algal toxicity"

Department of Environmental Engineering

Environmental Protection Agency
Period: 01/03/2003 → 01/12/2003
Number of participants: 3
Project ID: 30272
Project participant:
Nyholm, Niels (Intern)
Qualmann, Signe (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 200,000.00 Danish Kroner

Research in elastic properties and composition of chalk core plugs.
Financial support to build a library of velocity, density and porosity measurements of the chalk so the seismic response of expected changes of physical properties can be studied. This research will help to provide the rock mechanical basis needed to assess the feasibility for 4-D seismic in the contiguous area chalk hydrocarbon accumulations.

Department of Environmental Engineering
Period: 21/02/2003 → 01/03/2004
Number of participants: 3
Acronym: 388
Project ID: 30273
Project participant:
Diaz, Hektor Osvaldo Ampuero (Intern)
Nguyen, Sinh Hy (Intern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)
CityNet AM. The network of European research projects on integrated urban water management. Contract no: EVK1-CT-2002-80013-CITYNET

CityNet is a cluster of six projects of which most were independently conceptualised. E&R DTU will organize an international conference with worldwide attendance to position the CityNet cluster, its partners and their products on the international research scene. Issues related to fast urbanising regions and mega-cities in the developing world will be particularly addressed.

Department of Environmental Engineering
SINTEF
ENPC
Insavalar S:A:
Dresden University of Technology

Period: 01/02/2003 → 31/12/2006
Number of participants: 1
Acronym: CityNet AM
Project ID: 30269
Project Manager, organisational:
Mikkelson, Peter Steen (Intern)

Detection and Quantification of Subsurface Pesticide Degrading Microbial Populations

Department of Environmental Engineering
Period: 01/02/2003 → 16/04/2007
Number of participants: 6
Phd Student:
Lindberg, Ingrid Ellinor (Intern)
Supervisor:
Schmidt, Jens Ejbye (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Bjerg, Poul Løgstrup (Intern)
Martin-Laurent, Fabrice (Ekstern)
Nybroe, Ole (Ekstern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 216,500.00 Danish Kroner
Project

Mikrobiel nedbrydning efter dampoprensning af forventet jord og grundvand

Department of Environmental Engineering
Period: 01/02/2003 → 31/03/2006
Number of participants: 7
Phd Student:
Friis, Anne Kirketerp (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Udell, Kent S. (Ekstern)
Main Supervisor:
Bjerg, Poul Løgstrup (Intern)
Examiner:
Christensen, Thomas Højlund (Intern)
Jacobsen, Carsten Suhr (Ekstern)
Major, David W. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Modeller for anvendelse af drikkevandskvalitetsdata - fra boring til forbruger
Department of Environmental Engineering
Period: 01/02/2003 → 28/02/2006
Number of participants: 2
Phd Student:
Andersen, Ulla Tolstrup (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Status om forbrændingsslager
Status om forbrændingsslager
Department of Environmental Engineering
Period: 01/02/2003 → 01/07/2003
Number of participants: 1
Acronym: 346
Project ID: 30274
Project Manager, organisational:
Astrup, Thomas Fruergaard (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 150,000.00 Danish Kroner
Project

Start-programmet. Improved monitoring and control of the biogas process for reliable efficient and cost-effective energy production.
Start-programmet
Department of Environmental Engineering
Period: 20/01/2003 → 20/03/2003
Number of participants: 1
Acronym: 338
Project ID: 30270
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Acoustic properties and consolidation of deep-sea chalk

Department of Environmental Engineering

Department of Civil Engineering
Period: 01/01/2003 → 31/12/2003
Number of participants: 2
Acronym: 358
Project participant:
Ragen, Birte (Intern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 0.00 Danish Kroner
Project

Oh no, not the wiggles again! A revisit of an old problem and a new approach.
Lumping is often used to control oscillations in method of weighted residuals numerical methods. Standard lumping procedures add numerical diffusion indiscriminately resulting in excessively diffused solutions. Here it is shown that the mass matrix can be selectively lumped (SLUMPED), with an optimal amount of diffusion added to each row of the mass matrix. The amount of diffusion added is calculated from the right hand side vector. The optimal amount of diffusion is found in 4 steps. First the monotonicity problem is recast in the form of a maximum principle. Secondly, for a two by two, or element matrix, the amount of diffusion is calculated for an arbitrary right hand side so that the solution obeys a maximum principle. Thirdly, the result is generalised for larger matrices. And finally, the result is recast to meet the monotonicity requirement. The result is an equation giving the amount of diffusion to be added in terms of a given right hand side vector. Selective lumping is shown to be effective for both an Eulerian Lagrangian Localized Adjoint Method (ELLAM) solution of the transport equation and a finite element solution of the heat equation. In both cases, solutions were monotonic and contained less numerical diffusion than in standard lumping schemes. The SLUMPING method is general and can be applied to any numerical approximation based on the method of weighted residuals. The project will also investigate the relationship of SLUMPING schemes to flux limiter schemes used in finite difference approximations and to streamline upwind Petrov Galerkin methods.

Department of Environmental Engineering

National Science Foundation
Period: 01/01/2003 → 01/01/2006
Number of participants: 1
Acronym: 364
Project Manager, organisational:
Binning, Philip John (Intern)

Removal of arsenic in water works treating drinking water

Department of Environmental Engineering
Period: 01/01/2003 → 31/12/2003
Number of participants: 1
Acronym: 378
Project Manager, organisational:
Arvin, Erik (Intern)

SAFEWATER. Hazardous chemicals and micro-organisms in urban water management.
proposal to Marie Curie Host Fellowships for Early Stage Research Training (EST) No funding!

Department of Environmental Engineering
The balance between advection and diffusion in reactive gas transport in the unsaturated zone

Oxygen diffusion has long been held to be the rate limiting factor on aerobic reactions in the unsaturated zone and models of these systems have been driven by this assumption. However, oxygen comprises 23.2% by mass of dry air. When oxygen is consumed at depth in the unsaturated zone a pressure gradient is created between the reactive zone and the soil surface. This causes substantial air flow into the subsurface. To determine the balance between advective and diffusive transport, a one-dimensional unsaturated zone gas transport model is developed. The model includes advection, diffusion and dispersion in the oxygen and nitrogen gas components. Density and viscosity are dependent on the gas composition and the flux determined using Darcy’s law. The equations are cast in terms of the total gas pressure and the nitrogen mass fraction. This formulation is chosen because the total gas pressure is slowly varying and the total gas equation and nitrogen transport equation are only weakly coupled. Boundary conditions are driven by atmospheric conditions at the top of the column. At the bottom of the column a zero flux of nitrogen and unit mass fraction of nitrogen are imposed. Equations are solved using a backward Euler linear Galerkin finite element scheme with an iterative decoupling of the equations. The model is used to investigate the balance between advective and diffusive oxygen transport in the unsaturated zone in both steady and transient states. Barometric forcing at the top boundary can also induce advective flow in the unsaturated zone and is also investigated. Finally, the model is compared with existing field data and results from current approaches.

VO@NET. Virtual open-access network for education and training-enhancing interconnectivity between European and Asian universities.

This project aims to establish a virtual network to advance information exchange, increase communications, improve networking and develop joint courses and curricula through the introduction of new technologies to existing networks in Asia and Europe.

Department of Environmental Engineering
Aalborg University
Universitat de Barcelona
Mahidol University
Malaysian University
Period: 01/01/2003 → 31/12/2005
Number of participants: 2
Acronym: VO@NET
Project ID: 30253
Project participant:
Warnaars, Eric (Intern)
Project Manager, organisational:
Thygesen, Niels (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 12.00 Danish Kroner

Development of remediation technologies for chlorinated solvents
Samarbejdsaftale med Fyns Amt: *Gennemføre studier af de grundlæggende geokemiske, mikrobiologiske og hydrogeologiske processer for forskellige oprensningsteknikker for klorerede opløsningsmidler med det formål at kunne forbedre anvendelsen af teknikerne ved praktiske oprensninger *Udvikle, afprøve og dokumentere forskellige afværgeteknikkers anvendelse ved konkrete oprensninger *Udvikle og anvende egnede test i felt og laboratorium *Udvikling af data mhp. nærmere studier foretaget af speciale- eller Ph.D.studerende *Udveksle viden om processer og teknikker *Publicering af artikler *Muliggøre praktikordning for studerende fra M&R i Fyns Amt

Department of Environmental Engineering
Fyns Amt
Period: 05/12/2002 → 31/12/2006
Number of participants: 7
Acronym: 337
Project ID: 30260

Project participant:
Scheutz, Charlotte (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Broholm, Mette Martina (Intern)
Jakobsen, Rasmus (Intern)
Henriksen, Karina Bomholt (Intern)
Hønning, Jirij (Intern)
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Ukendt
Amount: 105,000.00 Danish Kroner

Bjørgsted. Groundwater protection. Phase 2
Teknisk bistand i forbindelse med detailkortlægning i Bjørgsted Indsatsområde.

Department of Environmental Engineering
Period: 01/12/2002 → 30/09/2005
Number of participants: 3
Acronym: 351
Project ID: 30279

Project participant:
Poulsen, Lene Hjelm (Intern)
Sonnenborg, Torben Obel (Intern)
Project Manager, organisational:
Larsen, Flemming (Intern)

Financing sources
DayWater - Adaptive decision support system for stormwater pollution control

Stormwater source control is perceived today as an efficient solution to problems in connection with flooding and pollution of stormwater. However, implementing the best solution remains difficult because the range of possible "best management practices" is vast and individual needs have to be met. The main objective of the DayWater project is to develop a tool for use by stakeholders in urban storm water management. As the decisions are made on various space and time scales (topography and dynamic nature of urban development) the tool has to be adaptive. E&R DTU's major role in the project is to develop methodologies and tools for hazard and risk assessment of potential stormwater priority pollutants. EC-contract no: EVK1-CT-2002-00111.

Department of Environmental Engineering

ENPC
DHI Hydroinform
Tauw bv, The Netherlands
Middlesex University
Chalmers University of Technology
Ingenieurgesellschaft Prof. Dr. Sieker
National Technical University of Athens
LCPC
Luleå University of Technology

Period: 01/12/2002 → 30/11/2005
Number of participants: 5
Acronym: DayWater
Project ID: 30255
Project participant:

- Baun, Anders (Intern)
- Ledin, Anna (Intern)
- Eriksson, Eva (Intern)
- Hauger, Mikkel Boye (Intern)
- Mikkelsen, Peter Steen (Intern)

BIOWASTE. Bioprocessing of sewage sludge for safe recycling on agricultural land

Disposal and handling of sewage sludge are an increasing problem in Europe due to increasing quantities of sewage sludge produced. A large amount of the sewage sludge contains small fractions of toxic chemicals, which results in problems with safe use of the sewage sludge on agricultural land. From an ecological and economical point of view, it would be essential to establish methodologies, which could allow sewage sludge to be reused as fertilizers on agricultural land. Energy efficient biotreatment processes of organic waste are, therefore, of crucial importance. BIOWASTE will offer an integrated study of this area. The typical composition of sewage sludge will be characterized with regard to key contaminating compounds. Analytical techniques suitable for qualitative and quantitative evaluation of the chemical species involved in the processes under investigation will be determined. Bacteria that are able to degrade selected contaminating compounds under anaerobic and aerobic conditions will be isolated, characterized and bioaugmented for decontamination of sewage sludge by bioprocessing. Aerobic, anaerobic and combination of aerobic/anaerobic bioprocessing of sewage sludge will be applied. A mathematical model will be developed to describe the biodegradation processes of the contaminating compounds after establishing the kinetic parameters for degradation of contaminating compounds. The bioprocessed sewage sludge will be used in eco- and planttoxicology tests to evaluated the impact of the xenobiotics on the environment. Methodologies will be developed and applied to assess the cleanliness of the bioprocessing as a safe method for waste recycling.
**Financing sources**

Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 5,463,000.00 Danish Kroner

**COMPRENDO. Comparative research on endocrine disrupters - phytogenetic approach and common principles focussing on androgenic/antiandrogenic compounds.**

Comprendo is an interdisciplinary, integrated approach addresses endocrine disruption in human and wildlife species, focused on androgenic/antiandrogenic compounds (AACs). The project will identify human and environmental exposures to AACs. A variety of human-relevant models (cell lines, tissues, rodents) and wildlife species (amphibians, fish, echinoderms, crustaceans, molluscs) will be exposed to 13 chemicals and various environmental samples to develop new biological effect measures, including a molecular screen for genomic AAC effects. Common principles of AAC action will be identified and new models for the extrapolation on human health developed. Lab cultures of suitable invertebrates will be established and their baseline endocrinology analysed, facilitating the use of these species as standard test organisms. Finally, an evaluation of the risk originating from AACs for humans and wildlife will be performed.

Department of Environmental Engineering
Johann Wolfgang Goethe-Universität Frankfurt
Universitätsklinikum Bonn
Forschungsverbund Berlin e.V.
Brunel University
Hatherly Laboratories
Lund University
BRGM
Spanish National Research Council
University of Milan
University of Insubria
University of Ioannina
University of Gdansk
Project Webpage
Period: 01/10/2002 → 30/09/2005
Number of participants: 3
Acronym: COMPRENDO
Project ID: 30249
Project participant:
Wollenberger, Leah (Intern)
Hedberg, Camilla Berg (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 2,118,000.00 Danish Kroner

Jernreduktion og arsenfrigivelse ved oxidation af organisk stof
Department of Environmental Engineering
Period: 01/10/2002 → 06/04/2006
Number of participants: 7
Phd Student:
Pedersen, Hanne Dahl (Intern)
Supervisor:
Jakobsen, Rasmus (Intern)
Larsen, Lars Ole (Intern)
Main Supervisor:
Postma, Diederik Jan (Intern)
Examiner:
Larsen, Flemming (Ekstern)
Hansen, Hans Chr. B. (Ekstern)
Peiffer, Stefan (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Monitoring of the anaerobic biogas process by on-line VFA measurement
Development of on-line VFA meter based on gas phase gas chromatographic analysis of VFA. VFA and other parameters are evaluated as indicators for the biogas process. Advanced control based on several process parameters will be developed.

Department of Environmental Engineering
Period: 01/10/2002 → 31/12/2005
Number of participants: 3
Acronym: 397
Project participant:
Boe, Kanokwan (Intern)
Batstone, Damien J. (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

On-line Monitoring and Control of the Biogas Process
Department of Environmental Engineering
MTBE can be removed from contaminated water in water works by a range of treatment methods. Biological destruction of MTBE with MTBE as the primary substrate offers an attractive method of removing MTBE without the disadvantages, as known from several of the other MTBE-removing technologies. It is the purpose of the project to investigate the effect of operating conditions (filter velocities, backwashing, etc.) on the biological removal of MTBE in sand filters in conventional water works. A field study at Svendborg Water Works, Denmark, showed that MTBE could be removed from 10-65 ug/L to a few 5 ug/L.

Evaluation of the attenuation of (NMOCs) in the top cover of Grand’Landes landfill

The specific goal of this project is to evaluate both a) the potential for NMOC attenuation as determined by laboratory batch studies; and b) the measured rates of NMOC emissions in the landfill cover material at the Grand’Landes Landfill.
**Risikovurdering af protozoerne "Crystosporidium parvum og Giardia intestinalis" i vand**

Department of Environmental Engineering

COWI A/S

Statens Veterinærinstitut

Dansk Veterinær Consult

Smittskyddsinstituttet, Stockholm

Period: 01/08/2002 → 31/12/2002

Number of participants: 3

Acronym: 330

Project ID: 30243

Project participant:

Boe-Hansen, Rasmus (Intern)

Andersen, Ulla Tolstrup (Intern)

Project Manager, organisational:

Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**

Source: Unknown

Name of research programme: Ukendt

Amount: 900,000.00 Danish Kroner

**Klassificeringsforslag for miljøfare på baggrund af QSAR beregninger sammenlignet med klassificering baseret på data**

Forbedring af QSAR-modellen (algetest)

Department of Environmental Engineering

Period: 15/07/2002 → 07/12/2002

Number of participants: 2

Acronym: 329

Project ID: 30242

Project participant:

Nyholm, Niels (Intern)

Project Manager, organisational:

Kusk, Kresten Ole (Intern)

**Financing sources**

Source: Unknown

Name of research programme: Ukendt

Amount: 50,000.00 Danish Kroner

**Development bioprocesses for handling and recycling seasonal industrial wastewaters.**

Food processing and other industries typically generate wastewaters that contain a high organic content. An optimal basic treatment for such wastewater could be anaerobic digestion, a process, on top of significantly reduction of the organic matter, can generate biogas. The proposed work will: -examine the characteristics of seasonally produced wastewater -investigate the co-digestibility of these wastewaters from a kinetic and microbial point of view -determine the optimal planning and scheduling for digestion process -investigate alternative digesters types, configurations and designs for flexibility -evaluate overall processes that exploit fully the by-products of anaerobic digestion

Department of Environmental Engineering

Period: 01/07/2002 → 01/08/2002

Number of participants: 2

Acronym: 287

Project participant:

Angelidaki, Irini (Intern)

Project Manager, organisational:

Schmidt, Jens Ejbye (Intern)
Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Øresund Summer University; udvikling af kurset/kurserne indenfor emnet "miljø".
Foreløbig tilkendegivelse af bevilling på 400.000 SEK til gennemførelse af Øresund Summer University 2002.

Department of Environmental Engineering
Period: 01/06/2002 → 01/09/2002
Number of participants: 1
Acronym: 322
Project ID: 30237
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 320,000.00 Danish Kroner
Project

Underskudsgaranti til konferencen ISSM02.

Department of Environmental Engineering
De Nationale Geologiske Undersøgelser for Danmark og Grønland
Period: 01/06/2002 → 01/09/2003
Number of participants: 1
Project ID: 30167
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 100,000.00 Danish Kroner
Project

Development of leaching tests for organic compounds in contaminated soils.
Inexpensive and fast performing column leaching tests are developed for both volatile and non-volatile organic compounds. The column leaching tests are able to avoid artifacts for non-volatile compounds due to colloids which make more traditionel batch leaching tests difficult to use.

Department of Environmental Engineering
DHI Denmark
Period: 31/05/2002 → 31/12/2004
Number of participants: 4
Acronym: 333
Project ID: 30247
Project participant:
Kjeldsen, Peter (Intern)
Christensen, Thomas Højlund (Intern)
Gamst, Jesper (Intern)
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Unknown
Removal of MTBE from LEUNA groundwater by biological filtration

The groundwater at the LEUNA chemical company, Germany, has been contaminated by MTBE due to former production facilities. The project is part of a research consortium that focuses on various technologies to remove MTBE in-situ in horizontal filters/treatment units. In this project, the removal of MTBE by biological filtration was studied. MTBE is removed as a primary substrate with bacteria enriched from the local groundwater. The experiments were conducted with artificial LEUNA groundwater using a filtration unit with Filtralite (expanded clay) as the support material. MTBE and ammonia were effectively oxidized using either pure oxygen or hydrogen peroxide as oxidation agents. The MTBE degraders are growing very slowly, even more slowly than the nitrifiers. Under optimal conditions (20 °C), the doubling time for MTBE degraders was 7.5 days.

Department of Environmental Engineering
Helmholtz Centre for Environmental Research

Period: 01/05/2002 → 31/12/2005
Number of participants: 2
Acronym: 345
Project ID: 30256
Project participant:
Kagstrup, Tanja (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 966,000.00 Danish Kroner

See also research project no 282.

Department of Environmental Engineering

Period: 01/05/2002 → 15/11/2002
Number of participants: 1
Acronym: 313
Project ID: 30167
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 65,000.00 Danish Kroner

EESD. European forum on integrated environmental assessment.
Integrated environmental assessment is policy-relevant on complex environmental issues. The proposed concerted action seeks to improve and demonstrate policy relevance through organizing 2-3 controlled policy-science interface workshops, and 2-3 rapid assessment workshops on topics such as climate, energy and water. It seeks to improve scientific quality and to consolidate and extend the peer community through organizing 2 summer workshops and 2-3 short, specialized workshops on topics such as uncertainty, decision analysis, and scenario design. It seeks to train young researchers through 2 summer schools, and grant fellowships to young researchers for exchange. It seeks to disseminate its findings widely to both the science and the policy community. Kontrakt: EKV2-2001-20011

Department of Environmental Engineering

Period: 01/04/2002 → 31/03/2005
Number of participants: 1
Acronym: EESD
Project Manager, organisational:
Harremoës, Poul (Intern)
Environmental assessment of solid waste management in the municipality of Aarhus


Department of Environmental Engineering

Municipality of Århus
Period: 01/04/2002 → 30/06/2004
Number of participants: 6
Project ID: 30225
Project participant:
Kirkeby, Janus Søgaard (Intern)
Christensen, Thomas Højlund (Intern)
Hansen, Trine Lund (Intern)
Riber, Christian (Intern)
Janniche, Gry Sander (Intern)

Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Kortlægning og dokumentation af procesforhold på danske biogasanlæg.


Data fra Lintrup biogasanlæg kan benyttes. Resultater fra Thorsø biogasanlæg følges.

Department of Environmental Engineering
Period: 01/04/2002 → 31/12/2005
Number of participants: 1
Project ID: 30206
Project Manager, organisational:
Angelidaki, Irini (Intern)

Optagelse af organiske stoffer i grøntsager og frugt.

Beskrivelse/vurdering af sammenhængen mellem forureningsniveau af organiske forureningskomponenter i jord - incl. poreluft - og i grøntsager og frugt vil blive baseret på matematiske modeller. Arbejdet vil blive baseret på litteraturstudier og eksisterende modeller.

Department of Environmental Engineering
Period: 08/03/2002 → 31/12/2002
Number of participants: 1
Acronym: 309
Project ID: 30218
Project Manager, organisational:
Trapp, Stefan (Intern)
Attenuation of alternative foam blowing agents in landfill
The objective of this project is to evaluate the potential for degradation of alternative foam blowing agents in landfill and landfill soil covers, using HCFC-14b, HFC-134a and HFC-245fa. CFC-11 will be used as reference.

Department of Environmental Engineering
Period: 01/03/2002 → 01/01/2004
Number of participants: 2
Acronym: 311
Project ID: 30223
Project participant: Scheutz, Charlotte (Intern)
Project Manager, organisational: Kjeldsen, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 120,000.00 Danish Kroner

Kursusnoter til: Grundkursus i grundvandskemi med henblik på zonering og udarbejdelse af indsatsplaner.

Department of Environmental Engineering
Period: 01/03/2002 → 31/08/2002
Number of participants: 1
Acronym: 317
Project ID: 30236
Project Manager, organisational: Larsen, Flemming (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 600,000.00 Danish Kroner

Opfølgende testning til udvikling af en non-congenerisk universal QSAR-model for algetoksicitet.
Toxicitetstest (fisk, dafnier, alger) til evaluering af kemiske stoffer effekt i vandmiljøet. Forbedring af QSAR modellen.

Department of Environmental Engineering
Period: 01/03/2002 → 01/12/2002
Number of participants: 1
Acronym: 304
Project ID: 30219
Project Manager, organisational: Kusk, Kresten Ole (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 295,000.00 Danish Kroner

Biodegradation of Complexed Cyanides
Toxicity of volatile organic compounds in groundwater

The toxicity of volatile organic compounds found in gasoline contaminated groundwater is investigated through fractionation and pre-concentration techniques in combination with algal toxicity tests.
University of Strathclyde
Universidad Autonoma de Barcelona
University of Pavia
Lund University
Imperial College of Science, Technology and Medicine
Technical University of Crete

Period: 01/02/2002 → 31/01/2006
Number of participants: 5
Acronym: WWT&SYSENG
Project ID: 30221
Project participant:
Lindblom, Erik Ulfson (Intern)
Ahlman, Stefan (Intern)
Raduly, Botond (Intern)
Henze, Mogens (Intern)

Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 1,124,950.00 Danish Kroner

Project

Pretreatment of source separated organic household waste prior to biogasification

Department of Environmental Engineering
Period: 16/01/2002 → 01/10/2002
Number of participants: 1
Acronym: 323
Project ID: 30239
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 130,000.00 Danish Kroner

Project

Sustainable Implementation of Sanitary Systems in Periurban Areas in Africa

Department of Environmental Engineering
Period: 15/01/2002 → 31/08/2005
Number of participants: 3
Phd Student:
Bravo, Augusto (Intern)
Supervisor:
Bregnhøj, Henrik (Intern)
Main Supervisor:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Programbevilling
Project: PhD
**Chemical oxidation of groundwater contaminants**  
Chemical oxidation is a promising remediation technology for chlorinated aliphatic compounds in groundwater. Laboratory methods for prediction of oxidant demand are developed. The role of natural organic matter in the oxidation process is investigated. The research is related to on-going field application performed by Danish consulting companies. See project homepage for further details (in Danish)
Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Nedbrydning af pesticider i grundvandsmagasiner og opskalering af nedbrydningsrater med fokus på "Processtudier af anaerob nedbrydning i grundvandsmagasiner.


Department of Environmental Engineering
De Nationale Geologiske Undersøgelser for Danmark og Grønland
Period: 01/01/2002 → 31/12/2004
Number of participants: 2
Acronym: 335
Project participant:
Clausen, Liselotte (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,275,000.00 Danish Kroner
Project

Transport and survival of human pathogenic microorganisms in groundwater and drinking water.
The main aims of this project are (i) to identify human pathogenic microorganisms in groundwater downstream of sewage infiltration (ii) to extrapolate our current knowledge of bacterial and viral transport (iii) to analyse factors that affect their surface properties (iv) to examine the influence of geochemistry on the transport, survival and potential ineffectivity of human microorganisms (v) to identify the factors that determine the retardation of microorganisms in waterworks filter and in distribution systems.

Department of Environmental Engineering
Period: 01/01/2002 → 01/12/2002
Number of participants: 1
Acronym: 305
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Uptake of organic chemicals into vegetables and fruits

Department of Environmental Engineering
Period: 01/01/2002 → 01/09/2002
Number of participants: 1
Acronym: 314
Project Manager, organisational:
Trapp, Stefan (Intern)
Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 140,000.00 Danish Kroner
Project

Varetagelse og koordinering af prøveudtagning og analyser af en række kemiske og mikrobiologiske parametre på gråvands anlægget på Bo90.

Det overordnede formål med et specifikt måleprogram for gråt spildevand er at gennemføre en grundig fysisk, kemisk og mikrobiologisk karakterisering. Det afdækkes, hvad gråt spildevand består af og belyser den tidsmæssige variation i sammensætningen af gråt spildevand på døgn- og årsbasis, variationen mellem forskellige typer af gråt spildevand. På baggrund af resultater fra måleprogrammets trin 1 (beskrevet i "Måleprogram for karakterisering af gråt spildevand i relevante Tema 4 projekter") vurderes det om et mindre omfangsrigt, men mere specifikt måleprogram kan gennemføres for at gråvandsanlægget lever op til de krav, som vil blive stillet, for at det rensedes vand kan bruges til toaletskyldning.

Department of Environmental Engineering
Royal Veterinary and Agricultural University
Period: 01/01/2002 → 31/12/2003
Number of participants: 3
Project ID: 30215
Project participant:
Eriksson, Eva (Intern)
Eilersen, Ann Marie (Intern)
Project Manager, organisational:
Ledin, Anna (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 98,200.00 Danish Kroner
Project

Forureningsundersøgelse på Hallegårdsvej 4, Bornholms Amt

Department of Environmental Engineering
Period: 01/12/2001 → 01/06/2002
Number of participants: 1
Project ID: 30212
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 53,000.00 Danish Kroner
Project

NAME. Nitrate from aquifers and influences on carbon cycling in marine ecosystems.Contrac no.: EVK3-CT-2001-00066-2003

Nitrate enters the sea with groundwater discharging through the shoreface at many locations along the European coast. The impact of this process on the state of eutrophication of the coastal marine environment is presently unknown. This project investigates the transport of nitrate through the shoreface by groundwater discharge and the biogeochemical processes that together determine the net flux of groundwater nitrate into the marine environment. The findings will be quantified in coupled groundwater and marine models that will facilitate integrated coastal zone management with respect to the interest of agriculture and the use of the coastal marine environment in terms of recreation and food production.

Department of Environmental Engineering
DHI Denmark
Max Planck Institute
Netherlands Institute of Ecology
Université de Lausanne
Ribe Amt
Period: 01/12/2001 → 28/02/2005
Number of participants: 7
Acronym: NAME
Project ID: 30185
Project participant:
Postma, Diederik Jan (Intern)
Andersen, Martin Søgaard (Intern)
Jakobsen, Rasmus (Intern)
Lange, Erik Rønn (Intern)
Hansen, Ellen Zimmer (Intern)
Skov, Henrik (Intern)
Jensen, Lene Kirstejn (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 3,563,730.00 Danish Kroner

Regulation of xenobiotic compounds in separate rainwater discharges
The contribution of E&R to this project deals with the application of biotests in the regulation of rainwater discharges

Department of Environmental Engineering
Period: 01/12/2001 → 01/04/2002
Number of participants: 2
Acronym: 318
Project participant:
Christensen, Anne Munch (Intern)
Project Manager, organisational:
Baun, Anders (Intern)

CORONA, Confidence in forecasting of natural attenuation as a risk-based groundwater remediation strategy.
The overall goal of CORONA is to increase confidence in assessment and forecasting of natural attenuation (NA) of groundwater pollution. M&R DTU collaborates with several European partners (http://www.shef.ac.uk/corona/) and together we will carry out multi-disciplinary research on 6 varied field sites and in the laboratory and use numerical modeling. The activities done by M&R DTU are primarily connected to a field site where landfill leachate infiltrates to an underlying sandy aquifer. This creates a reduced plume, with manganese and nitrate reducing conditions close to the landfill. Different phenoxy acid herbicides are the main pollutants in the leachate. These compounds are recalcitrant in the anaerobic core of the plume, but the hypothesis is that a significant mass reduction (by microbial degradation) occurs at the fringe of the plume, where aerobic water from the surrounding aquifer mixes with the contaminated water. This hypothesis will be tested by field observations (mass fluxes through control planes as well as high resolution multi-level-samplers) and laboratory investigations (micro-scale variations in fringe sediment cores of phenoxy acid degradation potential, microbial numbers and redox chemistry). The experimental results will be incorporated in a reactive solute transport model for the site.

Department of Environmental Engineering
Commonwealth Scientific and Industrial Research Organisation
Ejlskov Consult ApS
County of Southern Jutland
Period: 01/11/2001 → 31/12/2004
Number of participants: 6
Acronym: CORONA
Project ID: 30202
Project participant:
Tuxen, Nina (Intern)
Skov, Bent Henning (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Sørensen, Jens Schaarup (Intern)
Refstrup, Mona (Intern)
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 2,755,688.00 Danish Kroner
Project

Eftervækstpotentiale for polymere materialer i drikkevand
Department of Environmental Engineering
Period: 01/11/2001 → 01/11/2004
Number of participants: 6
Phd Student:
Corfitzen, Charlotte B. (Intern)
Supervisor:
Arvin, Erik (Intern)
Main Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Examiner:
Schmidt, Jens Ejbye (Intern)
Miettinen, Ilkka Tapani (Ekstern)
Roslev, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt EU-finansieret
Project: PhD

Life cycle assessment of road construction and reuse of waste incineration residues
The project develops a life-cycle-assessment model for road construction with and without use of incineration residues. The model accounts for all uses and savings in resources and environmental emissions including savings in residue landfilling if the residue is use in road construction. A key issue is quantification of the leaching from the materials and test data and sub-models have been developed.

Department of Environmental Engineering
Danish Road Directorate
Vestforbrænding

Amagerforbrænding
Period: 01/10/2001 → 31/05/2005
Number of participants: 3
Project ID: 30224
Project participant:
Birgisdottir, Harpa (Intern)
Christensen, Thomas Højlund (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 1,450,000.00 Danish Kroner
Project
Reduction of xenobiotic compounds found in the sewage sludge by bioprocessing. START-programmet.

Department of Environmental Engineering
Period: 20/09/2001 → 01/02/2002
Number of participants: 2
Project ID: 30199
Project participant:
Angelidaki, Irini (Intern)
Project Manager, organisational:
Schmidt, Jens Ejbye (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 82,500.00 Danish Kroner

Arsenfjernelse fra drikkevand ved udfældning med maturligt forekommende jern

Department of Environmental Engineering
Period: 01/09/2001 → 22/05/2006
Number of participants: 7
Phd Student:
Sharma, Anitha Kumari (Intern)
Supervisor:
Mosbæk, Hans (Intern)
Postma, Diederik Jan (Intern)
Main Supervisor:
Tjell, Jens Christian (Intern)
Examiner:
Arvin, Erik (Intern)
Ahmed, M. Feroze (Ekstern)
Østergaard, Peter Holm (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnnet stipendie
Project: PhD

Evaluation of the attenuation of non-methane-organic-compounds (NMOSs) in the top cover of a french landfill

The purpose of this project is to build on existing Danish and U.S. work to investigate both the mechanisms and rates of attenuation of NMOC’s in landfill cover material. This will be done through a combined field and laboratory investigation. The specific goals of this project are to evaluate both a) the potential for NMOC attenuation, as determined by laboratory batch studies; and b) the measured rates of NMOC emissions in the landfill cover material at a French landfill.

Department of Environmental Engineering
Period: 01/09/2001 → 30/11/2001
Number of participants: 1
Project ID: 30190
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 112,391.00 Danish Kroner

Incertitude and its Implications for the Environmental Field

Department of Environmental Engineering
Miljøvurdering af restprodukters genanvendelse

Department of Environmental Engineering
Period: 01/09/2001 → 23/12/2005
Number of participants: 6
Phd Student: Birgisdottir, Harpa (Intern)
Supervisor: Hauschild, Michael Zwicky (Intern)
Main Supervisor: Christensen, Thomas Højlund (Intern)
Examiner: Kjeldsen, Peter (Intern)
Finnveden, Göran (Ekstern)
Gardner, Kevin H. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Support to capacity building at the water resources university, Hanoi
Sub-components of the "National Capacity Building Component" under the Danida Water Sector Programme Support to Vietnam. The project support the Water Resources University in Hanoi and Ho Chi Minh City to improve teaching and capacity of teachers.

Department of Environmental Engineering
Period: 01/09/2001 → 01/10/2006
Number of participants: 2
Project ID: 30203
Project participant: Rosbjerg, Dan (Intern)
Project Manager, organisational: Bregnhøj, Henrik (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 264,000.00 Danish Kroner
Project

Nikkelfrigivelse ved pyritoxidation
Miljøstyrelsen ønsker undersøgt hvilke faktorer, der har betydning for nikkelfrigivelse til grundvandet i kalkmagasinerne i typeområdet ved Køge Bugt. Undersøgelsessstrategi omfatter: Gastransport (barometerånding) i den umættede zone, effekt af hævnning af vandspojlet på nikkelinholdet og vurdering af regionale aspekter.
Improved monitoring and control of the anaerobic process. START-programmet

Department of Environmental Engineering
Period: 01/07/2001 → 31/03/2002
Number of participants: 1
Project ID: 30191
Project Manager, organisational:
Angelidaki, Irini (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 89,512.00 Danish Kroner

Spreadsheet for estimation of CDS storms for short durations

In continuation of previous work with regionalisation of extreme rainfall data for urban runoff applications, a methodology for automated estimation of CDS design storms based on regional short-duration rain data is developed. This involves: 1. Analysis of short duration rain data (1, 2 and 5 minutes) corresponding to previous analyses, cf. the link below 2. Documentation of the new data analyses 3. Extention of spreadsheet-based CDS estimation tool 4. Documentation of the new spreadsheet version

Department of Environmental Engineering
DHI Denmark
Period: 01/07/2001 → 31/12/2002
Number of participants: 1
Acronym: svk26
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Study on anaerobic treatment of sewage sludge for removal of linear alkylbenzene sulfonates (LAS).

We are aiming with this project to investigate anaerobic treatment of sludge with respect of eliminating/reducing LAS concentration. The influence of several parameters, such as temperature, hydraulic retention time, etc. on the removal efficiency will be investigated.

Department of Environmental Engineering
Period: 01/07/2001 → 30/06/2004
Number of participants: 4
Project ID: 30189
Denitrification with high salt content.
Undersøgelse af denitrifikation i opløsninger med højt indhold af calciumklorid (10-12%), for at opbygge viden om denne proces med henblik på rensning af spildevand fra gødningsproduktion

Department of Environmental Engineering
Period: 15/06/2001 → 31/12/2001
Number of participants: 1
Project ID: 30195
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 1,090,680.00 Danish Kroner

Removal of MTBE from water
Department of Environmental Engineering
Period: 01/06/2001 → 15/12/2002
Number of participants: 1
Project ID: 30186
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 399,480.00 Danish Kroner

Center for Industrial Vandmiljøteknologi (CIV) / Øresundskontrakt
Purpose: to ensure competence building and technology development within concepts and technologies for the management of industrial water flows and environmental optimisation. Solutions developed shall aim at improving industrial pollution control through resources recovery in production processes, introduction of new technology, and integrated management of production and treatment facilities. And to inspire other enterprises to implement corresponding solutions in production and treatment facilities.

Department of Environmental Engineering
Period: 01/04/2001 → 31/03/2004
Number of participants: 2
Project ID: 30197
Project participant:
Eilersen, Ann Marie (Intern)
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Ecotoxicological effects of surface water and groundwater collected at waste dump site located near Harboøre Tange, Denmark

The project will, primarily through the execution of a practical research program, illuminate the risk of undesired biological effects of toxic substances in groundwater and surface water collected from areas suspected of being heavily contaminated near Harboøre Tange. The samples are subjected to ecological tests to investigate the possible acute toxicity and a few samples will also be subjected to tests for long-term effects in the recipient.

Department of Environmental Engineering
Period: 01/04/2001 → 31/12/2001
Number of participants: 4
Project participant:
Bergstrøm, Jane Mette (Intern)
Kusk, Kresten Ole (Intern)
Kruse, Susanne (Intern)

Project Manager, organisational:
Baun, Anders (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 60,000.00 Danish Kroner

The use of x-ray micro-tomography and pore-scale modeling to evaluate dynamic and equilibrium pore-scale processes in porous media

Department of Environmental Engineering
Period: 01/04/2001 → 08/09/2006
Number of participants: 5
PhD Student:
Christensen, Britt Stenhøj Baun (Intern)
Main Supervisor:
Jensen, Karsten Høgh (Intern)
 Examiner:
Binning, Philip John (Intern)
Jacobsen Hørbye, Ole (Ekstern)
Willson, Clinton S. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

**Biogasprogram**
Sammenfattning af Biogasprogrammets aktiviteter og resultater til programmets slutrapportering.

Department of Environmental Engineering
Period: 01/03/2001 → 01/07/2001
Number of participants: 2
Project ID: 30207
Project participant:
Pind, Peter Frode (Intern)
Project Manager, organisational:
Angelidaki, Irini (Intern)

**Financing sources**
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 158,384.00 Danish Kroner

**CPDW. Development of harmonized tests to be used in european approval scheme concerning construction products in contact with drinking water.**
5. Framework Programme (EESD)

Department of Environmental Engineering
KIWA.RC
WRC
OFICT
Thames Water Utilities Ltd
DVGW
Centre de Recherche D'Expertise et de Contrôle des Eaux de Paris
Period: 01/03/2001 → 31/05/2003
Number of participants: 2
Acronym: CPDW
Project ID: 30182
Project participant:
Corfitzen, Charlotte B. (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 835,000.00 Danish Kroner

**Environmental assessment of solid waste management system with a view to technological innovation**

Department of Environmental Engineering
Period: 01/03/2001 → 28/02/2003
Number of participants: 1
Project ID: 30159
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

**Financing sources**
Source: Sam.arb.aftaler, Private danske - Fonde
Name of research programme: Sam.arb.aftaler, Private danske - Fonde
Amount: 750,000.00 Danish Kroner
Algetoksicitet
Formålet med dette projekt er at frembringe et tilstrækkeligt datagrundlag til at definere en korrelation af toksicitet med LogP (minimumstoksicitet). Der vil blive udført test på ca. 75 kemiske stoffer bredt dækkende det kemiske univers.

Department of Environmental Engineering
Period: 01/02/2001 → 15/12/2001
Number of participants: 1
Acronym: QSAR-II-B
Project ID: 30158
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 295,000.00 Danish Kroner

Project

Algetoksicitetsdata for toksiske organiske kemiske stoffer - Litteratur
Formålet er at frembringe et tilstrækkeligt datagrundlag til at foretage en analyse af sammenhængene mellem fysisk-kemiske egenskaber af organiske stoffer og deres toksiske effekt. I projektet vil der blive søgt data fra håndbøger og databaser, hvor de fundne data søges underkastet en kvalitetsvurdering.

Department of Environmental Engineering
Period: 01/02/2001 → 31/10/2001
Number of participants: 1
Acronym: QSAR-II-A
Project ID: 30160
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 110,000.00 Danish Kroner

Project

A QSAR-based model for predicting of algal toxicity is developed based on multiple tests with compounds with selected molecular structures. About 400 chemicals are being tested.
The purpose of this project is, by performance of multiple algal tests to create a data base for development of a noncongeneric universal computer model. We focus on the QSAR-related toxicity of chemicals with molecular structures which influence the toxicity, in a way that makes it possible to find a relationship between structures and specific toxicity towards algae - and based on this - to develop a noncongenerisk universal computer model for prediction of algal toxicity of compounds which has not been tested.

Department of Environmental Engineering
Danish Ministry of Environment and Energy
Period: 01/02/2001 → 31/12/2003
Number of participants: 2
Project ID: 30181
Project participant:
Nyholm, Niels (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 295,000.00 Danish Kroner

Project
Litteraturstudium og opstilling af måleprogram for overfladevand

Department of Environmental Engineering
Period: 01/02/2001 → 30/06/2001
Number of participants: 1
Project ID: 30176
Project Manager, organisational: Ledin, Anna (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 250,000.00 Danish Kroner
Project

Modeller til miljøvurdering af affaldssystemer
Department of Environmental Engineering
Period: 01/02/2001 → 18/05/2005
Number of participants: 6
Phd Student: Kirkeby, Janus Søgaard (Intern)
Supervisor: Hauschild, Michael Zwicky (Intern)
Main Supervisor: Christensen, Thomas Højlund (Intern)
Examiner: Mikkelsen, Peter Steen (Intern)
Bilitewski, Bernd (Ekstern)
Nielsen, Per Henning (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Biogasification of organic household waste: Waste composition, pretreatment and methane potentials
Projektet vil etablere basisdata for sammensætning og karakteristika af organisk husholdningsaffald i forhold til biogaspotentialet for fraktioner indsamlet separat efter forskellige sorteringskriterier. Projektet indeholder 3 faser: En kritisk gennemgang af det eksisterende datagrundlag Indsamling af nye pålidelige data om sammensætningen af det organiske affald Måling af faktiske biogaspotentialer.

Department of Environmental Engineering
Lund University
Malmø Kommune/Sysav
Rambøll Danmark A/S
Period: 01/01/2001 → 30/11/2002
Number of participants: 2
Acronym: 240
Project ID: 30145
Project participant: Hansen, Trine Lund (Intern)
Project Manager, organisational: Christensen, Thomas Højlund (Intern)
Chemical assessment of the environment

Many chemicals pollute our environment. The extent and severity of the situation are not always well known if hard facts are lacking. The environmental state of affairs depends very much on the industrial production modes, the consumer habits, the enforcement of environmental protection regulations, and the end-of-pipe installations to limit harmful emissions. In developing economies some of the limiting factors for environmental protection are not optimal. This may lead to excess exposure with harmful substances to flora and fauna, including humans. Universities can play an important role in raising public awareness on the local, regional, and national problems, as well as providing theoretical framework for better environmental protection. The universities may often help in providing basic knowledge and hard facts on environmental presence and fate of chemicals, toxicity and risk, and local/regional conditions. The universities may gain reputation for competent and independent counselling through participation in public life, and through publicising their findings. Objectives

The objectives of the network are:

• To increase impact of university research through focusing manpower and equipment on elucidation of pertinent local/regional contamination problems
• To increase capacity and quality of chemical analysis
• To improve methodology for assessing the chemical status of the environment
• To improve the basis for risk assessment in relation to chemicals in the environment
• To increase inter-university collaboration on selected chemical contamination topics
• To improve the basis for risk assessment in relation to chemicals in the environment
• To increase inter-university collaboration on selected chemical contamination topics

Methods and approach

The base for a successful implementation to reach these objectives is the availability of well qualified staff capable of formulating and carrying through the concrete joint activities, and as well the presence of adequate and functioning physical possibilities for the practical research. Environmental assessment methodology in pollution research and chemical analytical capability of the involved researchers will be enhanced and strengthened through exchange of research staff (academics) and graduate students between universities for participation in topics of joint interest. This goes both ways, as studying at Danish universities should improve the analytical experience, while studying in DEA countries should strengthen undertaking of much needed fieldwork and improve laboratory analytical capacity and quality. The diversity of problems encountered in chemical assessment of the environment has called for creation of four sub-networks focusing on the joint practical collaboration. An additional approach is to support creation of “centres of excellence” at the involved universities. The remedies for this upgrading of existing activities are staff exchange and training at other LUCED universities, and exchange of experienced staff for help in solving problems of importance.

Department of Environmental Engineering

National University of Malaysia

Prince of Songkla University

Chiang Mai University

Period: 01/01/2001 → 31/12/2005
Number of participants: 5
Acronym: CHASE

Project participant:

Bregnhøj, Henrik (Intern)
Genc-Fuhrman, Hülya (Intern)
Sharma, Anitha Kumari (Intern)
Mosbæk, Hans (Intern)

Project Manager, organisational:

Tjell, Jens Christian (Intern)

Demonstrationsprojekt med genanvendelse af gråt spildevand fra større gråvandsproducent.


Department of Environmental Engineering

Miljøstyrelsen
ENDEGRADE. Endophytic degrader bacteria for improving phytoremediation of organic xenobiotics.

Development of a model that can consider a woody compartment, the transport and fate of metabolites and the effect of dissociation on transport. Modelling of the effects of endophytic bacteria (both wild type and modified) on the fate of specific organic xenobiotics in plants.

Department of Environmental Engineering
Period: 01/01/2001 → 31/12/2003
Number of participants: 1
Acronym: Endegrade
Project ID: 30150
Project Manager, organisational: Trapp, Stefan (Intern)

Financing sources
Source: Unknown
Name of research programme: Unknown
Amount: 1,296,300.00 Danish Kroner

Etablering og drift af anlæg til opsamling, rensning og genanvendelse af gråvand ved boliger til toiletteskyl og maskinvask af tøj.

Der er stigende interesse for at reducere vandforbruget særligt i områder, hvor vandforbruget overstiger den naturlige grundvandsproduktion. Erfaringerne med etablering og drift af gråvandsanlæg er dog endnu utilstrækkelig til at der kan udarbejdes regler desangående. Derfor iværksættes et projekt der har til formål at optimere driften i gråvandsrenseanlæg ved to boliger: Beboerforeningen Bo90, Nørrebro, københavn og beboerforeningen Afd. 47, Virklund, Silkeborg.

Department of Environmental Engineering
Miljøstyrelsen
Sundhedsstyrelsen
Period: 01/01/2001 → 31/12/2002
Number of participants: 6
Acronym: 247
Project participant: Eilersen, Ann Marie (Intern)
Eriksson, Eva (Intern)
Henze, Mogens (Intern)
Smith, Morten (Intern)
Mikkelsen, Peter Steen (Intern)
Project Manager, organisational: Ledin, Anna (Intern)

Financing sources
Source: Unknown
**Forsøg med kulfilterrensning af grundvand for pesticider**

Formålet er at bestemme 3 kultypers kapacitet til at fjerne pesticiderne BAM og Atrazin fra tre forskellige danske grundvandstyper. Kapaciteten bestemmes ud fra gennembrudskurverne opnået med kolonneforsøg. Såfremt undersøgelsens resultater giver mulighed for det, skal de undersøgte kultypers egnethed til at fjerne andre pesticider vurderes.

Department of Environmental Engineering

De Nationale Geologiske Undersøgelser for Danmark og Grønland

Krüger A/S

Danish Technological Institute

Period: 01/01/2001 → 28/02/2002

Number of participants: 5

Acronym: 256

Project participant:

Skov, Bent Henning (Intern)

Albrechtsen, Hans-Jørgen (Intern)

Clausen, Liselotte (Intern)

Kagstrup, Tanja (Intern)

Project Manager, organisational:

Arvin, Erik (Intern)

**Financing sources**

Source: Unknown

Name of research programme: Ukendt

Amount: 900,000.00 Danish Kroner

Project

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**Impact of DOM on the transport of organic contaminants in groundwater.**

Dissolved organic matter (DOM) in groundwater is, in elevated concentrations, to be treated as a contaminant per se. Furthermore, it may act as a carrier for different types of contaminants. The degradation of DOM is generally slow in groundwater, but when degradation takes place the binding capacity for different types of organic contaminants may be changed. A better understanding of these changes in binding capacity will be of importance in order to be able to understand and predict the transport of contaminants from polluted soils, like old petrol stations and landfills, to receiving aquifers. Furthermore, the degradation processes, as well as other types of attenuation of organic matter in the groundwater, are poorly understood, especially in qualitative terms. In the proposed project we hypothesize that: - DOM in the landfill leachate polluted groundwater is degraded in such a way that it is not only reduced in quality, but is also qualitatively transformed by microbial degradation processes. - As a consequence of these qualitative changes of DOM, the binding capacity for organic contaminants is influenced. Furthermore we intend to elucidate the mechanisms behind observed changes in binding capacity of DOM due to degradation.

Department of Environmental Engineering

Stockholm University

Period: 01/01/2001 → 31/12/2003

Number of participants: 1

Acronym: 226

Project Manager, organisational:

Ledin, Anna (Intern)

**Financing sources**

Source: Unknown

Name of research programme: Ukendt

Amount: 0.00 Danish Kroner

Project
Processes in water supply systems affecting water quality.
Currently, physical flow in water supply systems is very well understood, as is reflected by the spectrum of models available on the world market, which includes two Danish systems. However, a consistent model that can also predict the evolution of drinking water quality from the time it leaves the water treatment facility until it runs out of the consumer's tap is lacking. The bottleneck to credible water quality models is not mathematical formulations for currently understood processes, but the lack of parameters to describe much of the biological and chemical processes that take place in water supply systems. Basic fundamental understanding must be developed and the new information transferred into mathematical terms before the situation can be improved. We propose an integrated project that unites the skills and expertise of a multidisciplinary team to develop new understanding of microbial and chemical processes and to provide an improved model for predicting water quality evolution. The four themes are: Advanced characterisation methods - development Biological processes in water works and distribution systems Chemical processes in distribution systems Integrated modelling of water supply systems.

Department of Environmental Engineering
Aalborg University
DHI Denmark
FORCE Instituttet
Period: 01/01/2001 → 31/12/2002
Number of participants: 2
Acronym: 233
Project participant:
Jakobsen, Rasmus (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Uknown
Amount: 0.00 Danish Kroner

Støtte til udvikling af internetkurser
Støtte til udvikling af internetkurser

Department of Environmental Engineering
Period: 01/01/2001 → 31/12/2001
Number of participants: 2
Acronym: 285
Project ID: 30178
Project participant:
Warnaars, Eric (Intern)
Project Manager, organisational:
Harremoes, Poul (Intern)

Financing sources
Source: Unknown
Name of research programme: Uknown
Amount: 200,000.00 Danish Kroner

The use of Sewater Neutralised Red-Mud (Bauxsol) to remove Arsenic from Groundwater

Department of Environmental Engineering
Period: 01/01/2001 → 26/05/2004
Number of participants: 7
Phd Student:
Genc-Fuhrman, Hulya (Intern)
Supervisor:
McConchie, David (Ekstern)
Schuiling, Olaf (Ekstern)
Main Supervisor:
Tjell, Jens Christian (Intern)
Examiner:
Ledin, Anna (Intern)
Ahmed, M. Feroze (Ekstern)
Østergaard, Peter Holm (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Privatist
Project: PhD

DUCED - I&UA (Danish University Consortium for Environment and Development - Industry and Urban Areas) - Consolidation Phase 2000-2003
As described in "Letter of Grant, Annex 1"

Department of Environmental Science and Engineering
Department of Environmental Engineering
Period: 01/12/2000 → 31/12/2003
Number of participants: 6
Project participant:
Larsen, Nils Juul (Intern)
Bregnhøj, Henrik (Intern)
Warnaars, Eric (Intern)
Thygesen, Niels (Intern)
Whitehouse, Stuart Lee (Ekstern)
Project Manager, organisational:
Henze, Mogens (Intern)

Project

DUCED - I&UA (Danish University Consortium for Environment and Development - Industry and Urban Areas) - Consolidation Phase 2000-2003
As described in "Letter of Grant, Annex 1" Project Managing Director: Niels Thygesen

Department of Environmental Engineering
Period: 01/12/2000 → 31/05/2004
Number of participants: 4
Acronym: 262
Project ID: 30140
Project participant:
Warnaars, Eric (Intern)
Bregnhøj, Henrik (Intern)
Thygesen, Niels (Intern)
Thygesen, Niels (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt

Emmission scenarios for the end of service life of substances - waste treatment.
The new waste chapter in the TGD is expected to provide guidance how to address the potential concerns specifically related to the "rend-of-service-life" waste stage of chemical substances. This means in particular Criteria in which cases a waste scenario should be carried out guidance how to identify the most relevant emission scenarios in these cases recommendations on how to make use of available emission models for certain waste operations and emission scenarios for certain product types guidance on how proceed if no realistic emission scenario is available examples how to formulate the standard conclusions with regard for more information based on waste related releases.

Department of Environmental Engineering
Miljøstyrelsen
Period: 01/12/2000 → 31/12/2000
Number of participants: 2
Effekter af bekæmpelsesmidler på akvatiske planter og dyr

Environmental assessment of organic household waste management in the municipal of Copenhagen

Rensning af MTBE forurennet grundvand i bioreaktor med MTBE som primært substrat.
Projektet indbærer udvikling og afprøvning af rensningsmetode til biologisk nedbrydning MTBE. Metoden skal : Effektovt rense både høje og lave koncentrationer af MTBE Være driftsikker og forholdsmaessigt ukompliceret at drive for personalet rense ved tilstedeoværelse af jem, mangan og andre naturlige grundvandskomponenter Rense ved tilstedeoværelse af andre benzinkomponenter (BTEX) Starte opfungere inden for en overskuelig tid Være økonomisk i forhold til traditionel aktivt kulrensning.
**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 960,000.00 Danish Kroner

**Strømningsmønstre i opsprækket moræneler**

Department of Environmental Engineering
Period: 01/11/2000 → 23/12/2005
Number of participants: 8
Phd Student:
Rosenbom, Annette Elisabeth (Intern)
Supervisor:
Ernstsen, Vibeke (Ekstern)
Jensen, Karsten Hegh (Intern)
Refsgaard, Jens Christian (Ekstern)
Main Supervisor:
Larsen, Flemming (Intern)
Examiner:
Jakobsen, Rasmus (Intern)
Hansen, Søren (Intern)
Jarvis, Nicholas John (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Kandidatstipendiat
Project: PhD

**Udarbejdelse af måleprogram for komposteret fæces.**
Måleprogrammet skal berette til at vurdere reduktionen af smitstoffer i human afføring som har været behandlet enten centralt i efterkomposteringsbeholder eller i forskellige kommercielt tilgængelige komposttoiletter.

Department of Environmental Engineering
Miljøstyrelsen
Number of participants: 1
Acronym: 242
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 19,780.00 Danish Kroner

**Data Assimilation in Hydrological Modelling**

Department of Environmental Engineering
Period: 01/10/2000 → 20/08/2004
Number of participants: 6
Phd Student:
Drecourt, Jean-Philippe (Intern)
Supervisor:
Madsen, Henrik (Intern)
Main Supervisor:
Rosbjerg, Dan (Intern)
Examiner:
Binning, Philip John (Intern)
Dee, Dick (Ekstern)
Geer, Frans van (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

**Identifikation af gråvandsanlæg.**

Department of Environmental Engineering

Miljøstyrelsen
Period: 01/10/2000 → 01/03/2001
Number of participants: 3
Acronym: 246
Project participant:
Eriksson, Eva (Intern)
Smith, Morten (Intern)
Project Manager, organisational:
Ledin, Anna (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Project

**MARNURE research network**
MARNURE: Management of Resources in Urban Areas and Industries, Focus on Nutrient Recycling is a LUCED-I&UA research network. The focus of the MARNURE research network is techniques and management systems, which can improve the handling of resources in urban areas and industries. Especially, the focus in most of MARNURE’s projects is on improving the recycling of nutrients and investigating the socioeconomic possibilities and constraints in the practical implementation of the techniques.

Department of Environmental Engineering
Period: 01/10/2000 → 01/10/2006
Number of participants: 3
Acronym: MARNURE
Project participant:
Bregnhøj, Henrik (Intern)
Tjell, Jens Christian (Intern)
Project Manager, organisational:
Bregnhøj, Henrik (Intern)

**Studieophold i Australien vedr. oprensningsteknikker i grundvand.**

Department of Environmental Engineering

Centre for Groundwater Studies
Number of participants: 1
Acronym: 245
Project participant:
Energy - Based Land - Surface Modelling: New Opportunities in Integrated Hydrological Modelling

Department of Environmental Engineering
Period: 15/08/2000 → 28/09/2005
Number of participants: 6
Phd Student: Overgaard, Jesper (Intern)
Supervisor: Butts, Michael Brian (Intern)
Main Supervisor: Rosbjerg, Dan (Intern)
Examiner: Bauer-Gottwein, Peter (Intern)
Jensen, Karsten Høgh (Intern)
Shuttleworth, W. James (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Quantification of Natural Attenuation in Groundwater using Analytical-Chemical Tools

Department of Environmental Engineering
Period: 01/08/2000 → 10/06/2005
Number of participants: 6
Phd Student: Reitzel, Lotte (Intern)
Supervisor: Ledin, Anna (Intern)
Main Supervisor: Bjerg, Poul Legstrup (Intern)
Examiner: Kjeldsen, Peter (Intern)
Hunkeler, Daniel (Ekstern)
Lauritsen, Frants Roager (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

The use of x-ray micro-tomography and pore-scale modeling to evaluate dynamic and equilibrium pore-scale processes in porous media

Department of Environmental Engineering
Period: 01/07/2000 → 01/01/2005
Number of participants: 1
Acronym: 324
Project ID: 30087
Project Manager, organisational: Wildenschild, Dorthe (Intern)

Financing sources
**Effekter af toksiske stoffer i regnbetingede udløb.**
Projektet skal primært gennem udførelse af et praktisk undersøgelsesprogram belyse risikoen for uønskede biologiske effekter i recipienten af toksiske stoffer i regnbetingede udløb. Udløbsprøver fra udvalgte oplande undrækkes økotoksikologiske tests for at undersøge den mulige akutte toksicitet af regnbetingede udløb, mens risikoen for langsigtede effekter i recipienten forventes undersøgt ved testning af sedimenter udtager op- og nedstrøms et regnbetinget udløb.

Department of Environmental Engineering

COWI A/S
Period: 01/06/2000 → 31/12/2000
Number of participants: 2
Acronym: 236
Project participant:
Baun, Anders (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

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**PEGASE. Part of EU project EVK1-CT-1999-00028.**
Contract and direct costs transferred from University of Copenhagen, Faculty of Science, Department of Geology. Overført fra KU: 870.000 DKK 1/3-02

Department of Environmental Engineering
Period: 01/06/2000 → 30/11/2003
Number of participants: 3
Acronym: PEGASE
Project ID: 30217
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Clausen, Liselotte (Intern)
Project Manager, organisational:
Jørgensen, Peter Rene (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 152,500.00 Danish Kroner

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**PEGASE. Part of EU project EVK-CT-1999-00028**
Contract and direct costs transferred from University of Copenhagen, Faculty of Science, Department of Geology. Overført fra KU: 870.000 DKK 1/3-02

Department of Environmental Science and Engineering
Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
Period: 01/06/2000 → 30/11/2003
Number of participants: 4
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Clausen, Liselotte (Intern)
Jørgensen, Peter (Ekstern)
Project Manager, organisational:
Larsen, Nils Juul (Intern)
Project

PEGASE. Pesticides in European groundwaters.
The project is a detailed study of representative Aquifers and simulation of possible evolution scenarios to be carried out in the framework of the specific research and technological development programme Eenergy Environment and Sustainable Development (EESD).

Department of Environmental Engineering
University of Copenhagen
BRGM
Ecole Polytechnique Federale de Lausanne (EPFL)
Lund University
Research Centre Julich (FZJ)
Period: 01/06/2000 → 30/11/2003
Number of participants: 2
Acronym: PEGASE
Project ID: 30050
Project participant:
Clausen, Liselotte (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Unknown
Amount: 1,622,052.00 Danish Kroner
Project

Undersøgelse af udvalgte patogener, herunder campylobacter i udvalgte vandværker.

Department of Environmental Engineering
Miljøstyrelsen
Dansk Landbrugs Rådgivnings Center
Københavns Vand
Danske Vandværkers Forening
De private Vandværker
Period: 15/04/2000 → 15/12/2000
Number of participants: 1
Acronym: 229
Project ID: 30131
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Unknown
Amount: 50,400.00 Danish Kroner
Project
Faglig sekretær for Teknologiudviklingsprogrammet I forhold til MTBE

Department of Environmental Engineering

Miljøstyrelsen
Period: 03/04/2000 → 31/12/2001
Number of participants: 1
Acronym: 230
Project ID: 30130
Project Manager, organisational: Arvin, Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 325,060.00 Danish Kroner

Eksperimentelle og numeriske undersøgelser af forureningsoprensning ved dampinjektion

Department of Environmental Engineering
Period: 01/04/2000 → 12/02/2004
Number of participants: 6
Phd Student: Gudbjerg, Jacob (Intern)
Supervisor: Jensen, Karsten Høgh (Intern)
Main Supervisor: Sonnenborg, Torben Obel (Intern)
Examiner: Binning, Philip John (Intern)
Heron, Gorm (Intern)
Sleep, Brent Edwin (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Blandet Finansiering
Project: PhD

Memorandum of understanding for twinning arrangement between Asian Institute of Technology and Technical University of Denmark.
AIT and DTU have been successfully carrying out a twinning arrangement over the past 3 years on "Wastewater Nitrogen Removal. This arrangement aims to establish a continued scientific collaboration between Asian Institute of technology and DTU for promoting research and manpower development in the S.E. Asian region in "Industrial wastewater treatment for Reuse" .

Department of Environmental Engineering

Asian Institute of Technology
Period: 01/04/2000 → 30/06/2004
Number of participants: 1
Acronym: 235
Project ID: 30251
Project Manager, organisational:
Harremoës, Poul (Intern)

**Financing sources**

Source: Unknown  
Name of research programme: Ukendt  
Amount: 456,000.00 Danish Kroner  
Project

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**Modelbaseret risikovurdering af integrerede spildevandssystemer**

Department of Environmental Engineering  
Period: 01/04/2000 → 02/02/2006  
Number of participants: 6  
Phd Student:  
Hauger, Mikkel Boye (Intern)  
Supervisor:  
Linde, Jens Jørgen (Intern)  
Main Supervisor:  
Mikkelsen, Peter Steen (Intern)  
Examiner:  
Rosbjerg, Dan (Intern)  
Ashley, Richard Martin (Ekstern)  
Johansen, Niels Bent (Ekstern)

**Financing sources**

Source: Internal funding (public)  
Name of research programme: DTU-lønnet stipendie  
Project: PhD

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**BASELINE. Natural baseline quality in European aquifers: a basis for aquifer management**

The objective of the BASELINE project is to establish criteria for defining natural water quality baselines and develop a standardised Europe-wide approach for use in the emerging Water Framework Directive.

Department of Environmental Engineering  
Period: 01/03/2000 → 31/07/2003  
Number of participants: 4  
Acronym: Baseline  
Project ID: 30126  
Project participant:  
Kjøller, Claus (Intern)  
Andersen, Martin Søgaard (Intern)  
Iversen, Vibeke Margrethe Nyvang (Intern)  
Project Manager, organisational:  
Postma, Diederik Jan (Intern)

**Financing sources**

Source: Unknown  
Name of research programme: Ukendt  
Amount: 596,000.00 Danish Kroner  
Project

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**Displacement processes in fractured reservoir chalk**

Department of Environmental Engineering  
Section for Building Materials and Geotechnics  
Department of Civil Engineering  
Geotechnical Institute  
De Nationale Geologiske Undersøgelser for Danmark og Grønland
GRACOS- Groundwater risk assessment at contaminated sites.
Contaminated land in Europe poses a serious problem with respect to soil quality and the risk of spreading of pollutants into other compartments of the environment. The major concern at most contaminated sites is the risk of groundwater pollution by organic and inorganic compounds. Since, the remediation of all of the contaminated sites in Europe is economically not feasible, groundwater risk assessment procedures are needed for the ranking of sites, decision making on further use and remedial actions. In contrast to existing procedures this project concentrates on the development of methodologies for the assessment of the mobile contaminant fraction in contaminated soil and waste material. (i.e. the contaminant fraction which would reach the aquifer). It will allow the determination of the long-term contaminant release rates and the overall emission of pollutants into the groundwater at contaminated sites. The most important innovations expected will be more harmonized and integrated guidelines for groundwater risk assessment in Europe and beyond. At DTU a well controlled field experiment has been carried out. The experiment comprises an emplaced source of a hydrocarbon mixture consisting of volatile to semi-volatile, (partly) biodegradable compounds. The experiment is finalized and preparation of journal papers is on-going.

Department of Environmental Engineering
Eberhard-Karls-Universität Tübingen
Period: 01/02/2000 → 31/03/2004
Number of participants: 5
Acronym: GRACOS
Project ID: 30054
Project participant:
Sørensen, Jens Schaarup (Intern)
Christophersen, Mette (Intern)
Broholm, Mette Martina (Intern)
Hansen, Rita Kallesøe (Intern)
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 4,276,114.00 Danish Kroner

"Study on Phytoremediation of soils from Søllerød Gasværk".
Department of Environmental Engineering
Period: 01/02/2000 → 15/05/2000
Number of participants: 1
Acronym: 212
Project Manager, organisational:
Trapp, Stefan (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 140,000.00 Danish Kroner
Uptake of cyanides into plants - risk or chance for phytoremediation?
Plants have detoxification systems for cyanides. Free cyanide is quickly taken up into plants, but low dosages are also quickly metabolised. The project investigates toxicity, uptake and fate of free and iron complexed cyanides from nutrient solution and soil. The results are needed to evaluate the probable success of the phytoremediation of gas work Holte, Søllerød

Department of Environmental Science and Engineering
Department of Environmental Engineering
Period: 01/02/2000 → 31/12/2004
Number of participants: 2
Project participant:
Larsen, Morten (Ekstern)
Project Manager, organisational:
Trapp, Stefan (Intern)

Project

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 140,000.00 Danish Kroner

Electrochemical removal of CCA from impregnated wood waste
Målet med projektet er at skabe et grundlag for etablering af fælles nordisk samarbejde med det sigte at udvikle metoden: elektrokemisk fjernelse af CCA fra imprægneret træ.

Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
Forestia AS
Period: 03/01/2000 → 03/04/2000
Number of participants: 2
Project participant:
Christensen, Iben Vernegren (Intern)
Project Manager, organisational:
Ottosen, Lisbeth M. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 90,000.00 Danish Kroner

Project
Chemical interactions between polymers and water

Department of Environmental Engineering
Period: 01/01/2000 → 31/12/2002
Number of participants: 1
Acronym: 380
Project Manager, organisational:
Arvin, Erik (Intern)

Enhanced bioremediation of groundwater contaminants
The use of microbial degradation processes as a remedy is attractive because contaminants are degraded to carbon dioxide, water and salts. The research activities focuses on on enhancement of microbial degradation by addition of electron, donors, nutrient or microbes. The target compounds are chlorinated aliphatic compounds actual contaminated sites. The activities are carried out in collaboration with the county of Funen, Copenhagen County and consulting companies in Denmark and North America. The work is supported by County of Funen and the Danish EPA.

Department of Environmental Engineering
COWI A/S
Hedeselskabet
NIRAS A/S
Fyns Amt
GeoSyntec
Period: 01/01/2000 → 31/12/2006
Number of participants: 5
Acronym: 303
Project participant:
Scheutz, Charlotte (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Jakobsen, Rasmus (Intern)
Henriksen, Karina Bomholt (Intern)
Project Manager, organisational:
Bjerg, Poul Logstrup (Intern)

Financing sources
Source: Unknown
Name of research programme: Uukendt
Amount: 0.00 Danish Kroner

Impact of colloidal carrier substances on the mobility of xenobiotic organic compounds in landfill leachates.
The objective of this project is to extend the knowledge on the behaviour of xenobiotic organic compounds in leachate water within landfills and their transport routes to recipients. It is expected that: a) sorption of organic pollutants to colloidal matter will occur in the landfill environments; b) this sorption is dependent on the content of organic matter in the colloids and the pH of the water; c) the sorption is expected to follow the order from hydrophilic to hydrophobic; d) the sorption will affect the availability of the organic pollutant to micro-organisms and thus their degradability. These hypotheses will be addressed by our field and laboratory investigations on phthalates, which are chosen as model compounds, since they cover a large variety of properties common among organic xenobiotics. The results of this study will be published in scientific papers and communicated to landfill owners and companies dealing with wastes as well as their organisations in written reports and open seminars. The research will also be presented on our University home for the interested public.

Department of Environmental Engineering
Department of Water and Environment
Linköping University
Period: 01/01/2000 → 31/12/2002
Number of participants: 1
Acronym: 228
Project Manager, organisational:
Ledin, Anna (Intern)
**Financing sources**  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 0.00 Danish Kroner  
Project

**Kemisk stabilisering af røggasrensning​sprodukter**  
Department of Environmental Engineering  
Period: 01/01/2000 → 14/05/2004  
Number of participants: 6  
PhD Student:  
Astrup, Thomas Fruergaard (Intern)  
Supervisor:  
Hjelmar, Ole (Ekstern)  
Main Supervisor:  
Christensen, Thomas Højlund (Intern)  
Examiner:  
Kjeldsen, Peter (Intern)  
Johnson, Carola Annette (Ekstern)  
Stipp, Susan Louise Svane (Ekstern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Forskningsrådsfinansiering  
Project: PhD

**Koordinator for Aktionsplanens tema 4, samt rapportering af litteraturstudium for tema 4.**  
Projektets opgave er at sammenfatte en rapport for et litteraturstudium om gråvand, d.v.s. spildevand fra køkkenvask, håndvask, badefaciliteter og maskinvask. Litteraturstudiet skal anvendes i forbindelse med godkendelse af måleprogram for gråvandsanlæg i Sundhedssyretsen og Miljøstyrelsen.  
Department of Environmental Engineering  
Miljøstyrelsen  
Sundhedsstyrelsen  
Period: 01/01/2000 → 31/12/2001  
Number of participants: 3  
Acronym: 249  
Project ID: 30134  
Project participant:  
Eilersen, Ann Marie (Intern)  
Ledin, Anna (Intern)  
Project Manager, organisational:  
Henze, Mogens (Intern)  

**Financing sources**  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 280,000.00 Danish Kroner  
Project

**Migration of organic compounds from plastic pipes into drinking water**  
A whole range of chemicals may migrate from polymers to water in contact with the polymer, for example stabilisers. This may affect the aesthetic quality the water and consumer's health. Some of the chemicals are substrate for bacteria and thus stimulates biological growth (aftergrowth). The research has focused on the identification and quantification of chemicals migrating from polyethylene pipes. Thereby, it has been possible to identify aromatic compounds with isobutyl substitutions which can be used as chemical markers for additives. The aim is to provide data that can be used in models describing water quality in distribution systems. In addition, pipe producers can use the information to optimise the hygienic quality their products.  
Department of Environmental Engineering
Regional scaling of groundwater recharge

This project is aimed at improving groundwater recharge estimates in a shallow coastal aquifer as part of a wider investigation of sustainable yield. Current techniques for measuring recharge provide estimates at various scales, both temporal and spatial. These scales may be different from those required for yield calculations. It is therefore necessary to provide methods that can both aggregate and disaggregate recharge measurements. Yield calculations do not adequately account for uncertainty in recharge estimates. The aggregation and disaggregation techniques provided in this thesis show how to estimate the uncertainty in recharge and provide indications of the data requirements of the methods. Finally it is shown that yield calculations require accurate determination of mass balance. For aquifers with shallow water tables, this means that it is necessary to determine plant water use and its impact on recharge. Small spatial scale estimates of recharge have been made using the water table fluctuation method and the chloride mass balance method. A time series model has been developed for the water table fluctuation method of estimating recharge. The water table fluctuation method measures gross recharge, or the sum of all rainfall reaching the water table. The model uses a variable specific yield based upon the soil moisture retention curve, filters out the influence of the Lisse effect on the water table and is capable of detecting recharge even if the water table does not rise. It is shown that high temporal resolution water level data and a variable specific yield are essential for the accurate estimation of recharge. This study has shown that considerable amounts of data are required to minimize uncertainty in the chloride mass balance method. It is shown that a single observation of the chloride concentration of the groundwater can deviate as much as 50% from the average. If observations are averaged over 100 days the error reduces to 20% and after 10,000 days the error is expected to be less than 10%. The chloride mass balance measures long term net recharge, or the gross recharge remaining after accounting for evapotranspiration. A temporal disaggregation method based on a water balance is presented for determining the short term variability of recharge. In the aquifer under investigation, the average annual recharge volume is between a half and a third of the available storage. This means that the temporal variability of the recharge is extremely important in determining the sustainable yield of the aquifer. Annual recharge estimates were found to be well correlated with the annual rainfall, but the annual evapotranspiration sourced from the groundwater was found to be inversely related to the annual rainfall. In a drought period there is reduced recharge and increased discharge by phreatophytes. A simple model has been used to show how these observations can be incorporated into a probabilistic determination of the sustainable yield of the aquifer.

Removal of the pesticides BAM and Atrazine from drinking water by activated carbon

The Danish drinking water resource is increasingly polluted by pesticides, especially BAM and atrazine. Activated carbon filtration is an obvious technology that is used worldwide, but primarily for treatment of surface water, whereas Danish drinking water supply is based on groundwater. The purpose of the project has therefore been to investigate the opportunities for using activated carbon (AC) filtration to remove the pesticides BAM (2,6-Dichlorobenzamide) and atrazine from Danish groundwater. The main objective of the study was to determine the AC capacity, which is an expression for the amount of pesticide which can be bound to a certain amount of AC and maintain the outlet concentration below a certain, given value. The AC capacity was investigated for three different types of activated carbon (Chemviron Filtrasorb F400, Norit ROW 0.8, and Lurgi, Hydrafìn CC 8 x 30). Experimentally three different approaches were used: Column experiments at bench-scale (near-realistic scale (one meter scale)), small-scale column test (centimetre scale) and adsorption isotherm test (batch test with suspended AC). In general this project showed that AC adsorption is a suitable method for removal of BAM from groundwater. Furthermore, the capacities for BAM unexpectedly were in the same order
of magnitude as capacities for atrazine. It was expected that the adsorption of BAM onto activated carbon would be considerably lower compared to that of atrazine, because of the more polar structure of BAM (hydrophobicity). The capacity for BAM and atrazine did not vary significantly with the different types of activated carbon or groundwater investigated in this study. Modelling of break-through curves with the program AQUASIM of tracer experiments carried out in the bench-scale columns and of pesticide adsorption in bench-scale columns and small-scale columns has shown a potential for model-based scaling. It is possible to model sorption of BAM in both bench-scale columns and small-scale columns with isotherm data for BAM (Kd=1.15 m3/g AC). By modelling of the tracer experiments from the bench-scale columns, it is possible to estimate mass transfer parameters necessary for modelling the breakthrough profiles of BAM.

Department of Environmental Engineering
Period: 01/01/2000 → 31/12/2005
Number of participants: 5
Acronym: 377
Project participant:
Skov, Bent Henning (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Clausen, Liselotte (Intern)
Kagstrup, Tanja (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)
Project

Transport of arsenic and iron following mine induced oxidation of an aquifer
Iron and arsenic concentrations have been monitored in a water supply aquifer located in NSW Australia. The aquifer has been sandmined upstream of the water supply pump stations. The sandmining has oxidized the aquifer resulting in the release of trace metals including iron, arsenic and manganese into the aquifer. The project determined the geochemical processes controlling the downstream migration of contamination. These included ion exchange, gibbsite buffering, sulphate reduction, arsenic sorption and aquifer flushing.

Department of Environmental Engineering
University of South Australia
Period: 01/01/2000 → 01/01/2005
Number of participants: 2
Acronym: 367
Project participant:
Postma, Diederik Jan (Intern)
Project Manager, organisational:
Binning, Philip John (Intern)
Project

Udvaskning af organiske kemikalier fra restprodukter
Department of Environmental Engineering
Period: 01/01/2000 → 31/12/2001
Number of participants: 2
Phd Student:
Tuchsen, Peter Lysholm (Intern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Centerfinansieret
Project: PhD

Weathering kinetics and processes
A major environmental problem facing many areas of the world is that of soil erosion. During erosion, the fine sediment is washed away leaving an armour comprised of larger particles on the soil surface. In the long term, erosion rates are therefore no longer transport limited, and instead are limited by the breakdown or weathering of larger sediment. Our ability to model soil erosion in the long term is seriously hindered by a lack of rock weathering kinetic data. In this study we aim, through laboratory and fieldwork, to study the rates of breakdown of various rock types undergoing weathering. The kinetic models that result and insights we gain into the interplay between the rock structure and the breakdown process will result in an enhanced ability to predict both soil erosion and development.
Development of immunological assays for the analysis of pesticides and determination of their prevalence and fate in groundwater and water supply systems.

Immunological assays have turned out to be powerful means to detect pesticides and other environmental contaminants including some of their metabolites at the low concentrations (sub-ug/L) actually found in groundwater. A compound like BAM can be detected even at a concentration of 0.02 ug/L. The project aims at developing the methods in order to cover more pesticides, to improve sensitivity and specificity, and to immobilize the immunological agents on a microchip so that a whole spectrum of pesticides can be detected rapidly and cheaply. The specific role of E&R is to verify the applicability of the methods for groundwater analysis and analysis of water from water supply systems. Furthermore E&R will use the immunological assays during studies of biodegradation processes in groundwater, water treatment plants, and water distribution systems.
Groundwater contamination by MTBE from underground storage tanks.
The aim of the project has been to make a framework project proposal that outlines how future projects can identify whether methyl tert. butyl ether (MTBE) leaking from underground storage tanks is a significant threat to groundwater. It is suggested to: 1) Perform investigations in both sandy aquifers and in moraine clay and chalk aquifers to reflect Danish conditions, and 2) That the field investigations are supplemented by laboratory investigations under controlled conditions.

Department of Environmental Engineering
Miljøstyrelsen
Period: 15/09/1999 → 31/12/1999
Number of participants: 2
Acronym: 199
Project participant:
Bjerg, Poul Løgstrup (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 12,600.00 Danish Kroner

Aqutic toxicity of mono- and diesters of o-phthalic esters
The toxicity of mono- and disesters of o-phthalic esters towards bacteria, algae, and crustaceans is studied through a series of standardized ecotoxicity tests

Department of Environmental Engineering
Period: 01/09/1999 → 01/09/2002
Number of participants: 1
Acronym: 320
Project Manager, organisational:
Baun, Anders (Intern)

BEIDS
BEIDS (Baltic Environmental Information Dissemination System) er et miljøprojekt for østersøregionen med vægten specielt lagt på Energi, transport og bæredygtig udvikling. 6 lande deltager i projketet, som via Internettet søger at forbedre udvekslingen af miljøinformationer i Østersøområdet.

Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
Period: 01/09/1999 → 31/08/2001
Number of participants: 3
Project participant:
Villumsen, Arne (Intern)
Filho, Walter Leal (Ekstern)
Project Manager, organisational:
Christensen, Iben Vernegren (Intern)

Characterization and stabilization of municipal waste incineration residues.
Department of Environmental Engineering
Period: 01/09/1999 → 30/03/2003
Number of participants: 2
Acronym: 184
Project participant:
Kjeldsen, Peter (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)
Characterization and stabilization of Residues.

Department of Environmental Science and Engineering

Department of Environmental Engineering

Period: 01/09/1999 → 30/08/2002
Number of participants: 3

Project participant:
- Kjeldsen, Peter (Intern)
- Hjelmar, Ole (Ekstern)

Project Manager, organisational:
- Christensen, Thomas Højlund (Intern)

Release of volatile trace gases from waste materials

Procedures and models for the diffusive release of trace gases (e.g. CFCs, HFCs, and others) from waste materials such as insulation foam, plastics etc. have been developed and applied to a range of materials found in household appliances. The fate of the released VOCs in landfills after disposal is also studied. The work is partly funded by Association of Home Appliance Manufacturers, Washington DC, USA

Department of Environmental Engineering

Association of Home Appliance Manufacturers

Period: 01/09/1999 → 01/01/2004
Number of participants: 2
Acronym: 371

Project participant:
- Scheutz, Charlotte (Intern)

Project Manager, organisational:
- Kjeldsen, Peter (Intern)

Potentials and problems related to handling of grey wastewater from households

Department of Environmental Engineering

Period: 01/08/1999 → 17/01/2003
Number of participants: 6

Phd Student:
- Eriksson, Eva (Intern)

Supervisor:
- Henze, Mogens (Intern)

Main Supervisor:
- Ledin, Anna (Intern)

Examiner:
- Mosbæk, Hans (Intern)
- Butler, David (Ekstern)
- Halling-Sørensen, Bent (Intern)

Financing sources

Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Ecological handling of rainwater in Tingbjerg

The "Tingbjerg" study area is a relatively small (50 hectares) catchment which discharges combined sewerage during rain via overflows to an urban lake in the western suburbs of Copenhagen. Extensive renovation of the apartment blocks in the area can be foreseen during the next decade, and there is a unique opportunity for simultaneously retrofitting the
combined sewer system. Solutions based on infiltrating stormwater locally are possible but need to be negotiated with the local residents' associations. Copenhagen Water is particularly interested in uncovering the potential for reducing the hydraulic load of wastewater treatment plants and solving surface water quality problems by implementing structural and non-structural best management practices for stormwater control. At the same time, we wish to assess the possible negative environmental effects (i.e. pollution of urban soils and groundwaters). The "Tingbjerg" study area is used as a model catchment for developing new procedures for stormwater control.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Rambøll Danmark A/S
Copenhagen Water
Royal Veterinary and Agricultural University

Investigations of local handling of grey waste water
Physical-chemical characterisation, microbiological analyses, and toxicity tests are used to evaluate the characteristics of the grey wastewater in a building with 17 apartments, BO-90, situated in Copenhagen. The treatment efficiency of the on-site grey wastewater treatment plant will also be evaluated. The presence of xenobiotic organic compounds (XOC) will be evaluated through chemical analyses and an inventory of amounts and use patterns of the household chemicals and personal care products in the building. Furthermore, will activities producing grey wastewater be investigated and a sampling programme for grey wastewater developed.

Department of Environmental Engineering
Royal Veterinary and Agricultural University

Grundvandsdannelse
Department of Environmental Engineering
Modeling of soil-vegetation-atmosphere transfer processes
The aim of the project is to develop a micro-scale SVAT (Soil Vegetation Atmospheric Transfer) model using data from the Danish EUROFLUX site Sorø Lille Bøgeskov. Presently the data covers four growing seasons of measurements in a closed beech canopy. To understand how carbon dioxide and water vapour fluxes depend on other environmental variables is an important question when modelling the global climate. Micro-scale models provide useful information for larger scale models. Important steps in this project are to understand which parameters are most important to the canopy conductance and then to use the result to simplify an existing SVAT model.

Department of Hydrodynamics and Water Resources
Risø National Laboratory for Sustainable Energy
Department of Environmental Engineering
Period: 01/06/1999 → 31/05/2002
Number of participants: 2
Project participant:
Dellwik, Ebba (Intern)
Project Manager, organisational:
Jensen, Karsten Hegh (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,200,000.00 Danish Kroner

Prediction of porosity and fluid in chalk from acoustic measurements
Department of Environmental Engineering
Period: 01/06/1999 → 28/03/2003
Number of participants: 5
Phd Student:
Gommesen, Lars (Intern)
Supervisor:
Pedersen, Jacob Mørch (Ekstern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Smith, Brackin A. (Ekstern)
Vejbæk, Ole Valdemar (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samarbejdsaftalefinans
Udvikling af SVAT-model

Department of Environmental Engineering
Period: 01/06/1999 → 12/02/2004
Number of participants: 7
Phd Student: Dellwik, Ebba (Intern)
Supervisor: Jensen, Niels Otto (Intern)
Jensen, Karsten Høgh (Intern)
Main Supervisor: Sonnenborg, Torben Obel (Intern)
Examiner: Rosbjerg, Dan (Intern)
Bernhofer, Christian (Ekstern)
Schelde, Kirsten (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskerakademiets Samfinansier
Project: PhD

Ecological handling of rain water in Tingbjerg
The "Tingbjerg" study area is a relatively small (50 hectares) catchment which discharges combined sewerage during rain via overflows to an urban lake in the western suburbs of Copenhagen. Extensive renovation of the apartment blocks in the area can be foreseen during the next decade, and there is a unique opportunity for simultaneously retrofitting the combined sewer system. Solutions based on infiltrating stormwater locally are possible but need to be negotiated with the local residents' associations. Copenhagen Water is particularly interested in uncovering the potential for reducing the hydraulic load of wastewater treatment plants and solving surface water quality problems by implementing structural and non-structural best management practices for stormwater control. At the same time, we wish to assess the possible negative environmental effects (i.e. pollution of urban soils and groundwaters). The "Tingbjerg" study area is used as a model catchment for developing new procedures for stormwater control.

Department of Environmental Engineering
Københavns Vandforsyning

Rambøll Danmark A/S
Period: 01/05/1999 → 31/12/2003
Number of participants: 2
Acronym: 193
Project ID: 30048
Project participant: Sønderup, Henrik (Intern)
Project Manager, organisational: Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 130,000.00 Danish Kroner
Project

High quality algal toxicity data for use in QSAR research

Department of Environmental Engineering
Period: 01/05/1999 → 01/12/1999
Number of participants: 2
Acronym: 195
Project participant: Kusk, Kresten Ole (Intern)
Calibration of flow meters by LDA
A technique is developed to calibrate large flow meters used in district heating in site by Laser Doppler Anemometry.

Department of Energy Engineering
Department of Environmental Engineering
Danish Technological Institute
Dantec Measurement Technology A/S
Danish District Heating Suppliers
Danish Flowmeter Manufactures

Period: 01/04/1999 → 01/07/2001
Number of participants: 2
Project participant:
Ullum, Ulrik (Intern)

Project Manager, organisational:
Meyer, Knud Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Project

Saltwater intrusion
Reactive transport in saltwater intrusion zones is investigated at a Danish field site and in the laboratory. A density-dependent flow and reactive transport simulator is developed and applied to simulate the field data. In collaboration with Dept. of Geology and Geotechnical Engineering, DTU. A Ph.D. study by Flemming D. Christensen, funded by the Groundwater Research Centre, DTU.

Department of Hydrodynamics and Water Resources
Department of Geology and Geotechnical Engineering

Period: 01/04/1999 → 31/03/2001
Number of participants: 3
Project participant:
Christensen, Flemming Damgaard (Intern)
Jakobsen, Rasmus (Intern)

Engesgaard, Peter Knudegaard (Intern)

Project Manager, organisational:
Engesgaard, Peter Knudegaard (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,200,000.00 Danish Kroner

Project

**Sustainable Renewal of Owner-occupied Single Houses**

The aim of this project is to create the basis for dissemination of facts regarding sustainable renewal to the central actors in renewal of owner occupied single houses. Three themes has been chosen to test the possible strategy: Kitchen, Windows and Water. An in-depth analysis of the primary target group - the house owners - has been carried out.

Department of Planning
Department of Environmental Engineering
Department of Management Engineering
Ladings Tegnestue
The Danish Centre for Urban Ecology
Grøn Information

Period: 01/03/1999 → 31/07/2000
Number of participants: 3
Project participant:
Hoffmann, Birgitte (Intern)
Jessen, Astrid (Intern)

Project Manager, organisational:
Eile, Morten (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 775,000.00 Danish Kroner

**Treatment of residues from solid waste incineration: Pilotscale experiments.**

Incineration is the most common waste treatment and disposal method for municipal and industrial solid waste in Denmark. Solid residues are generated in terms of bottom ash and APC (air pollution control) solids (fly ashes and acid flue gas cleaning products). The bottom ashes are primarily used for construction purposes while the APC solids are landfilled or temporarily stored until permanent landfills are approved. All the residues from incineration should be utilized or landfilled by sustainable methods without adverse impacts on the environment. One of the main environmental concerns is the short term (few years) as well as long term (centuries) leaching of salts and heavy metals from construction material containing residues or from waste residue landfills. The aim of this project is to develop technologies for bottom ashes as well as for APC products based on combinations of washing and chemical stabilization. Currently focus is on APC solids and washing followed by stabilization by ironoxides. This leads to a refuction in the leaching of salts by partial removal and a permanent binding of heavy metals in the treated solids.

Department of Environmental Engineering

I/S Amagerforbrænding
Vestforbrænding
AV Miljø
AVM
Miljøstyrelsen

Period: 01/03/1999 → 31/12/2000
Number of participants: 3
Acronym: 151
Project participant:
Lundtorp, Kasper (Intern)
Sørensen, Mette Abildgaard (Intern)

Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 2,100,000.00 Danish Kroner

Project
Afværgeteknologier for grundvand forurenet med pesticider fra punktkilder

Department of Environmental Engineering
Period: 01/02/1999 → 02/10/2002
Number of participants: 6
Phd Student:
Tuxen, Nina (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Main Supervisor:
Bjerg, Poul Løgstrup (Intern)
Examiner:
Arvin, Erik (Intern)
Helweg, Arne (Ekstern)
Schirmer, Mario (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Udvikling af invivo-screeeningsmetoder med krebsdyr til detektion af miljøfremmede stoffers hormonforstyrrende og reproduktionsstokslige effekter

Department of Environmental Engineering
Period: 01/02/1999 → 18/05/2005
Number of participants: 6
Phd Student:
Wollenberger, Leah (Intern)
Supervisor:
Halling-Sørensen, Bent (Intern)
Main Supervisor:
Kusk, Kresten Ole (Intern)
Examiner:
Baun, Anders (Intern)
Bjerregaard, Poul (Ekstern)
Williams, Tim D. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Samordnat miljøforskningsprogram för Öresundsuniversitetet.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Period: 07/01/1999 → 30/06/2000
Number of participants: 5
Project participant:
Woin, Per (Ekstern)
Erik Swietlicki (Ekstern)
Christoffersen, Kirsten (Ekstern)
Skärbäck, Erik (Ekstern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Biodegradation of agricultural antibiotics in surface water

The project is a subproject of a larger collaborative joint research that aims at elucidating the environmental problems associated with the use of antibiotics in agriculture and the release of these substances to the environment. Biodegradation studies are performed as far as possible following the principles of the ISO standard described in project B 1.

Department of Environmental Science and Engineering

Department of Environmental Engineering

Royal Danish School of Pharmacy

Flakkebjerg

Period: 01/01/1999 → 01/01/9999

Number of participants: 8

Project participant:

Ebert, Birthe (Intern)
Qualmann, Signe (Intern)
Toräng, Lars (Intern)
Sørensen, Bent Halling (Ekstern)
Ingerslev, F. (Ekstern)
Helweg, Arne (Ekstern)
Fomsgård, Ida (Ekstern)

Project Manager, organisational:

Nyholm, Niels (Intern)

Financing sources

Source: Unknown

Name of research programme: Ukendt
Amount: 343,000.00 Danish Kroner

Project

Biodegradation of agricultural antibiotics in surface water.

The project is a subproject of a larger collaborative joint research that aims at elucidating the environmental problems associated with the use of antibiotics in agriculture and the release of these substances to the environment. Biodegradation studies are performed as far as possible following the principles of the ISO standard described in project B 1.

Department of Environmental Engineering

Period: 01/01/1999 → 31/08/2001

Number of participants: 4

Acronym: 62

Project participant:

Ebert, Birthe (Intern)
Toräng, Lars (Intern)
Qualmann, Signe (Intern)

Project Manager, organisational:

Nyholm, Niels (Intern)

Composition of landfill leachates

Department of Environmental Engineering

Period: 01/01/1999 → 01/01/2002

Number of participants: 1

Acronym: 372

Project Manager, organisational:

Kjeldsen, Peter (Intern)
Ecological wastewater handling on Christiansø - a small island in the Baltic

Christiansø and Frederiksø, two small rocky Danish islands, are inhabited by 100 residents. On top of this comes 1000 daily tourists during the summer period. Currently, the wastewater is discharged untreated into the Baltic sea. The bedrock underground, the distance to the mainland, the peaks in wastewater production and the relatively strict nature preservation regulations implies that conventional wastewater transport and treatment is expensive and not considered appropriate. Consequently, this project aimed at identifying alternative solutions based on source control and "green" treatment methods. A number of alternative systems solutions were drawn up and evaluated in a holistic manner.

Department of Environmental Engineering

Department of Civil Engineering

Period: 01/01/1999 → 30/06/2001
Number of participants: 4
Acronym: 221

Project participant:

Hauger, Mikkel Boye (Intern)
Smith, Morten (Intern)
Gabriel, Søren (Intern)

Project Manager, organisational:

Mikkelsen, Peter Steen (Intern)

Financing sources

Source: Unknown
Name of research programme: Ukendt
Amount: 300,000.00 Danish Kroner

Permable reactive barriers using zerovalent iron

Groundwater polluted with chlorinated compounds and metals can be remediated by use of reactive material such as metallic iron. Research is carried out on permeable reactive barriers by use of laboratory experiments, and field investigations. Lately a study on the hydraulic properties and the in situ degradation rates has been carried out at the Vapokon site together with Irene Lo and Keith Lay from Hong Kong University of Science and Technology. The work continues in student projects.

Department of Environmental Engineering

Hong Kong University of Science and Technology

Fuen county

Period: 01/01/1999 → 01/01/2004
Number of participants: 1
Acronym: 370

Project Manager, organisational:

Kjeldsen, Peter (Intern)

Remediation of MTBE-contaminated groundwater

Department of Environmental Science and Engineering

Department of Environmental Engineering

Period: 30/11/1998 → 01/03/1999
Number of participants: 5

Project participant:

Broholm, Kim (Ekstern)
Jensen, Michael Mücke (Ekstern)
Asp-Fuglsang, Inger (Ekstern)
Kaalund, Lars (Ekstern)

Project Manager, organisational:

Arvin, Erik (Intern)

Financing sources
Remediation of MTBE-contaminated groundwater

Methyl tert. butyl ether (MTBE) has been used in gasoline since 1985 in order to increase the octane number. Since many underground storage tanks for oil products are not tight, there is a risk of groundwater contamination at many places. The pollution potential is particularly high if MTBE is present because of its biological persistance and poor sorption to the soil matrix. The project aims at identifying the most feasible methods of groundwater remediation following contamination with MTBE. The project has shown that several technologies are relevant, for example stripping methods. It is also likely that natural bioremediation works in some places. The is a considerable need for the development of methods for biological treatment of the off-gases from the stripping methods and treatment of contaminated water from the pumping operations.

Department of Environmental Engineering
VKI Water Quality Institute
Miljøstyrelsen
Amternes Videncenter for jordforurening

Period: 30/11/1998 → 31/12/1999
Number of participants: 1
Acronym: 150
Project Manager, organisational: Arvin, Erik (Intern)

Assessment of sustainable wastewater handling in sewerless settlms.

The purpose is to develop a method for comparative assessment of solutions for sustainable handling of wastewater in the open land. The perspective is transparancy and a better agreement between different stakeholders perception of what sustainable wastewater handling is. The assessment method will be incorporated in a generally accessible and practicable computer-based decision support system for use in planning and quality control of projects. The basic premise of the method is that no specific technologies are inherently sustainable, or ecological, but that the sustainability of the total system of technologies for a settlement in a given location must be assessed in a holistic and transparent manner. The method brings wastewater handling into focus, but related waste streams and stormwater is included in the assessments, when their handling are directly coupled with the handling of wastewater. Settlements without traditional sewer systems are covered, e.g. farm houses, summer cottages, garden allotments, villages and ecological settlements planned with specific reference to avoiding sewers. These types of settlements have very different natural and manmade preconditions and the method thus rests on site-analyses of local conditions. The project will involve external stakeholders through case-studies where solutions for existing or planned settlements are assessed to test and illustrate the assessment method.

Department of Environmental Science and Engineering
Department of Planning

Department of Environmental Engineering
Period: 01/10/1998 → 31/12/2000
Number of participants: 12
Project participant:
Mikkelsen, Peter Steen (Intern)
Eilersen, Ann Marie (Intern)
Gabriel, Søren (Intern)
Rauch, Wolfgang (Intern)
Tjell, Jens Christian (Intern)
Hauger, Mikkel Boye (Intern)
Christensen, Knud (Intern)
Elle, Morten (Intern)
Assessment of sustainable wastewater handling in sewerless settlements
The purpose is to develop a method for comparative assessment of solutions for sustainable handling of wastewater in the open land. The perspective is transparency and a better agreement between different stakeholders perception of what sustainable wastewater handling is. The assessment method will be incorporated in a generally accessible and practicable computer-based decision support system for use in planning and quality control of projects. The basic premise of the method is that no specific technologies are inherently sustainable, or ecological, but that the sustainability of the total system of technologies for a settlement in a given location must be assessed in a holistic and transparent manner. The method brings wastewater handling into focus, but related waste streams and stormwater is included in the assessments, when their handling are directly coupled with the handling of wastewater. Settlements without traditional sewer systems are covered, e.g. farm houses, summer cottages, garden allotments, villages and ecological settlements planned with specific reference to avoiding sewers. These types of settlements have very different natural and manmade preconditions and the method thus rests on site-analyses of local conditions. The project will involve external stakeholders through case-studies where solutions for existing or planned settlements are assessed to test and illustrate the assessment method.
Henze, Mogens (Intern)

**Financing sources**
Source: Unknown
Name of research programme: *Ukendt*
Amount: 230,000.00 Danish Kroner

**Project**

**Biotechnological procedures for sustainable water management.**
Urban, industrial and agricultural pollution of natural water resources and low quality of drinking water are currently major problems for human and animal health, especially in the countries of CCE/NIS. This multidisciplinary project concerns the application of modern biotechnological and molecular biological approaches, which will help to solve these problems and are based on existing knowledge in the participating countries of EU/CCE/NIS, thereby contributing to stabilization of RTD potential in the respective CCE/NIS. The topics of the proposed research are: A. Determination of phosphate pollution of wastewaters and the development of methods for phosphate removal with its consequent reuse (enhanced biological phosphorus removal). B. Determination of genotoxicity of by-products of water oxidation/disinfection and development of methods for its routine assessment.

Department of Environmental Engineering
Institute of Chemical Technology
Semmelweis University
Johannes Gutenberg-Universität
Period: 01/10/1998 → 01/10/2001
Number of participants: 3
Acronym: 144
Project participant:
Mosbæk, Hans (Intern)
Dircks, Klaus (Intern)
Project Manager, organisational:
Henze, Mogens (Intern)

**Financing sources**
Source: Unknown
Name of research programme: *Ukendt*
Amount: 230,000.00 Danish Kroner

**Project**

**Determination of microbial available growth in lab. investigations.**
Department of Environmental Engineering
VKI Water Quality Institute
Danske Elværkers Forening
Københavns Vand
Miljøstyrelsen
Period: 01/10/1998 → 30/06/2001
Number of participants: 2
Acronym: 129
Project participant:
Arvin, Erik (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

**Financing sources**
Source: Unknown
Name of research programme: *Ukendt*
Amount: 749,080.00 Danish Kroner

**Project**
Determination of microbial available organic growth in lab. investigations.

Department of Environmental Science and Engineering

Department of Environmental Engineering
Period: 01/10/1998 → 30/06/1999
Number of participants: 7
Project participant:
Arvin, Erik (Intern)
Jørgensen, Claus (Ekstern)
Beck, Jørgen (Ekstern)
Lind, Søren (Ekstern)
Forslund, Jane (Ekstern)
Bagge, Linda (Ekstern)

Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 749,080.00 Danish Kroner

Reliability of Foundation Analysis: Model uncertainty and uncertainties of design soil parameters

A reliability study of the performance of a foundation requires, among other factors, the specification of the uncertainties of the design parameters and those of the adopted model. The first task is concerned with geological, experimental, and statistical uncertainties, whereas the second task is basically a calibration work which demands a good, generally accepted reference that normally does not exist. In this project both issues are addressed in the case of spread footings in the following way: (i) large model tests performed under well-controlled conditions are analyzed numerically and semi-empirically; (ii) the testing soils is investigated in the laboratory, utilizing different methods and setups. A reference model will be created for quantifying the uncertainties inherent in different models.

Department of Geology and Geotechnical Engineering

Department of Environmental Engineering
Period: 01/10/1998 → 01/01/1999
Number of participants: 2
Project participant:
Hansbo, Sven (Ekstern)

Project Manager, organisational:
Du-Thinh, Kien (Intern)

The coupling between the dynamics and the biology in the North Sea

In stratified waters there may be a close connection between the dynamics and the biology of the water masses. Recent research suggests that this circumstance is responsible for the fact that the North Sea is among the world's most important with respect to the production of fish. The project aims at studying this possible close connection by considering the course of the thermal stratification in the North Sea and the abundance of cod larvae for the past 40 years.

Department of Hydrodynamics and Water Resources

National Institute of Aquatic Resources

Department of Environmental Engineering
Period: 01/10/1998 → 14/12/1999
Number of participants: 2
Project participant:
St. John, Michael (Intern)

Project Manager, organisational:
Nielsen, Morten Holtegaard (Intern)
Bioavailability and effects of chemicals on aquatic plants and animals under varied conditions.

Department of Environmental Engineering
Period: 01/09/1998 → 31/12/2001
Number of participants: 2
Acronym: 112
Project participant:
Ledin, Anna (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Chromium reduction in soils and groundwater
Chromium(VI) (Cr(VI)) is a highly toxic and mobile pollutant. Cr(VI) is mainly found in connection to pollution from tanneries, electroplating and wood preserving activities. Cr(VI) can be reduced to Cr(III) which is less toxic and mobile by addition of reductants. The objectives of this project is to evaluate through laboratory experiments the possibility of 1) to reduce Cr(VI) in pumped groundwater in on-site filters containing metallic iron. 2)to reduce the Cr(VI) in soils by adding metallic iron or other reductant In 1999 the experiments made for optimizing the on-site filters was finilized and reported. Experiments with three different chromium polluted soils using zero-valent iron and ferro sulfate has been carried out. The experiements showed that the reduction of chromate in soils might be possible using ferro sulfate, but the use of zero-valent iron was not feasible. The reporting of the soil experiments was finalized as well.

Department of Environmental Engineering
Period: 01/09/1998 → 01/04/2000
Number of participants: 2
Acronym: 158
Project participant:
Locht, Thomas (Intern)
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 480,000.00 Danish Kroner

Environmental risk assesment and algal ecotoxicology - basics, methodologies, safety factors and no-effect levels.
The project will explore basic phenomena and further develop a number of new concepts and methodologies in algal ecotoxicology with a special view to applications in regulatory risk assessments of chemicals, mixtures of chemicals and complex test materials, such as chemically contaminated water, wastewater, aquatic soil and groundwater.

Department of Environmental Engineering
Danmarks Farmaceutiske Højskole
Research Institute of Toxicology
Period: 01/09/1998 → 31/12/2004
Number of participants: 3
Acronym: 113
Project participant:
Kusk, Kresten Ole (Intern)
Hedberg, Camilla Berg (Intern)
Project Manager, organisational:
Nyholm, Niels (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,627,484.00 Danish Kroner
Environmental risk assessment and Algal ecotoxicology - Basis, methodologies, safety etc.

Department of Environmental Engineering

Department of Environmental Science and Engineering

Period: 01/09/1998 → 01/09/2001
Number of participants: 4
Project participant:
Qualmann, Signe (Intern)
Halling-Sørensen, Bent (Ekstern)
Mayer, Philipp (Ekstern)
Project Manager, organisational:
Nyholm, Niels (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,627,484.00 Danish Kroner

European team for new methods of education and training in urban water resources management.

This project responds to the SOCRATES objective of promoting ODL by establishing a European partnership in the field of Urban Water Resources Management. This partnership will integrate the new information and communication technologies offered by the World Wide Web and Internet to improve two existing university courses that have successfully run in a distance learning mode for 2 and 5 years respectively. The project will make use of the expertise of the partners in the field of Urban Water Resources Management to divide the load of interacting with the course participants to respond to exercises and discuss related topics. The project will involve private enterprise to help develop an educational product that has practical value in addition to academic. The project will also make use of partners’ experience with previous distance learning and multimedia projects to develop the technical aspects of establishing a web-based class room with a user-friendly interface. The project will seek to enable synchronous (chat room) and asynchronous (e-mail) communication on an individual or group level. Through using the web the project will maintain a platform independence and will present a (for most) familiar interface.

Department of Environmental Engineering

PH-Consult Aps.

Norwegian University of Science and Technology

Vrije Universiteit Brussel

TECHWARE

Period: 01/09/1998 → 01/08/2000
Number of participants: 4
Acronym: 111
Project participant:
Warnaars, Eric (Intern)
Loke, Egon (Intern)
Rauch, Wolfgang (Intern)
Project Manager, organisational:
Harremoës, Poul (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 532,800.00 Danish Kroner


Department of Environmental Engineering
Investigation of the properties of dredged limestone fill

Dredged limestone from the Øresund fixed link has been used for reclamation purposes and Peberholm and Kastrup. The IGG study - carried out partly as a Mid-term project for two students - utilises a number of geophysical and geotechnical investigation techniques, supplemented by laboratory testing. At the Kastrup reclamation site DSB is developing a maintenance centre. The Danish Geotechnical Institute has carried out geotechnical investigations and studied the fill properties using dynamic compaction and plate loading test. The resistivity contouring by IGG showed local variability in the 5 m thick fill layer which was confirmed by electrical soundings but not seen in the boreholes. The surface wave technique was able effectively to characterise deformation properties of the coarse granular material (dmax=200mm). It was concluded that the limestone fill could be divided in three main categories: (1) coarse well graded granular material with low fines content having good engineering properties when compacted, (2) loose layered silty fine sand prone to liquefaction, (3) very soft normally consolidated clayey silt with very low shear strength. The forward modelling of the continuous surface wave method was applied and the results compared very well with the plate loading test taking into account that SASW works at very small strain. The study showed that geophysical methods were applicable and very cost effective to more traditional geotechnical methods.
Department of Environmental Engineering
University of Surrey
Geotechnical Institute
Øresundskonsortiet
DSB Jernbanestyrelsen
Period: 01/09/1998 → 01/01/9999
Number of participants: 5
Project participant:
Gordon, Anne (Ekstern)
Hansen, H. Kryger (Ekstern)
Anderse, Kim Smedegaard (Ekstern)
Larsen, Ole Schøller (Ekstern)
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

**Proceskinetik og mekanismer for bionedbrydning af kemikalier i naturlige systemer ved miljørelevante koncentrationer**

Department of Environmental Engineering
Period: 01/09/1998 → 26/03/2004
Number of participants: 6
Phd Student:
Toräng, Lars (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Main Supervisor:
Nyholm, Niels (Intern)
Examiner:
Bjerg, Poul Løgstrup (Intern)
Boethling, Robert (Ekstern)
Madsen, Torben Ole (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-lønned stipendie
Project: PhD

**Recirkulering af næringsstoffer i affald fra byer i det sydlige Thailand**

Department of Environmental Engineering
Number of participants: 6
Phd Student:
Schouw, Nanette L.. (Intern)
Supervisor:
Tjell, Jens Christian (Intern)
Main Supervisor:
Mosbæk, Hans (Intern)
Examiner:
Mikkelsen, Peter Steen (Intern)
Polprasert, Chongrak (Ekstern)
Østergaard, Peter Holm (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD
Stability and creep of gas caverns in rocksalt
DONG A/S and IGG/DTU have initiated an industrial PhD-project for Mikkel Kristian Dahl on developing robust models for creep and stability modelling of gas caverns in rocksalt. The study involves advanced laboratory testing of creep under actual field stress and temperature conditions. During the project period of 3 years MKD should develop the necessary software to be used on DONG’s EDP-facilities for modelling of gas caverns under operational conditions. A verification is done based on measurements of cavern deformations under more than 10 years operation. It is the major research and development goal to establish a Danish expertise in this field of gas storage.

Department of Geology and Geotechnical Engineering

Department of Environmental Engineering

DONG Energy A/S
Period: 01/09/1998 → 01/01/9999
Number of participants: 2
Project participant:
Knudsen, Jørgen (Ekstern)
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 605,900.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 2,204,100.00 Danish Kroner

Reduction of gas emissions from flue gases in reactive barriers
Department of Environmental Engineering
Period: 01/08/1998 → 10/01/2003
Number of participants: 5
Phd Student:
Scheutz, Charlotte (Intern)
Main Supervisor:
Kjeldsen, Peter (Intern)
Examiner:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD
Pollution concentrations in wet weather discharges from combined sewer systems

Annual loads of organic matter, nitrogen and phosphorus to Danish receiving waters have been calculated every year for more than a decade. All receiving waters from small streams to lakes and seas are evaluated and allowable loads are assessed. The pollution sources are mainly rural runoff from intensely cultivated land, atmospheric deposition and urban sewage. There is an increased focus on urban runoff during rain. This is due to mainly two reasons: 1) loads from other sources are decreasing due to human intervention, and 2) an intensified national measurement campaign has shown significantly higher concentrations than what has previously been observed. The national authorities recommend three levels of complexity in the calculations of urban runoff loads from CSO structures during rain. The methods range from unit loads to long-term simulation with the SAMBA module in the MOUSE software package. Common for all these methods are the concept of event mean concentrations (EMC), i.e. that the pollutant concentrations in the runoff are assumed to be independent of the size and distribution of the rain volume and also independent of characteristics of the catchment such as size, slope, storage capacity, maintenance etc. All variation of measured pollutant concentrations is assumed to be random. On this basis the national authorities recommend EMC-values for calculating annual pollution loads. Recent data question the present concept. During two summer periods runoff from six catchments have been measured. The preliminary analysis shows significant systematic differences between the hydrograph and the pollutograph, possibly caused by flushing of the sewer systems. More troublesome is the fact that the calculated event mean concentrations are significantly higher than what has previously been observed. The present work elaborates the data more closely and evaluates the results in light of the many data sets that are available now throughout the world. The aim is to identify a few parameters that can describe pollution runoff from urban areas with sufficient accuracy. At present three parameters are used, i.e. an initial losses, a hydrological reduction factor and an event mean concentration. Detailed models that incorporate pollutant washout are most often extremely complex and use a vast number of parameters. It will be attempted to reach a better description then currently by using one or two extra parameters and perhaps re-parameterising the present runoff model. The findings are meant to improve the basis for estimating pollution loads from combined sewer systems in the future.

Department of Environmental Engineering
Aalborg University
COWI Consultants A/S
Miljøstyrelsen
PH-Consult Aps.

Period: 01/07/1998 → 31/03/1999
Number of participants: 3
Acronym: 147
Project participant:
Harremoës, Poul (Intern)
Rauch, Wolfgang (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Pollution concentrations in wet weather discharges from combined sewer systems.

The national authorities recommend three levels of complexity in the calculations of urban runoff loads from CSO structures during rain. The methods range from unit loads to long-term simulation with the SAMBA module in the MOUSE software package. Common for all these methods are the concept of event mean concentrations (EMC), i.e. that the pollutant concentrations in the runoff are assumed to be independent of the size and distribution of the rain volume and also independent of characteristics of the catchment such as size, slope, storage capacity, maintenance etc. All variation of measured pollutant concentrations is assumed to be random. On this basis the national authorities recommend EMC-values for calculating annual pollution loads. Recent data question the present concept. During two summer periods runoff from six catchments have been measured. The preliminary analysis shows significant systematic differences between the
hydrograph and the pollutograph, possibly caused by flushing of the sewer systems. More troublesome is the fact that the calculated event mean concentrations are significantly higher than what has previously been observed. The present work elaborates the data more closely and evaluates the results in light of the many data sets that are available now throughout the world. The aim is to identify a few parameters that can describe pollution runoff from urban areas with sufficient accuracy. At present three parameters are used, i.e. an initial losses, a hydrological reduction factor and an event mean concentration. Detailed models that incorporate pollutant washout are most often extremely complex and use a vast number of parameters. It will be attempted to reach a better description then currently by using one or two extra parameters and perhaps re-parameterising the present runoff model. The findings are meant to improve the basis for estimating pollution loads from combined sewer systems in the future.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Aalborg University
COWI A/S
PH-Consult Aps.

Miljøstyrelsen
Period: 01/07/1998 → 01/07/2000
Number of participants: 7
Project participant:
Harremoës, Poul (Intern)
Rauch, Wolfgang (Intern)
Hvitved-Jacobsen, Thorkild (Ekstern)
Johansen, Niels-Bent (Ekstern)
Ambjerg-Nielsen, Karsten (Ekstern)
Kaasgaard, Mogens (Ekstern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 175,000.00 Danish Kroner

Rock mechanical properties of Jurassic underburden at Valdemar
The pore pressure generation due to conversion of clay minerals under the Danish oil and gas reservoir Valdemar is studied. The structural change from smectite to illite under high temperature and stresses implying collapse and release of inter-layer water seems to be of great importance to oil migration from a potential source rock. The structural development may be caused by volume-constant flow of the clay shale under very low effective pressure. And the release of gas and oil to be caused by internal hydraulic fracturing during this process. The research project intends to intergrate the knowledge in a number of geosciences to the benifit of understanding very important reservoir mechanisms. Rock mechanics, structural geology, clay mineralogy and -chemistry, and geotechnical modelling of porepressure development seem to be key points for the oil maturing and migration from Jurassic clay shales, which then is contained in the Lower Cretaceous reservoir at Valdemar. Preliminary results were presented at the Fifth Nordic Symposium on Petrophysics, August 19-20th 1999, Copenhagen, DK. The study is presumed to be finalised in March 2000 and the results will be published as part of the on-going Energy Research Programme PRIORITY.

Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
De Nationale Geologiske Undersøgelser for Danmark og Grønland
Geotechnical Institute
Period: 22/04/1998 → 01/01/9999
Number of participants: 5
Project participant:
Jacobsen, Finn (Ekstern)
Lindgren, Holger (Ekstern)
Springer, Niels (Ekstern)
Christensen, Helle F. (Ekstern)
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 134,000.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 134,000.00 Danish Kroner

Redox Processes at the Seawater/Freshwater Interface in an Anaerobic Aquifer

Department of Environmental Engineering
Period: 01/04/1998 → 15/10/2003
Number of participants: 5
Phd Student:
Iversen, Vibeke Margrethe Nyvang (Intern)
Main Supervisor:
Jakobsen, Rasmus (Intern)
Examiner:
Albrechtsen, Hans-Jørgen (Intern)
Thamdrup, Bo (Ekstern)
Van Capellen, Philippe (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Blandet Finansiering
Project: PhD

Saltvandsindtrængning

Department of Environmental Engineering
Period: 01/04/1998 → 02/10/2002
Number of participants: 6
Phd Student:
Christensen, Flemming Damgaard (Intern)
Supervisor:
Jakobsen, Rasmus (Intern)
Main Supervisor:
Engesgaard, Peter Knudegaard (Intern)
Examiner:
Jensen, Karsten Høgh (Intern)
Appelo, Tony (Ekstern)
Konikow, Leonard F. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Algal toxicity tests with coloured substances

Toxicity testing of coloured substances in algal growth inhibition tests gives problems because light absorption by the test material may reduce the rate of algal growth and thus interfere with the toxicity measurement. A separation of the toxic effect and the light absorption effect is necessary for the proper interpretation of test results, not only because information of toxicity per se (inherent toxicity) is needed but also because the overall response to the factors combined is highly specific to the test setup and therefore can only be generalized and used with great difficulty. In order to assess the inherent toxicity or toxicity potential of a coloured substance towards algae in a growth inhibition test, the influence of light absorption should be eliminated or if not possible minimized and corrected for. The final goal of this project and subsequent projects is the adoption of a consensus protocol for testing coloured substances in algal growth inhibition tests based upon the principles of eliminating the influence of light absorption.
Department of Environmental Engineering

Miljøstyrelsen
Period: 01/03/1998 → 30/06/2001
Number of participants: 1
Acronym: 110
Project Manager, organisational:
Nyholm, Niels (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 70,000.00 Danish Kroner

Project

Recycling of nutrients.

Department of Environmental Engineering

Department of Environmental Science and Engineering
Period: 01/03/1998 → 14/05/1998
Number of participants: 3
Project participant:
Eilersen, Ann Marie (Intern)
Magid, Jacob (Ekstern)
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 75,000.00 Danish Kroner

Project

Recycling of nutrients.
The object of the project is to evaluate the potential of recycling nutrients from the cities to agriculture.

Department of Environmental Engineering

Royal Veterinary and Agricultural University
Period: 01/03/1998 → 14/05/1998
Number of participants: 2
Acronym: 152
Project participant:
Eilersen, Ann Marie (Intern)
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 75,000.00 Danish Kroner

Project

Sammenhænge mellem mikrotekstur, reservoiregenskaber og lithitype for kalk fra Nordsøen

Department of Environmental Engineering
Period: 01/03/1998 → 17/01/2003
Number of participants: 5
Phd Student:
Røgen, Birte (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Krogsbøll, Anette (Intern)
Holt, Rune M. (Ekstern)
Tirsgaard, Henrik (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Blandet Finansiering
Project: PhD

Degradation of persistent toxic organic chemicals by cometabolism in a biofilm system

Department of Environmental Engineering
Period: 01/02/1998 → 14/12/2001
Number of participants: 5
Phd Student:
Rivas, Isabelle Marie (Intern)
Main Supervisor:
Arvin, Erik (Intern)
Examiner:
Baun, Anders (Intern)
Fedorak, Phil (Ekstern)
Svensmark, Bo (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Optimering af design og udnyttelse af overfladevands reservoirer i bæredygtigt perspektiv

Department of Environmental Engineering
Period: 01/02/1998 → 28/01/2002
Number of participants: 6
Phd Student:
Kjeldsen, Thomas Rødding (Intern)
Supervisor:
Knudsen, Jesper (Ekstern)
Main Supervisor:
Rosbjerg, Dan (Intern)
Examiner:
Mikkelsen, Peter Steen (Intern)
Heybye, Jan (Ekstern)
Kundzewicz, Zbigniew W. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Saltvandsintrusion

Department of Environmental Engineering
Period: 01/02/1998 → 22/01/2002
Number of participants: 5
Phd Student:
Andersen, Martin Søgaard (Intern)
Main Supervisor:
Postma, Diederik Jan (Intern)
Examiner:
Engesgaard, Peter Knudegaard (Intern)
Appelo, C. A. J. (Ekstern)
Edmunds, W. M. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Biofilm modelling for real time control.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Period: 01/01/1998 → 01/06/1999
Number of participants: 3
Project participant:
Nielsen, Marinus K. (Ekstern)
Madsen, Henrik (Ekstern)
Project Manager, organisational:
Harremoës, Poul (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 300,000.00 Danish Kroner

Chalk Heterogeneity Catalogue
Confidential

Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
Period: 01/01/1998 → 31/12/1999
Number of participants: 2
Project participant:
Frykman, Peter (Ekstern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 50,000.00 Danish Kroner

Reactive barriers for the remediation of fluoride contamination in groundwater
This project will build the first pilot scale calcite permeable reactive barrier for the remediation of fluoride contamination in groundwater at VAW aluminium, an aluminium smelter located in NSW Australia. At VAW, fluoride has contaminated groundwater at concentrations up to 3000mg/L, levels far higher than the drinking water guideline value of 1.5mg/L. The barrier design will be based on laboratory work which has shown that calcite can remove 99% of fluoride contamination from water. The project will prove the technology at the field scale and provide the basis for its application to other contaminants.

Department of Environmental Engineering
University of Newcastle
University of Copenhagen
Period: 01/01/1998 → 01/01/2006
Number of participants: 1
Acronym: 366
Project Manager, organisational:
Binning, Philip John (Intern)
Removal of Cadmium from Straw and Wood Combustion Flyashes
Investigation on the use of electric fields to remove cadmium from fly ashes from wood and straw combustion. Project done in co-operation with dk-TEKNIK under a project financed by Energistyrelsen.

Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
dk-TEKNIK ENERGI & MILJØ
Period: 01/01/1998 → 31/12/1999
Number of participants: 4
Project participant:
Ottosen, Lisbeth M. (Intern)
Dame, Anne Juul (Intern)
Villumsen, Arne (Intern)
Project Manager, organisational:
Hansen, Henrik K. (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 290,000.00 Danish Kroner

Rock Physics of Chalk
Acoustic properties of North Sea chalk is upscaled from plug to reservoir-scale. Plug data are interpreted from microtexture

Department of Environmental Engineering
Department of Geology and Geotechnical Engineering
Period: 01/01/1998 → 01/09/2000
Number of participants: 7
Project participant:
Røgen, Birte (Intern)
Borre, Mai Kirstine (Intern)
Peter Japsen (Ekstern)
Nielsen, Erik (Ekstern)
Pedersen, Jakob Mørch (Ekstern)
Mavko, Gary (Ekstern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 810,000.00 Danish Kroner

Subcontract. Existing biofilm theory incorporated into stochastic models.
Existing biofilm theory is examined with the aim of selecting a suitable level of complexity for incorporation into stochastic models. This is done primarily with the aim of later application to model predictive real time control. Although this project focuses on modelling for control at biofilter level, the major benefits of this grey-box modelling approach are expected on application at a treatment plant and a catchment level. The project will involve much PC work using data collected from earlier IMT laboratory work and from pilot/full scale plants outside IMT. The project is a sub-project of the EFS-CINTEM project co-ordinated from VKI.

Department of Environmental Engineering
Technical University of Denmark
Krüger A/S
Period: 01/01/1998 → 01/06/1999
Number of participants: 2
Acronym: EFS-CINTEM
Project participant:
Grun, Morten (Intern)
Project Manager, organisational:
Harremoës, Poul (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 300,000.00 Danish Kroner

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**Sustainable water and sanitation systems in developing countries**
Research and education in appropriate methods and barriers for establishment of affordable and sustainable solutions in water and sanitation management in developing countries.

Department of Environmental Engineering
Period: 01/01/1998 → 31/12/1999
Number of participants: 7
Acronym: 162
Project participant:
Petersen, Grith Lindgren (Intern)
Mosbæk, Hans (Intern)
Bregnhøj, Henrik (Intern)
Lønholdt, Jens (Intern)
Christensen, Lena (Intern)
Schouw, Nanette L. (Intern)
Project Manager, organisational:
Tjell, Jens Christian (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 2,000,000.00 Danish Kroner

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**Næringsstofbalancer for små landbrug i det sydlige Thailand**

Department of Environmental Engineering
Period: 01/12/1997 → 30/09/2001
Number of participants: 2
PhD Student:
Christensen, Lena (Intern)
Main Supervisor:
Tjell, Jens Christian (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

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**Permeable reactive barriers for groundwater remediation. Scientific coordinator for demonstration programme.**
Groundwater polluted with chlorinated compounds and metals can be remediated by use of reactive material such as metallic iron. The Danish EPA has started a demonstration programme where reactive walls are to be used. Under this programme IMT (PK) serves as a scientific coordinator working together with Danish EPA, counties and consulting companies. Besides research is carried out on reactive walls by use of laboratory experiments, especially looking at chromate reduction and simultaneous removal of chlorinated solvents. The demonstration programme is closed and the final summary report about to be published.
Department of Environmental Engineering
Danish Ministry of the Environment
Period: 01/12/1997 → 31/12/2003
Number of participants: 1
Acronym: 157
Project ID: 30014
Project Manager, organisational:
Kjeldsen, Peter (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 482,298.00 Danish Kroner

Preferentiel transport af pesticider til grundvand

Department of Environmental Engineering
Period: 01/12/1997 → 22/01/2002
Number of participants: 5
Phd Student:
Mortensen, Annette Pia (Intern)
Main Supervisor:
Jensen, Karsten Høgh (Intern)
Examiner:
Sonnenborg, Torben Obel (Intern)
Flühler, Hannes (Ekstern)
Jacobsen Hørbye, Ole (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden Forskningsrådsfinan.-SU
Project: PhD

Treatment of residues from solid waste incineration

Incineration is the most common waste treatment and disposal method for municipal and industrial solid waste in Denmark. Solid residues are generated in terms of bottom ash and APC (air pollution control) solids (fly ashes and acid flue gas cleaning products). The bottom ashes are primarily used for construction purposes while the APC solids are landfilled or temporarily stored until permanent landfills are approved. All the residues from incineration should be utilized or landfilled by sustainable methods without adverse impacts on the environment. One of the main environmental concerns is the short term (few years) as well as long term (centuries) leaching of salts and heavy metals from construction material containing residues or from waste residue landfills The aim of this project is to develop technologies for bottom ashes as well as for APC products based on combinations of washing and chemical stabilization. Currently focus is on APC solids and washing followed by stabilization by ironoxides. This leads to a reduction in the leaching of salts by partial removal and a permanent binding of heavy metals in the treated solids. Utilization by incorporation into ceramics is currently being considered.

Department of Environmental Engineering
Period: 01/12/1997 → 30/08/2000
Number of participants: 6
Acronym: 90
Project ID: 30020
Project participant:
Skov, Bent Henning (Intern)
Jensen, Dorthe Lærke (Intern)
Lundtorp, Kasper (Intern)
Sørensen, Mette Abildgaard (Intern)
Duhring, Pernille Bayard (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)
Fate of particulate organic in biofilm reactors
The project is part of a network that aims at obtaining advancements in the biological removal of nitrogen from industrial and municipal wastewaters, focusing on the use of biofilm technology. The ultimate goals of the network are: the development of efficient and compact biofilm reactors; the scientific training of young researchers; the exchange of know-how between the research teams involved. Correlations will be established between biofilm structure and activity, on one side, and the bioreactor operating conditions, on the other side, in order to obtain an optimized design of the nitrogen conversion processes. Main topics of research are: a) Biofilm structure and activity: characterization of microbial aggregates as a function of the physico-chemical and hydrodynamic environment; b) Bioprocess modeling: predictive biofilm models and process simulation; c) Bioreactor design, operation and control: guide-lines for the efficient design and control of nitrifying/denitrifying biofilm reactors. The specific focus of the work at IMT will be to perform laboratory scale experiments and mathematical simulations to evaluate the fate of particulate organic matter in biofilm reactors treating wastewater.

Microbial growth in drinking water distribution systems
The project concerns changes in water quality due to microbial growth during the transport of drinking water from waterworks to the consumer. The major part of the biomass in drinking water system is attached to the inner surfaces of the waterpipes as a 'biofilm'. The project focuses on the factors controlling the growth of this biofilm, primarily the concentration of microbial available nutrients and the flow velocity in the pipes. The kinetics of the growth will be investigated, with respect to determining the effect of the hydraulic retention time in the water distribution system. These factors will be investigated in a constructed model pipe system. The goal of the project is to provide an useful tool for assessing the microbial growth potential of various types of water in different drinking water distribution systems.
Microbial growth in drinking water distribution systems

The project concerns changes in water quality due to microbial growth during the transport of drinking water from waterworks to the consumer. The major part of the biomass in drinking water system is attached to the inner surfaces of the waterpipes as a 'biofilm'. The project focuses on the factors controlling the growth of this biofilm, primarily the concentration of microbial available nutrients and the flow velocity in the pipes. The kinetics of the growth will be investigated, with respect to determining the effect of the hydraulic retention time in the water distribution system. These factors will be investigated in a constructed model pipe system. The goal of the project is to provide an useful tool for assessing the microbial growth potential of various types of water in different drinking water distribution systems.

Department of Environmental Engineering
Period: 01/10/1997 → 14/06/2001
Number of participants: 4
Acronym: 87
Project participant:
Corfitzen, Charlotte B. (Intern)
Arvin, Erik (Intern)
Boe-Hansen, Rasmus (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Mikrobiel vækst i drikkevandsdistributionssystemer

Department of Environmental Engineering
Period: 01/10/1997 → 31/08/2001
Number of participants: 7
Phd Student:
Boe-Hansen, Rasmus (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Jørgensen, Claus (Ekstern)
Main Supervisor:
Arvin, Erik (Intern)
Examiner:
Henze, Mogens (Ekstern)
Block, Jean-Claude (Ekstern)
Gruttner, Henrik (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Erhvervsforskerordningen
Project: PhD

Mobilization of Nickel in Aquifers in response to Afforestation

Department of Environmental Engineering
Period: 01/10/1997 → 30/11/2001
Number of participants: 5
Phd Student:
Kjøller, Claus (Intern)
Main Supervisor:
Postma, Diederik Jan (Intern)
Examiner:
Christensen, Thomas Højlund (Intern)
Hansen, Hans Chr. B. (Ekstern)
Kinniburgh, David G. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Stabilisering af restprodukter fra affaldsforbrænding
Department of Environmental Engineering
Period: 01/10/1997 → 30/10/2001
Number of participants: 7
Phd Student:
Lundtorp, Kasper (Intern)
Supervisor:
Jensen, Dorthe Lærke (Intern)
Mogensen, Erhardt (Ekstern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Kjeldsen, Peter (Intern)
Hjelmar, Ole (Ekstern)
Johnson, Carola Annette (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Erhvervsforskerordningen
Project: PhD

Behandling af restprodukter fra affaldsforbrænding med henblik på genanvendelse og/eller bæredygtig deponering
Department of Environmental Engineering
Period: 01/09/1997 → 26/09/2001
Number of participants: 6
Phd Student:
Sørensen, Mette Abildgaard (Intern)
Supervisor:
Koch, Christian Bender (Ekstern)
Main Supervisor:
Christensen, Thomas Højlund (Intern)
Examiner:
Postma, Diederik Jan (Intern)
Hansen, Hans Chr. B. (Ekstern)
Johnson, Carola Annette (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Geotechnical and hydraulic properties of fissured clay till
The project is a multi-disciplinary study of field and laboratory methods connecting engineering geology, geotechnical and environmental engineering related to fissured clay till. It forms the basis for a number of parallel courses carried out by students (Mid-course projects and MSc. courses). It is carried out in co-operation with the Danish Geotechnical Institute, the Geological Institute at the University of Copenhagen and the Geological Survey of Denmark and Greenland. Using the modified "intact block"-method large test specimens of fissured clay till have been collected at field site and studied in an
isotropically loaded permeameter as well as in a triaxial cell. The objectives are to characterise the spatial distribution, orientation, apertures and coating of fissures, and to study and evaluate fracture permeability, and to determine strength and deformation properties of fissured clay till.

Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
Geotechnical Institute
University of Copenhagen

Geological Survey of Denmark and Greenland
Period: 01/09/1997 → 01/01/9999
Number of participants: 4
Project participant:
Baumann, Jens (Ekstern)
Jørgensen, Peter (Ekstern)
Klint, Knud Erik (Ekstern)

Project Manager, organisational:
Foged, Niels Nielsen (Intern)

Model based optimization of integrated drainage systems
The research project is focusing on the overall perspectives of optimization of urban drainage systems. The idea is to analyze the system performance by means of mathematical models, to question the basic concepts and to outline the benefit that is gained by the application of integrated modeling and optimization concepts as compared to the more traditional engineering approaches.

Department of Environmental Engineering
Period: 01/09/1997 → 31/08/2001
Number of participants: 3
Acronym: 148
Project participant:
Mikkelsen, Peter Steen (Intern)
Rauch, Wolfgang (Intern)

Project Manager, organisational:
Harremoës, Poul (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,092,000.00 Danish Kroner

Treatment of residues from solid waste incineration
Incineration is the most common waste treatment and disposal method for municipal and industrial solid waste in Denmark. Solid residues are generated in terms of bottom ash and APC (air pollution control) solids (fly ashes and acid flue gas cleaning products). The bottom ashes are primarily used for construction purposes while the APC solids are landfilled or temporarily stored until permanent landfills are approved. All the residues from incineration should be utilized or landfilled by sustainable methods without adverse impacts on the environment. One of the main environmental concerns is the short term (few years) as well as long term (centuries) leaching of salts and heavy metals from construction material containing residues or from waste residue landfills. The aim of this project is to develop technologies for bottom ashes as well as for APC products based on combinations of washing and chemical stabilization. Currently focus is on APC solids and washing followed by stabilization by ironoxides. This leads to a reduction in the leaching of salts by partial removal and a permanent binding of heavy metals in the treated solids. Extensive laboratory studies are being carried out and currently a pilot-plant is being constructed.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Ansaldo Vølund A/S
University of Copenhagen
Royal Veterinary and Agricultural University

University of Washington
Period: 01/09/1997 → 30/08/2000
Number of participants: 11
Project participant:

Jensen, Dorthe Lærke (Intern)
Sørensen, Mette Abildgaard (Intern)
Lundtorp, Kasper (Intern)
Duhring, Pernille Bayard (Intern)
Skov, Bent Henning (Intern)
Mogensen, Erhardt (Ekstern)
Stipp, Susan (Ekstern)
Koch, Christian Bender (Ekstern)
Bordia, Raj (Ekstern)
Benjamin, Mark (Ekstern)

Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,512,000.00 Danish Kroner

Agrohydrologisk modellering på stor geografisk skala

Department of Environmental Engineering
Period: 01/08/1997 → 21/09/2001
Number of participants: 6
Phd Student:

Andersen, Jens Asger (Intern)

Supervisor:
Refsgaard, Jens Christian (Ekstern)

Main Supervisor:
Jensen, Karsten Høgh (Intern)

Examiner:
Rosbjerg, Dan (Intern)
Dolman, Han (Ekstern)
Thomsen, Anton (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsstip.-SU, Eksp

Argillaceous carbonate rocks

Petrophysical data bases for argillaceous limestone from Estonia and from the Caribbean Sea are analysed in order to identify the influence of clay on petrophysical data, especially sonic velocities.

Department of Geology and Geotechnical Engineering

Department of Environmental Engineering
EE
Period: 01/08/1997 → 01/01/9999
Number of participants: 2
Project participant:

Shogenova, Alla (Ekstern)

Project Manager, organisational:
Fabricius, Ida Lykke (Intern)
Occurrence and environmental properties of antibiotics in organic waste. Effects and bioaccumulation in Crustaceans

Medical substances such as antibiotics have been used intensively in agriculture and exposed to the environment with very little attention. In this project an environmental risk assessment is performed involving analyses of 10 different antibiotics and their metabolites in organic wastes; investigations of degradation is soil and water, transport in the environment including leaching and effect and accumulation analysis on algae and daphnids. As test objects are selected 10 different antibiotics representing different groups of action. Besides they represent the groups used in the highest quantities in Danish farming. In the present part of the project is focused on effects and bioaccumulation in the freshwater crustacean Daphnia magna. Acute (immobilisation) tests and reproduction tests are performed and accumulation studies are planned.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Period: 15/07/1997 → 31/12/2000
Number of participants: 3
Project participant:
Wollenberger, Leah (Intern)
Project Manager, organisational:
Kusk, Kresten Ole (Intern)
Halling-Sørensen, Bent (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 171,600.00 Danish Kroner

Occurrence and environmental properties of antibiotics in organic waste. Effects and bioaccumulation in Crustaceans

Frost susceptibility of limestone fill

Frost susceptibility of hydraulic fill from dredged limestone used for an artificial island at the Øresund Link has been studied and evaluated. The fill acts as bearing layer for a combined rail and motor way. Due to removal of fines in the dredging operations the material has no significant heave caused by frost. It could be classified as not susceptible to frost under the used conditions at the construction site.

Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
Transport og nedbrydning af pesticider i injektionsforsøg

Department of Environmental Engineering
Period: 01/04/1997 → 18/09/2001
Number of participants: 6
Phd Student:
Højberg, Anker Lajer (Intern)
Supervisor:
Bjerg, Poul Løgstrup (Intern)
Main Supervisor:
Engesgaard, Peter Knudegaard (Intern)
Examiner:
Schirma, Mario (Ekstern)
Jensen, Karsten Høgh (Intern)
Refsgaard, Jens Christian (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Sektorministerium, Stip-SU
Project: PhD

Effects of redox conditions on pesticide degradation in groundwater

Department of Environmental Engineering
Period: 01/03/1997 → 30/03/2001
Number of participants: 4
Phd Student:
Pedersen, Philip Grinder (Intern)
Supervisor:
Albrechtsen, Hans-Jørgen (Intern)
Main Supervisor:
Mosbæk, Hans (Intern)
Examiner:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samarbejdsaftale-Finan-SU
Project: PhD

ECO-CAMPUS, Energy Environment network of European universities and research centers
The project is carried out by an international network between universities in France, Denmark, Finland, Greece, Poland, Portugal and Romania. The aim is to investigate the energy and environmental situation at the universities themselves, realizing the importance of these institutions being examples for the rest of societies, especially the students. Studies from various campuses are analysed and compared.

Department of Buildings and Energy
Department of Environmental Science and Engineering
Department of Civil Engineering

Department of Environmental Engineering
Period: 15/02/1997 → 01/01/9999
Number of participants: 8
Project participant:
Gabriel, Søren (Intern)
Roturier, Jacques (Ekstern)
Laine, T. (Ekstern)
Apostolidou, E. (Ekstern)
Gula, A. (Ekstern)
Almeida, A. de (Ekstern)
Berbecaru, D. (Ekstern)

Project Manager, organisational:
Nørgaard, Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 73,500.00 Danish Kroner

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Behavior of iron-cyanides in soil and groundwater at gaswork sites

Department of Environmental Engineering
Period: 01/02/1997 → 31/12/1999
Number of participants: 2
Acronym: 104
Project participant:
Mosbæk, Hans (Intern)

Project Manager, organisational:
Kjeldsen, Peter (Intern)

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Evaluering af anvendeligheden af netværksmodeller til den specielle kerneanalyse

Department of Environmental Engineering
Period: 01/02/1997 → 30/07/2001
Number of participants: 6
PhD Student:
Larsen, Jens Kjell (Intern)
Supervisor:
Winter, Anatol (Ekstern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Foged, Niels Tækker (Intern)
Engstrøm, Finn (Ekstern)
Payatakes, Alkiviades C (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

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Mikrobiel respiration ...

Department of Environmental Engineering
Period: 01/02/1997 → 26/03/2000
Number of participants: 2
Phd Student:
Dircks, Klaus (Intern)
Main Supervisor:
Henze, Mogens (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-Stipendium, Eksperiment
Project: PhD

**Network models and special core analysis**
The purpose of this project is to evaluate the applicability of physical and mathematical network models in the interpretation of special core analysis data, e.g. capillary pressure and relative permeability. The possibility of including microscopic phenomena in macroscopic reservoir models will be addressed.

Department of Geology and Geotechnical Engineering

Department of Environmental Engineering
Period: 01/02/1997 → 31/01/2000
Number of participants: 3
Project participant:
Larsen, Jens Kjell (Intern)
Winter, Anatol (Ekstern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

**Reactive walls for groundwater remediation.**
Groundwater polluted with chlorinated compounds and metals can be remediated by use of reactive material such as metallic iron. The Danish EPA has started a demonstration programme where reactive walls are to be used. Under this programme IMT (PK) serves as a scientific coordinator working together with Danish EPA, counties and consulting companies. Besides research is carried out on reactive walls by use of laboratory experiments, especially looking at chromate reduction and simultaneous removal of chlorinated solvents.

Department of Environmental Science and Engineering

Department of Environmental Engineering
Period: 01/02/1997 → 31/12/2001
Number of participants: 1
Project Manager, organisational:
Kjeldsen, Peter (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Uknown
Amount: 400,000.00 Danish Kroner
Project

**rykket for studieplam 5.11.97**

Department of Environmental Engineering
Period: 01/02/1997 → 16/02/2000
Number of participants: 2
Phd Student:
Loke, Egon (Intern)
Main Supervisor:
Harremoës, Pou (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-Stipendium, Eksperiment
Project: PhD
Activated carbon filtration of water
Contamination of ground water reservoirs by organic chemical pollutants (solvents and pesticides) is becoming common in Denmark. As a consequence, many wells have been closed and the loss of water resources has been compensated by savings of water. However, this strategy may lead to a shortage of water, and therefore treatment of the water for the organic chemicals may be required in the future. The purpose of the project is to: 1) Determine the capacity of activated carbon to remove atrazine and other pesticides at realistic very low concentrations (0.01-1 ug/l) in groundwaters with different contents of natural organic matter (NOM), and 2) To develop the laboratory and modeling methodologies to predict actual full scale sorption capacities.

Department of Environmental Engineering
Period: 01/01/1997 → 31/12/1999
Number of participants: 2
Acronym: 94
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

Bioenergetics of microbiologically mediated water rock interactions
Microbiologically mediated sulfate reduction and methanogenesis is closely linked to the in-situ energy available for the processes, to what extent this is the case for the suboxic processes modified is not well described, but pursued here. The processes may occur when a threshold energy level is superseded. There are different threshold values for different processes and different systems, and the factors controlling this are to be studied.

Department of Environmental Engineering
Period: 01/01/1997 → 28/03/2003
Number of participants: 6
Phd Student:
Schrøder, Thomas Morville (Intern)
Supervisor:
Jensen, Karsten Høgh (Intern)
Main Supervisor:
Rostbjerg, Dan (Intern)
Examiner:
Christensen, Steen (Intern)
Bengtsson, Lars (Ekstern)
Jørgensen, Peter Rene (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Biological phosphorus removal

Department of Environmental Engineering
Period: 01/01/1997 → 31/12/2000
Number of participants: 1
Acronym: 165
Project Manager, organisational:
Henze, Mogens (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 300,000.00 Danish Kroner

Combined anaerobic and aerobic biodegradation of perchloroethylene
Highly chlorinated compounds are easily dechlorinated under anaerobic conditions and the dechlorinated compounds may be completely mineralized in a subsequent aerobic step. This process was investigated with perchloroethyene as a model substrate. The anaerobic process was performed in an UASB reactor with the dechlorinating organism Dehalospirillum multivorans inoculated in the granulars. The subsequent aerobic degradation was done in a biofilm reactor with methanotropic organisms. The fate of the metabolites and the kinetic behavior of the reactors has been studied.

Department of Environmental Science and Engineering

Department of Environmental Engineering
Period: 01/01/1997 → 01/01/9999
Number of participants: 6
Project participant:
Arvin, Erik (Intern)
Christensen, Nina (Intern)
Arcangeli, Jean-Pierre (Intern)
Ahring, Birgitte Kiær (Intern)
Arvin, Erik (Intern)
Hörfer, Christina (Ekstern)

Combined anaerobic and aerobic biodegradation of perchloroethylene
Highly chlorinated compounds are easily dechlorinated under anaerobic conditions and the dechlorinated compounds may be completely mineralized in a subsequent aerobic step. This process was investigated with perchloroethyene as a model substrate. The anaerobic process was performed in an UASB reactor with the dechlorinating organism Dehalospirillum multivorans inoculated in the granulars. The subsequent aerobic degradation was done in a biofilm reactor with methanotropic organisms. The fate of the metabolites and the kinetic behavior of the reactors has been studied.

Primary Focus Area : Environmental engineering

Department of Environmental Engineering
Period: 01/01/1997 → 31/12/1999
Number of participants: 2
Acronym: 96
Project participant:
Christensen, Nina (Intern)

Concrete, hardened: Self desiccation
The scope is to describe and verify a test method for control of self desiccation for hardened concrete. The test method covers the determination of internal relative humidity (RH) in hardened concrete and cement mortar using RH instruments. The determination of RH is done on crushed samples of concrete or cement mortar. The test method is only for measuring equipment which gives off or takes up humidity to a limited extent, so that a stable RH value can be obtained within 24 hours.

Department of Environmental Science and Engineering

Department of Environmental Engineering
Lund University
Field investigations of transport and fate of pesticides in a sandy aquifer

The behaviour of selected pesticides will be studied in the field e.g. migration, sorption, and degradation. A continuous injection experiment has been conducted for ambient flow gradients in an aerobic sandy aquifer. Hydrological and geochemical characteristics of the aquifer are already known. The microbiological and sorption characteristics of the aquifer will be characterized. Selected pesticides and conservative tracer will continuously be injected for a period of 0.5-1 year. Multilevel samplers installed downstream of the injection will be monitored frequently during a period of about two years. The experiment will be evaluated based on: (1) breakthrough curves at sampling points downstream of the injection and (2) reactive solute transport simulation of the pesticide plume using a model developed and evaluated in this project. From the breakthrough data, dilution, sorption, and degradation can be determined and field degradation rates calculated. The spatial distribution of the pesticide plume will be determined by synoptic sampling at all monitoring points (2-3 times). The field investigation will be planned in detail autumn 1997. The project is made in collaboration with GEUS and Department of Hydrodynamics and Water resources (ISVA). The project is funded by The Danish Environmental Research Programme. The project period is 1997-1999.
Inorganic fluxes in watersheds hosting old landfills
Natural attenuation by degradation may be substantial for organic pollutants in leachate plumes, but most inorganic species will be subject to only minor attenuation in the aquifer. However inorganic species as chloride, sodium, potassium, calcium, magnesium, sulfate etc. enter the groundwater also from other sources than the landfill. This be precipitation, soil weathering, use of fertilizer and use of road deicing chemicals. The significance of these other sources is being mapped by monitoring of groundwater quality just below different land uses within two watersheds also containing unlined landfills. The contributions from the landfills are also being assessed. The results indicate that deicing chemicals and agriculture contribute significantly to the load of inorganic species on the groundwater.

Kinetics of degradation of chlorinated aliphatics and domestic compounds in biofilm reactors.
The purpose of the research was to determine kinetic parameters for the biodegradation of organic contaminants at the very low concentrations which are often found in practice (ug/l range). Since several important compounds are degraded by cometabolism, this phenomenon was studied intensively. Experiments have been conducted in a "biodrum" reactor where biofilm samples can be removed easily and the thickness of the biofilm can be determined non-destructively by microscopy. Substrate removal and the simultaneous biofilm growth is modelled by the computer programme Aquasim from EAWAG in Zürich. The modelling takes into account the main processes affecting the different species of the biofilm (growth, decay, hydrolysis, polymer production, attachment, and detachment).

Long-lived radioisotopes (Sr, Nd and U-Th) as tracers for exogene geochemical processes.
The objective of this project is to improve the understanding of element transport from the continents to the oceans by using radioisotopes of Sr and Nd. Suspended particles, colloidal size fractions and truly dissolved material in oxic and anoxic brackish water, comprising a vertical profile in the central Baltic Sea will be sampled in 1997. Colloid concentration and size distribution will be measured by photon correlation spectroscopy. The separation of colloids in different size classes
Long-lived radioisotopes (Sr, Nd and U-Th) as tracers for exogene geochemical processes: The importance of particles, colloids and dissolved components for element transport in fresh and brackish water.

The objective of this project in to improve the understanding of element transport from the continents to the oceans by using radioisotopes of Sr and Nd. Suspended particles, colloidal size fractions and truly dissolved material in oxic and anoxic brackish water, comprising a vertical profile in the central Baltic Sea will be samples in 1997. Colloid concentration and size distribution will be measured by photon correlation spectroscopy. The separation og colloids in different size classes will be done by ultrafiltration. The brackish water data, compared with freshwater data, will be used to model the importance of particles and colloids for in freshwater-estuarine systems for element transport in general, and for the element transport in the Baltic Sea in particular. The project is financed by the Swedish Natural Research Council and the grants are administrated by Per Andersson at the Swedish Museum of Natural History, Stockholm, Sweden.

Department of Environmental Engineering
Swedish Museum of Natural History
Stockholm University
Period: 01/01/1997 → 31/12/2001
Number of participants: 1
Acronym: 105
Project Manager, organisational:
Ledin, Anna (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Natural attenuation as remediation of landfill leachate plumes.

Natural attenuation as a remediation technology is being considered for landfill leachate plumes. The demonstration of mass removal of target pollutants by natural remediation and the evaluation of residual risk is somewhat more complicated than the approaches and protocols used in the context of petroleum hydrocarbons and chlorinated aliphatic compounds. The difference relates to the size of the source term and its influence on local hydrogeology, the mixture of pollutants and general organic matter and the often unidentified toxicity of the leachate. Based on the extensive research results described under "landfills" a conceptual model for natural attenuation at landfills is being developed.

Department of Environmental Engineering
Luleå University of Technology
Dow Chemical Company
Period: 01/01/1997 → 31/12/2001
Number of participants: 5
Project participant:
Gustavsson, Örjan (Ekstern)
Ingri, Johan (Ekstern)
Schoeman, Brian (Ekstern)
Project Manager, organisational:
Ledin, Anna (Intern)
Andersson, Per (Ekstern)

Natural attenuation as remediation of landfill leachate plumes.

Natural attenuation as a remediation technology is being considered for landfill leachate plumes. The demonstration of mass removal of target pollutants by natural remediation and the evaluation of residual risk is somewhat more complicated than the approaches and protocols used in the context of petroleum hydrocarbons and chlorinated aliphatic compounds. The difference relates to the size of the source term and its influence on local hydrogeology, the mixture of pollutants and general organic matter and the often unidentified toxicity of the leachate. Based on the extensive research results described under "landfills" a conceptual model for natural attenuation at landfills is being developed.

Department of Environmental Engineering
Period: 01/01/1997 → 31/12/2000
Number of participants: 9
Acronym: 93
Project participant:
Foverskov, Anja (Intern)
Baun, Anders (Intern)
Ledin, Anna (Intern)
Troelsen, Lena Birgit Dalskov (Intern)
Nyholm, Niels (Intern)
Bjerg, Poul Legstrup (Intern)
Kruse, Susanne (Intern)
Nilsson, Torben (Intern)

Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 2,215,200.00 Danish Kroner

Natural attenuation of landfill leachate plumes
Natural attenuation as a remediation technology is being considered for landfill leachate plumes. The demonstration of mass removal of target pollutants by natural remediation and the evaluation of residual risk is somewhat more complicated than the approaches and protocols used in the context of petroleum hydrocarbons and chlorinated aliphatic compounds. The difference relates to the size of the source term and its influence on local hydrogeology, the mixture of pollutants and general organic matter and the often unidentified toxicity of the leachate. Based on the extensive research results described under “landfills” a conceptual model for natural attenuation at landfills is being developed.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Amternes Videncenter for jordforurening
Ejlskov Consult ApS
Senderjyllands Amt
Period: 01/01/1997 → 31/12/2000
Number of participants: 6
Project participant:
Bjerg, Poul Legstrup (Intern)
Kjeldsen, Peter (Intern)
Rokkjær, Arne (Ekstern)
Ejlskov, Palle (Ekstern)
Züricho, Henrik (Ekstern)

Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Natural attenuation of xenobiotic organic compounds in groundwater.
Natural attenuation has gained more and more interest as a remediation strategy for groundwater contaminated by petroleum hydrocarbons and chlorinated solvents. The current project focus on the actual potential for natural attenuation as a remedy. The dependency on the conditions with respect to geology, redox and type of contaminants are investigated and the estimation of mass removal by different methods is evaluated. As a part of the project Poul L. Bjerg acts as technical advisor for the Danish EPA.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Hedeselskabet
NIRAS A/S
Oliebranchens Miljøpulje
Danish Ministry of the Environment
Amternes Videncenter for jordforurening
Period: 01/01/1997 → 01/01/9999
Number of participants: 10
Project participant:
Arvin, Erik (Intern)
Mossing, Christian (Ekstern)
Larsen, Lars Chr. (Ekstern)
Anders G. Christensen (Ekstern)
Riis, Charlotte E. (Ekstern)
Lassen, Ernst (Ekstern)
Asp-Fuglsang, Inger (Ekstern)
Dahlstrøm, Kim (Ekstern)
Kaalund, Lars (Ekstern)
Project Manager, organisational:
Bjerg, Poul Løgstrup (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 300,000.00 Danish Kroner

Pesticide & Grundvand 2.3, Kinetics of pesticide degradation
Kineticundervisninger af pesticidnedbrydning i grundvand ved realistisk lave koncentrationer og med særlig vægt på undersøgelse af tærskelkoncentrationer og disse afhængighed af primære substrater. Endvidere undersøges adaptationsfænomener. De absolutte rater sammenlignes med rateestimater opnået i andre delprojekter ved felforløb/modellering.

Department of Environmental Engineering
Period: 01/01/1997 → 31/12/1997
Number of participants: 2
Acronym: 3
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Project Manager, organisational:
Nyholm, Niels (Intern)

Threshold concentrations for biodegradation of pesticides in groundwater
The project is a subproject of project no. 2.2 of the pesticide and groundwater strategic environmental research programme. Methods and theory are used as established in the above STVF funded project on general biodegradation kinetics, except that tests are being conducted at even lower concentrations (pg/L levels)

Department of Environmental Science and Engineering

Department of Environmental Engineering

De Nationale Geologiske Undersøgelser for Danmark og Grønland
Period: 01/01/1997 → 31/12/1999
Number of participants: 6
Project participant:
Toräng, Lars (Intern)
Qualmann, Signe (Intern)
Justesen, Kasper Bo (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Ámand, Jens (Ekstern)
Project Manager, organisational:
Nyholm, Niels (Intern)

Financing sources
Source: Unknown
Threshold concentrations for biodegradation of pesticides in groundwater

The project is a subproject of project no. 2.2 of the pesticide and groundwater strategic environmental research programme. Methods and theory are used as established in the above STVF funded project on general biodegradation kinetics, except that tests are being conducted at even lower concentrations (pg/L levels).

Department of Environmental Engineering
Period: 01/01/1997 → 31/12/1999
Number of participants: 3
Acronym: 58
Project participant:
Toräng, Lars (Intern)
Qualmann, Signe (Intern)
Project Manager, organisational:
Nyholm, Niels (Intern)

Effects of redox conditions and geology on pesticide degradation

Degradation of pesticides in aquifers will be investigated by aseptically collecting sediment and water samples from various redox environments (e.g., aerobic, denitrifying, sulfate- and iron-reducing and methanogenic). Samples will be obtained from different aquifers representing typical geological settings in Denmark. Sediment and groundwater amended with low concentrations of pesticides (typically below 10 mg/l) will be incubated in the laboratory at field redox conditions and temperatures. The removal of pesticides and the accumulation of metabolites in the sediment-groundwater will be analyzed using HPLC and GC-MS. Complete mineralization will be assessed by addition of 14C-labelled pesticides and measurement of 14CO2 evolution. The degradation observed will be compared to the biomass and activity of dominant bacterial groups (i.e., aerobic, denitrifying, Fe(III)/Mn(IV)-reducing, sulfate-reducing and methanogenic) as well as to geochemical conditions in the aquifer. Finally, the degradation of pesticides in the field will be investigated at selected sites using in situ microcosms. These field investigations will facilitate the comparison and transfer of laboratory results to field conditions.

Department of Environmental Science and Engineering
Department of Environmental Engineering
De Nationale Geologiske Undersøgelser for Danmark og Grønland
Period: 01/10/1996 → 31/12/2000
Number of participants: 4
Project participant:
Mosbæk, Hans (Intern)
Refstrup, Mona (Intern)
Pedersen, Philip Grinder (Intern)
Project Manager, organisational:
Albrechtsen, Hans-Jørgen (Intern)

Effects of Xenohormones on Crustaceans

The aim of the project is to develop a fast and easy method to identify chemicals, which act as hormones or as hormone disrupters in humans and wildlife. The ecologically important copepod Acartia tonsa is used as a test organism and different chemicals suspected to interfere with hormone systems are used as positive controls. The increasing incidence of some cancer types, damage to reproductive systems and developmental problems of this system of humans and wildlife has caused concern about some industrial compounds used in high quantities, which can mimic the natural hormones and acts as such or in other ways interfere with the functions of the natural hormones. Crustaceans posses some of the same hormones as many other animal groups - oestrogen, testosterone and progesterone - among others have been identified, and it seems likely that the hormones act in much the same way in Crustaceans as in mammals. In this project is used the small (1 mm) copepod, Acartia tonsa, as a test animal. It is a very common planktonic organism in European and American coastal waters and as such of great ecological importance. It’s easily cultured and handled in the laboratory.
Suspected oestrogens such as alkylphenoles, alkylphenole ethoxylates, bisphenol A and plastic softeners has been investigated together with the positive controls (oestrogen, testosterone) and some negative controls to find parameters which will show or at least indicate if the compounds act as hormones. Life cycle tests with Acartia is performed, and focus is directed against different parts of the lifecycle.

Department of Environmental Science and Engineering

Department of Environmental Engineering

Royal Danish School of Pharmacy
Period: 01/10/1996 → 31/12/1999
Number of participants: 3
Project participant:
Bergstrøm, Jane Mette (Intern)
Halling-Sørensen, Bent (Ekstern)

Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,090,000.00 Danish Kroner

Effects of Xenohormones on Crustaceans

The aim of the project is to develop a fast and easy method to identify chemicals, which act as hormones in humans and wild life. The increasing incidence of some cancer types, damage to reproductive systems and developmental problems of this system of humans and wildlife has caused concern about some industrial compounds used in high quantities, which can mimic the natural hormones and actsas such. Crustaceans posses the same hormones as many other animal groups - oestrogen, testosterone and progesterone - among others have been identified, and it seems likely that the hormones act in the same way in Crustaceans as in mammals. In this project is used the small (1 mm) copepod, Acartia tonsa, as a test animal. It is a very common planktonic organism in European coastal waters and as such of great ecological importance. It is easily cultured and handled in the laboratory. Suspected oestrogen such as alkylphenoles, alkylphenole ethoxylates, bisphenol A and plastic softeners has been investigated together with the positive control oestrogen and some negative controls to find parameters which will show or at least indicate if the compounds act as hormones. Life cycle tests with Acartia is performed, and focus is directed against different parts of the lifecycle.

Department of Environmental Engineering

Danmarks Farmaceutiske Højskole
Period: 01/10/1996 → 31/12/2000
Number of participants: 2
Acronym: 43
Project participant:
Bergstrøm, Jane Mette (Intern)

Project Manager, organisational:
Kusk, Kresten Ole (Intern)

Project

Estimation Problems in Hydrology: Unsaturated Flow and Reactive Transport

Department of Environmental Engineering
Period: 01/09/1996 → 11/06/1999
Number of participants: 3
Phd Student:
Hollenbeck, Karl-Josef (Intern)
Main Supervisor:
Jensen, Karsten Høgh (Intern)
Examiner:
Engesgaard, Peter Knudegaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Blandet Finansiering-SU
Project: PhD
Monitoring and interpretation of H2 as a redox indicator in an anaerobic leachate plume

Concentrations of hydrogen (H2) were measured in 52 sampling points in the leachate pollution plume at the Grindsted Landfill. The H2 concentrations indicate that the redox level of the main part of the strongly anaerobic plume is iron-reducing. Calculation of Gibb's free energy for various redox processes at the actual groundwater temperature of 8 degrees C suggests that sulfate-reduction may also take place, but that methanogenesis must take place in microniches or by fermentation since the free energy and the H2 levels are not favorable for carbondioxide reduction. These results are in accordance with the microbial studies performed in the plume. Prior to the study, testing of well construction and materials was performed to allow for correct measurements to be made.

Department of Environmental Engineering
Technical University of Denmark
Period: 01/09/1996 → 30/09/1997
Number of participants: 4
Acronym: 6
Project participant:
Skov, Bent Henning (Intern)
Albrechtsen, Hans-Jørgen (Intern)
Bjerg, Poul Legstrup (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Geographical variation of extreme point rainfall

In 1979 the institute initiated a nationwide rain gauge system suitable for monitoring short, intense rain events. The system consists of approximately 50 measuring stations separated by one to 300 km, and covering a total of 43,000 square kilometres. At the present time the longest records include 16 years of data. Statistical analysis of the new data reveals a remarkable geographical variation which can be explained only partially by correlation with regional climatological
variables that describe differences in physiography and microclimate. In addition to sampling errors originating from use of
limited samples for estimation at individual sites, there is a significant statistical residual that cannot be explained by a
regional model. Consequently, the engineering application of rainfall data for design and analysis are being revised. The
project aims at establishing guidelines for use of rain data in modelling of urban drainage systems.

Department of Environmental Science and Engineering

Department of Environmental Engineering
Period: 09/08/1996 → 30/06/1999
Number of participants: 6
Project participant:
Arnbjerg-Nielsen, Karsten (Intern)
Mikkelsen, Peter Steen (Intern)
Rosbjerg, Dan (Intern)
Madsen, Henrik (Ekstern)
Hanne Kjær Jørgensen (Ekstern)
Project Manager, organisational:
Harremoës, Poul (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 275,000.00 Danish Kroner

Adsorption og desorption af pesticider i akviferer

Department of Environmental Engineering
Period: 01/08/1996 → 18/05/2000
Number of participants: 5
Phd Student:
Clausen, Liselotte (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Grøn, Christian (Intern)
Hansen, Hans Chr. B. (Ekstern)
Postma, Diederik Jan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Geographical variation of extreme point rainfall
In 1979 the institute initiated a nationwide rain gauge system suitable for monitoring short, intense rain events. The system
consists of approximately 70 measuring stations separated by one to 300 km, and covering a total of 43,000 square
kilometres. At the present time the longest records include 16 years of data. Statistical analysis of the new data reveals a
remarkable geographical variation which can be explained only partially by correlation with regional climatological
variables that describe differences in physiography and microclimate. In addition to sampling errors originating from use of
limited samples for estimation at individual sites, there is a significant statistical residual that cannot be explained by a
regional model. Consequently, the engineering application of rainfall data for design and analysis are being revised. Part
of the conclusions have recently been published in a new guide from the Danish Water Pollution Control Committee.

Department of Environmental Engineering

Department of Hydrodynamics and Water Resources
Danish Meteorological Institute
Period: 01/08/1996 → 30/06/1999
Number of participants: 3
Acronym: 33
Project participant:
Rosbjerg, Dan (Intern)
Nedbrydning af pesticider i grundvandsmagasiner

Department of Environmental Engineering
Period: 01/08/1996 → 27/07/2000
Number of participants: 3
Phd Student: Arildskov, Niels Peter (Intern)
Supervisor: Aamand, Jens (Ekstern)
Main Supervisor: Postma, Diederik Jan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Toxic effects by cadmium on growth and phosphate uptake by P-deficient algae
The project is a continuation of research performed by Niels Nyholm under a sabbatical leave in 1982 to the states. Inhibition of the ecologically relevant parameter phosphate uptake may perhaps be more sensitive than inhibition of growth, and as there is no direct relation between the growth of algae and their uptake of nutrients, phosphate uptake must be studied in short term spiking experiments. Perturbations of natural communities as a result of toxic exposure could potentially take place with no detection possible in normal growth tests, if nutrient uptake was inhibited at a more sensitive level than seem equally sensitive, if selected mathematically consistent and distinguishing organism response from system (reactor) response.

Department of Environmental Engineering
Period: 01/08/1996 → 01/02/1998
Number of participants: 2
Acronym: 59
Project participant: Ebert, Birthe (Intern)
Project Manager, organisational: Nyholm, Niels (Intern)

Sorption of pesticides in aquifers
Sorption of pesticides are studied in batch experiments on mineral powders and on aquifer sediment samples. The results from the experiments are interpreted with the basis on pore surface mineralogy of the sediments.

Department of Geology and Geotechnical Engineering

Department of Environmental Engineering
De Nationale Geologiske Undersøgelser for Danmark og Grønland
Period: 01/07/1996 → 01/01/9999
Number of participants: 5
Project participant: Madsen, Lene (Intern)
Clausen, Kirsten Suzanne Hvid (Intern)
Lindhardt, Bo (Ekstern)
Project Manager, organisational: Fabricius, Ida Lykke (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
**Joule Heating**

Department of Environmental Engineering  
Period: 01/06/1996 → 30/12/1998  
Number of participants: 2  
Acronym: 108  
Project participant:  
Heron, Gorm (Intern)  
Project Manager, organisational:  
Christensen, Thomas Højlund (Intern)

**Rain as a water resource in households.**  
The water resource, energy and economy aspects of rainwater collection are assessed to evaluate rainfall collection as an alternative option for sustainable water supply in Denmark. A maximum of 229 million m$^3$/year of rainwater can be collected from Danish roofs, provided that all possible surfaces are used and all rain falling on the surfaces is collected. This is equivalent to 24% of the total present production of drinking water, which is mainly based on groundwater. From household roofs 64.5 million m$^3$/year can be collected if used for toilet flushing and washing of clothes. This is 68% of the actual demand for toilet flushing and washing of clothes in households and 22% of the total water consumption in households, but only 7% of the total present drinking water production in Denmark. From the society point of view there is neither an environmental nor an economic reason to systematically promote rainfall collection.

Department of Environmental Engineering  
Period: 01/05/1996 → 31/12/1997  
Number of participants: 3  
Acronym: 23  
Project participant:  
Henze, Mogens (Intern)  
Mikkelsen, Peter Steen (Intern)  
Project Manager, organisational:  
Albrechtsen, Hans-Jørgen (Intern)

**Substitution of drinking water by rainwater or gray water for flushing of toilets in household.**  
The reduction of the groundwater resources, and maybe also the increasing drinking water prizes, have increased the interest for collecting rainwater for use in toilet flushing or laundry. However, there is little knowledge of the hygienic quality of the collected and stored rainwater and of the hygienic consequences of this use. Therefore several rainwater collection systems and gray water reuse systems for use in toilet flushing established in different parts of Denmark are investigated with respect to occurrence of a range of microorganisms: bacteria, fungi and protozoans.

Department of Environmental Engineering  
Period: 01/05/1996 → 31/12/1998  
Number of participants: 1  
Acronym: 17  
Project Manager, organisational:  
Albrechtsen, Hans-Jørgen (Intern)

**Neural networks in environmental engineering**  
The purpose of this phd-study is to identify the features of neural networks with respect to application in the field of urban wastewater problems. The features of neural networks will be compared to other approaches to the problems.

Department of Environmental Engineering  
Period: 01/04/1996 → 31/12/1999  
Number of participants: 2  
Acronym: 101  
Project participant:  
Loke, Egon (Intern)  
Project Manager, organisational:
Artificial recharge of groundwater

Artificial recharge is a method to increase the capacity to extract groundwater by augmenting the natural infiltration of surface water. At the same time the top soil is utilized as a reactor for treatment of surface water. Artificial recharge has a wide spectrum of research challenges that need to be addressed to fully benefit from the technique. In the near future IMT

Department of Environmental Science and Engineering

Water Quality Institute, Denmark, Science Park Aarhus

Albrechtsen, Hans-Jørgen (Intern)
Henze, Mogens (Intern)
Boe-Hansen, Rasmus (Intern)
Hansen, Karin (Intern)
Engelsen, Peter Christian (Intern)
Jensen, Bjørn K. (Ekstern)

Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 650,000.00 Danish Kroner

Artificial recharge of groundwater

Artificial recharge is a method to increase the capacity to extract groundwater by augmenting the natural infiltration of surface water and at the same time utilize the top soil as a reactor for treatment of surface water. Artificial recharge has a wide spectrum of research challenges that need to be addressed to fully benefit from the technique. In the near future IMT
will focus on physical, chemical and biological processes occurring during biological clogging of sand filters and soils. Methods for characterization of the water input and the clogging materials (biomass) found in artificial recharge systems will be tested. Furthermore, laboratory column experiments will be conducted to measure the development of redox zones during progress of biological growth and clogging. The project is part of the European research project Artificial recharge of groundwater (1996-98) which is funded partly by the European Committee through the 4th framework programme Environment and Climate. This project involves nine different European partners, including the Water Quality Institute (VKI), and includes six work packages, (1) clogging and heterogeneity, (2) organic compounds and biodegradation, (3) redox dynamics, (4) water-aquifer material interaction, (5) fate of pathogens and (6) integration of knowledge from all work packages.

Department of Environmental Engineering
Period: 01/02/1996 → 31/01/1999
Number of participants: 5
Acronym: 51
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Henze, Mogens (Intern)
Engelsen, Peter Christian (Intern)
Boe-Hansen, Rasmus (Intern)

Mass-transfer and degradation of organic compounds from coal-tar in dual porosity geologic media
Department of Environmental Engineering
Period: 01/02/1996 → 24/06/1998
Number of participants: 3
Phd Student:
Broholm, Mette Martina (Intern)
Main Supervisor:
Arvin, Erik (Intern)
Examiner:
Helweg, Arne (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Kandidatstipendium ansat på DT
Project: PhD

Simultaneous removal of nitrogen and Phosphorus in biofilters
Biological removal of Phosphorus is inherently a cyclic mode of operation, where bacteria with the ability to store P intracellularly are selected for by the cyclic operation of the wastewater plant. In biofilm reactors this has the special effect that the diffusion of substrates into and products out of the biofilm changes rapidly during a cycle of operation. The aim of the project is to elucidate the diffusional phenomena and to identify the significance of diffusional resistance to the performance of the process. The phenomena has been clearly identified experimentally.

Department of Environmental Engineering
Period: 01/02/1996 → 31/12/2001
Number of participants: 4
Acronym: 102
Project participant:
Falkenštøt, Christina Maria (Intern)
Mosbæk, Hans (Intern)
Henze, Mogens (Intern)

Simultanfjernelse af kvælstof og forfor i biofiltre
Department of Environmental Engineering
Characterisation of wastewater and biomass
Detailed characterisation of wastewater and biomass is important in relation to modelling of wastewater treatment processes. A key element in municipal wastewater is the type of organic material present. Research is done on the uptake of organics and the influence of stored substrate on the processes.

Leaching of heavy metals from soils.
Quality criteria for soils with respect to heavy metals have traditionally focused on the environmental issues related to the land use (ingestion of soil, skin contact, etc.) and very little attention has been given to protection of the groundwater. The complex form of heavy metals in polluted soils makes prediction of leachability difficult and leaching experiments or leaching test are usually the only way to assess the amount of metal to leach from the soil. Model scenarios are being developed to evaluate heavy metal leaching in the context of groundwater protection and allow for simplified methods to account for groundwater quality criteria, depth and location of polluted soil, reduction in infiltration and leachable amounts determined in leaching test. Experimental studies have been performed at actual sites and leaching experiments are conducted in the laboratory.

Modelling of biological wastewater processes
Development of models for removal of organic matter, nitrogen and phosphorus from wastewater.
**Scientific Co-operation with Phuket Marine Biological Station, Thailand**

The overall aim of the Danida co-sponsored programme is science and technology transfer through co-operative research with the local Thai scientists. The first phase of the present project was a screening study of the occurrence of pesticides in surface water and of the risk for the adjacent marine environment as a result of the pesticide runoff. The scientific focus was a practical evaluation of a monitoring method using bioassays with algae and daphnia on XAD concentrated water samples. The method proved useful and revealed severe pesticide contamination of stream water but toxic impact on the marine environment was concluded to be unlikely because of a large dilution factor caused by tidal action. The subsequent project activities have dealt with development and uses of marine algal toxicity tests with tropical algae. Temperature control was here a critical factor in addition to factors determining metal speciation. It has been found that metals toxicity increases with decreasing cell size. Initial studies of the heavy metals pollution in the Phuket area revealed no severe problems.

**Department of Environmental Engineering**

**Period:** 01/01/1996 → 01/01/2000

**Number of participants:** 2

**Acronym:** 57

**Project participant:**

Baun, Anders (Intern)

**Project Manager, organisational:**

Nyholm, Niels (Intern)

**Financing sources**

**Source:** Unknown

**Name of research programme:** Ukendt

**Amount:** 906,000.00 Danish Kroner

**Scientific Co-operation with Phuket Marine Biological Station, Thailand**

The overall aim of the Danida co-sponsored programme is science and technology transfer through co-operative research with the local Thai scientists. The first phase of the present project was a screening study of the occurrence of pesticides in surface water and of the risk for the adjacent marine environment as a result of the pesticide runoff. The scientific focus was a practical evaluation of a monitoring method using bioassays with algae and daphnia on XAD concentrated water samples. The method proved useful and revealed severe pesticide contamination of stream water but toxic impact on the marine environment was concluded to be unlikely because of a large dilution factor caused by tidal action. The subsequent project activities have dealt with development and uses of marine algal toxicity tests with tropical algae. Temperature control was here a critical factor in addition to factors determining metal speciation. It has been found that metals toxicity increases with decreasing cell size. Initial studies of the heavy metals pollution in the Phuket area revealed no severe problems.

**Department of Environmental Science and Engineering**

**Department of Environmental Engineering**

**PMBC**

**Period:** 01/01/1996 → 01/01/2000

**Number of participants:** 6

**Project participant:**

Baun, Anders (Intern)

Jensen, Susanne Dal (Intern)

Prawin, E. (Ekstern)

Bussarivit, N. (Ekstern)

Panutrakul, S. (Ekstern)

**Project Manager, organisational:**

Nyholm, Niels (Intern)

**Financing sources**

**Source:** Unknown
Transformation processes in water treatment plants
A wide range of biotic and abiotic transformation processes are going on in treatment plants for groundwater. It is of particular interest whether organic chemical pollutants in trace concentrations (ug/l) can be degraded. Experiments with aromatic hydrocarbons in a pilot water works have shown very high treatment efficiencies resulting in residual concentrations of benzene, toluene, and naphthalene below 1 microg/l. This has to be further verified in larger scale, and a possible negative effect of iron precipitation has to be investigated. Studies of MTBE degradation in a full-scale water works has been conducted. MTBE was degraded efficiently from 10-50 ug/L to a few ug/L. It is planned to include a broader range of organic contaminants in the studies, including chlorinated aliphatic hydrocarbons and pesticides. Biological transformation of some of the "traditional" pollutants is still an interesting research topic (nitrification, iron and manganese removal, etc.), in particular interactions between the specific groups of organisms involved. Modelling of the organic and inorganic substrate removal and the simultaneous microbial growth and precipitation reactions is also considered as important. The better understanding of the processes will improve the chances of success of the modelling.

Department of Environmental Engineering
Period: 01/01/1996 → 30/11/2003
Number of participants: 3
Acronym: 16
Project participant:
Albrechtsen, Hans-Jørgen (Intern)
Boe-Hansen, Rasmus (Intern)
Project Manager, organisational:
Arvin, Erik (Intern)

Urban ecological engineering
Technologies for handling urban wastes is studied. The purpose is to design wastewater that is optimal for further handling and treatment, either in the cities or on agricultural land.

Department of Environmental Engineering
Period: 01/01/1996 → 31/12/1999
Number of participants: 2
Acronym: 36
Project participant:
Eilersen, Ann Marie (Intern)
Project Manager, organisational:
Henze, Mogens (Intern)

Wet oxidation for extraction of recalcitrant organic matter in Danish biogas plants

Department of Environmental Science and Engineering
Department of Environmental Engineering
Period: 01/01/1996 → 31/12/1997
Number of participants: 2
Project participant:
Nørgaard, Claus Schmidt (Intern)
Project Manager, organisational:
Ahring, Birgitte Kiær (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,150,000.00 Danish Kroner

Enzymatic synthesis and modification of carbohydrates.

Department of Environmental Science and Engineering
Department of Environmental Engineering

Aalborg University
Period: 01/10/1995 → 31/12/1999
Number of participants: 6
Project participant:
Adamsen, Anne Karin (Intern)
Hinz-Berg, Gitte (Intern)
Sonne-Hansen, Jacob (Intern)
Jørgensen, Carl-Otto F (Intern)
Zimmerman, Wolfgang K. (Ekstern)

Project Manager, organisational:
Ahring, Birgitte Kiar (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 4,000,000.00 Danish Kroner

Project

Microbial degradation af PAHs: Mechanisms for surfactant enhanced bioavailability

Department of Environmental Engineering
Period: 01/10/1995 → 02/09/1998
Number of participants: 4
PhD Student:
Willumsen, Pia Arentsen (Intern)
Main Supervisor:
Arvin, Erik (Intern)
Examiner:
Helweg, Arne (Ekstern)
Struwe, Sten (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskerakademiets Samfinansier
Project: PhD

Sammenhængen mellem porøsitet og akustisk hastighed i kalk

Department of Environmental Engineering
Period: 01/10/1995 → 16/09/1999
Number of participants: 3
PhD Student:
Borre, Mai Kirstine (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Japsen, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden Programfinansiering-SU
Project: PhD

Biotechnological research

Department of Environmental Science and Engineering
Department of Biotechnology
Department of Microbiology

Department of Environmental Engineering

Department of Systems Biology
Period: 01/09/1995 → 31/12/1999
Number of participants: 8
Project participant:
Mathrani, Indra Madan (Intern)
Fischer, Lene (Intern)
Huusom, Elisabeth (Intern)
Schmidt, Jens Ejbye (Intern)
Christensen, Nina (Intern)
Villadsen, John (Intern)
Molin, Søren (Intern)
Project Manager, organisational:
Ahring, Birgitte Kiær (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 4,500,000.00 Danish Kroner

Real Time Control of urban storm drainage
The project is deals with the real time control of the integrated urban drainage system: The sewer system, the treatment plant and the receiving water, interpreted as one unit. Different procedures for optimised control has been developed, including genetic algorithm.

Department of Environmental Engineering
Period: 01/08/1995 → 31/12/1998
Number of participants: 2
Acronym: 32
Project participant:
Rauch, Wolfgang (Intern)
Project Manager, organisational:
Harremoës, Poul (Intern)

Simulation of the integrated urban wastewater system
A deterministic model for the integrated system: The sewer system, the treatment plant and the receiving water, interpreted as one unit, has been developed. The problems associated with the accumulation of nutrients leading to eutrophication has been investigated. Simulations have shown that the usual design procedures are less than optimal with respect to minimisation of the pollution.

Department of Environmental Engineering
Period: 01/08/1995 → 31/08/2001
Number of participants: 3
Acronym: 31
Project participant:
Mikkelsen, Peter Steen (Intern)
Rauch, Wolfgang (Intern)
Project Manager, organisational:
Harremoës, Poul (Intern)

Complexation of Cd, Ni, Zn, Pb and Cu by dissolved organic carbon from landfills
The complexation of heavy metals by dissolved organic carbon from a leachate plume has been measured by means of ion exchange resin techniques. The dissolved organic carbon was studied in its original matrix in order to avoid artifacts by purification and loss of non-purifiable carbon (in some cases up to 30% is lost). Conditional stability constants have been estimated showing much higher complexation for Cu and Pb than for Cd, Ni and Zn. Experiments using aquifer material instead of resin gave comparable results but showed that even in the presence of the dissolved organic carbon, the
distribution coefficients for the metal sorption onto the aquifer material still were high indicating limited mobility also in the presence of dissolved organic carbon. Traditional purification of the dissolved organic carbon showed that 60% was fulvic-acid-like, 10% was humic-acid-like and 30% belonged to a hydrophilic group somewhat related to fulvic acids. The characteristics of the separated fractions are being studied and complexation modeled by Model V/WHAM and NICA-Donnan/Ecosat.

Department of Environmental Science and Engineering

Department of Environmental Engineering

RISØ

Verein für Wasser-, Boden- und Lufthygiene e.V.

Fresh Water Institute

British Geological Survey
Period: 01/06/1995 → 28/02/1999
Number of participants: 6
Project participant:
Hansen, Jette Bjerre (Intern)
Grøn, C. (Ekstern)
Filip, Z. (Ekstern)
Tipping, E. (Ekstern)
Kinninbrugh, D. (Ekstern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 400,000.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Complexation of Cd, Ni, Zn, Pb and Cu by dissolved organic carbon from landfills
The complexation of heavy metals by dissolved organic carbon from a leachate plume has been measured by means of ion exchange resin techniques. The dissolved organic carbon was studied in its original matrix in order to avoid artifacts by purification and loss of non-purifiable carbon (in some cases up to 30% is lost). Conditional stability constants have been estimated showing much higher complexation for Cu and Pb than for Cd, Ni and Zn. Experiments using aquifer material instead of resin gave comparable results but showed that even in the presence of dissolved organic carbon, the distribution coefficients for the metal sorption onto the aquifer material still was high indicating limited mobility also in the presence of dissolved organic carbon. Traditional purification of the dissolved organic carbon showed that 60% was fulvic-acid-like, 10% was humic-acid-like and 30% belonged to a hydrophilic group somewhat related to fulvic acids. The characteristics of the separated fractions are being studied and complexation modeled by Model V/WHAM and NICA-Donnan/Ecosat.

Department of Environmental Science and Engineering

Rise National Laboratory for Sustainable Energy

Fresh Water Institute

British Geological Survey
Period: 01/06/1995 → 28/02/1999
Number of participants: 6
Project participant:
Hansen, Jette Bjerre (Intern)
Grøn, Christian (Intern)
Tipping, E. (Ekstern)
Kinninbrugh, D. (Ekstern)
Wabolu, Dr. Z. Filip (Ekstern)
Hydrologic behaviour of stormwater infiltration systems
The hydrological behaviour of stormwater infiltration structures needs to be understood to ensure safe design and long life-time. Mathematical models may be used to assess the behaviour and sub-models are needed as part of the general urban drainage simulation models. Field measurements are established in newly constructed facilities and by comparing measured and simulated data the significant model parameters may be estimated. In collaboration with the Department of Inner City Renovation of Copenhagen Municipality two infiltration trenches are constructed in a densely built-up part of central Copenhagen. The trenches are equipped with on-line sensors measuring rain, runoff flow from the connected surfaces and water level in the trenches. Two infiltration trenches were constructed in a densely built-up area in central Copenhagen and equipped with on-line sensors measuring rain, runoff flow from the connected surfaces and water level in the trenches. Although the two trenches are placed close to each other they function rather differently, corresponding to effective soil permeabilities of $2 \times 10^{-6}$ m/s in one trench and a factor $10^2$ smaller in the other. During 2½ years of measuring 89 events were recorded, of which 7 cause overflow. Analyses of falling water tables after rain indicated slight clogging, but this effect is less important than the general lack of knowledge about soil permeability for normal design situations. The results indicate that the stormwater infiltration in central urban areas with compressed soils and backfill is more feasible than previously anticipated. The project started in October 1994, and the first measuring campaign lasted until June 1997. The intention is to resume the measurements twice, after 5 and 10 years respectively, to investigate possible long-term changes in the hydrologic performance of the infiltration changes. A list of publications (html) related to this project and a slide show (pdf, 2.058KB) summarising the results is available on-line.
Heavy metal species in solid waste leachates.
The complexation of heavy metals by dissolved organic carbon from a leachate plume has been measured by means of ion exchange resin techniques. The dissolved organic carbon was studied in its original matrix in order to avoid artifacts by purification and loss of non-purifiable carbon (in some cases up to 30% is lost). Conditional stability constants have been estimated showing much higher complexation for Cu and Pb than for Cd, Ni and Zn. Experiments using aquifer material instead of resin gave comparable results but showed that even in the presence of dissolved organic carbon, the distribution coefficients for the metal sorption onto the aquifer material still was high indicating limited mobility also in the presence of dissolved organic carbon. Traditional purification of the dissolved organic carbon showed that 60% was fulvic-acid-like, 10% was humic-acid-like and 30% belonged to a hydrophilic group somewhat related to fulvic acids. The characteristics of the separated fractions are eing studied and complexation modeled by Model V/WHAM and NICA-Donnan/Ecosat.

Department of Environmental Engineering
Period: 01/05/1995 → 31/12/1997
Number of participants: 2
Acronym: 92
Project participant:
Hansen, Jette Bjerre (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

In Situ heat treatment of polluted clayish soils
Laboratory experiments have been performed determining the effects of elevated temperatures on the physico-chemical constants of TCE forming the basis for heating soils as a mean of remediation.

Department of Environmental Science and Engineering
Department of Environmental Engineering
US.EPA Research Laboratory,
TNO-Research
Period: 01/05/1995 → 01/01/9999
Number of participants: 4
Project participant:
Heron, Gorm (Intern)
Enfield, Ada C. (Ekstern)
Zupthen, Macus van (Ekstern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,200,000.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

Anvendelse afbiotests i forbindelse med karakterisering og risikovurdering af kemikaliefurenet grundvand
Department of Environmental Engineering
Densitetspåvirket strømning og opblanding i grundvand

Department of Environmental Engineering
Period: 01/04/1995 → 15/09/1999
Number of participants: 3
PhD Student: Holm, Jesper (Intern)
Main Supervisor: Engesgaard, Peter Knudegaard (Intern)
Examiner: Postma, Diederik Jan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsstip.-SU, Eksp
Project: PhD

Acoustic properties of chalk from the Ontong Java Plateau and from the North Sea
We wish to establish a model for the relationship between porosity, texture, and acoustic velocity of chalk. Chalk from the Ontong Java Plateau (OJP) has a wide range of porosities as a consequence of the progressive burial diagenesis of chalk. P-wave velocity data and textural data obtained by electron microscopy for OJP material form the basis for a model, which will be applied to chalk from North Sea reservoirs.

Department of Geology and Geotechnical Engineering
Risø National Laboratory for Sustainable Energy
Department of Environmental Engineering
Period: 01/03/1995 → …
Number of participants: 3
Project participant: Borre, Mai Kirstine (Intern)
Ølgaard, Povl Lebeck (Intern)
Project Manager, organisational: Fabricius, Ida Lykke (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 122,600.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 592,963.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Project
Chemical fate models for environmental assessment
The project has been carried out as a DTU funded Ph.D. study and terminated halfway through, because the student quit engineering and resumed studies in philosophy. Nevertheless 2 papers in CHEMOSPHERE have emerged - one on a regional chemical fate model for Denmark developed in cooperation with the DMU while the other sub project was a study on the importance of including terrestrial vegetation in such chemical fate models this study was performed while Morten Severinsen was visiting the RIVM, The Netherlands.

Department of Environmental Engineering
Period: 01/02/1995 → 22/08/1997
Number of participants: 1
Acronym: 60
Project Manager, organisational:
Nyholm, Niels (Intern)
Project

Jernoxiders omsætning i grundvandsmagasiner
Department of Environmental Engineering
Period: 01/02/1995 → 28/08/1998
Number of participants: 3
Phd Student:
Larsen, Lars Ole (Intern)
Main Supervisor:
Postma, Diederik Jan (Intern)
Examiner:
Villumsen, Arne (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsstip.-SU, Eksp
Project: PhD

Landfill Remediation via Decision Analysis
Department of Environmental Engineering
Period: 01/02/1995 → 30/06/1998
Number of participants: 2
Phd Student:
Krom, Thomas Donald (Intern)
Main Supervisor:
Rosbjerg, Dan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Erhvervsforskerordningen
Project: PhD

Matematisk modellering af kemikaliers skæbne i det ydre miljø
Department of Environmental Engineering
Period: 01/02/1995 → 01/03/1997
Number of participants: 2
Phd Student:
Severinsen, Morten (Intern)
Main Supervisor:
Nyholm, Niels (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD
The role of particulates in biofilm reactors

The kinetics of degradation of particulates in biofilms is complicated and is still not well described. We have chosen to make unsteady experiments, such that the sequence of variations of loading is designed to reveal important features of particulate adsorption and degradation in the biofilter. The experiments include mass balances on the basis of Total Carbon (TOC and TIC). Experiments in lab scale and pilot scale have shown that only a small fraction of the particulates are degraded in the period between backwash, to the benefit of digestion and gas production in the treatment plant; but to the detriment of the availability of organic matter for denitrification in the biofilters.

Department of Environmental Engineering
Algal bioassays for metal mining wastes
The project is a Danish contribution to a larger Canadian project funded by Environment Canada. The overall objective is to develop scientifically based algal bioassays that can reveal the presence and toxicity of bioavailable metal forms in complex wastewaters from the Canadian metal mining industry and in leachates from Danish deposits of combustion residues. The main effort has been the optimization and interpretation of algal toxicity tests of heavy metals which are complicated by interactions between algal growth and medium factors on the one hand and by the influence of these factors on metal speciation. The main emphasis of the TUD project part has been to study iron-chelator interactions and to develop an optimized medium for heavy metal toxicity testing. It has further been found that the commonly used chelator EDTA photodecomposes under the test conditions and therefore an alternative chelator should be selected, for instance citrate. The work has been considered (and used in part) by the ISO.

Department of Environmental Science and Engineering
Department of Environmental Engineering
Saskatchewan Research Council
VKI Water Quality Institute

Algal bioassays for metal mining wastes
The project is a Danish contribution to a larger Canadian project funded by Environment Canada. The overall objective is to develop scientifically based algal bioassays that can reveal the presence and toxicity of bioavailable metal forms in complex wastewaters from the Canadian metal mining industry and in leachates from Danish deposits of combustion residues. The main effort has been the optimization and interpretation of algal toxicity tests of heavy metals which are complicated by interactions between algal growth and medium factors on the one hand and by the influence of these factors on metal speciation. The main emphasis of the TUD project part has been to study iron-chelator interactions and to develop an optimized medium for heavy metal toxicity testing. It has further been found that the commonly used chelator EDTA photodecomposes under the test conditions and therefore an alternative chelator should be selected, for instance citrate. The work has been considered (and used in part) by the ISO.

Department of Environmental Engineering
Period: 01/01/1995 → 31/12/1997
Number of participants: 2
Acronym: 56
Project participant:
Ebert, Birthe (Intern)
Project Manager, organisational:
Nyholm, Niels (Intern)
Distribution coefficients for metals in soils and aquifer materials

Distribution coefficients are useful parameters to describe trace metal distribution between solid phase and solute phase at low trace metal concentration provided that sorption is the controlling process. The database on distribution coefficient determined at low environmentally relevant concentration levels is still very limited and few regression equations are available for predicting distribution coefficients from soil and aquifer characteristics. We conduct Batch experiments to measure distribution coefficients on soils and aquifer materials. Most studies are done on samples from our library of soil and aquifer material. In general the distribution coefficients are lower in aquifer materials than in soil, but for both materials pH seems to be the dominating parameter for all the metals studied.

Department of Environmental Engineering
Period: 01/01/1995 → 31/12/1999
Number of participants: 2
Acronym: 9
Project participant:
Hansen, Jette Bjerre (Intern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

The phase systems Fe-Re-S and Fe-Os-S

In connection with the growing geochemical importance of the Re-Os pair, the phase systems Fe-Re-S and Fe-Os-S have been studied at temperatures between 800 and 1200°C.

Department of Geology and Geotechnical Engineering
Department of Environmental Engineering
Period: 01/01/1995 → 01/01/9999
Number of participants: 2
Project participant:
Makovicky, Emil (Ekstern)
Project Manager, organisational:
Karup-Møller, Sven (Intern)

Fluoride in Magadi Salts

High Fluoride intakes via water is common in dry or volcanic regions in Africa. This calamity is aggravated with the use of Magadi (sodium hydrogen carbonate) with high Fluoride concentrations. The Ph.D. project covers the occurrence of contaminated Magadi, the crystallization processes in the alkaline lakes, and the technical possibilities for purifying Magadi for human consumption.

Department of Environmental Engineering
Department of Chemistry
Period: 01/09/1994 → 31/01/1997
Number of participants: 1
Acronym: 64
Project Manager, organisational:
Tjell, Jens Christian (Intern)

Kinetisk Grundlag for Projektering af Biofiltrer til Spildevandsrensning

Department of Environmental Engineering
Number of participants: 2
Phd Student:
Janning, Kenneth F. (Intern)
Main Supervisor:
Harremøes, Poul (Intern)

Financing sources
**Koloidbåren transport af forureningsstoffer i porøse medier**

Department of Environmental Engineering  
Number of participants: 2  
Phd Student:  
Ullum, Marlene (Intern)  
Main Supervisor:  
Jensen, Karsten Høgh (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: DTU-Su Stipendium, Eksperiment  
Project: PhD  

**Oprindelse og kemisk sammensætning af fluorid-kontamineret magade fra alkaliske søer og jordoverflader i Tanzania**

Department of Environmental Engineering  
Number of participants: 3  
Phd Student:  
Nielsen, Joan Maj (Intern)  
Main Supervisor:  
Tjell, Jens Christian (Intern)  
Examiner:  
Mosbæk, Hans (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Blandet Finansiering-SU  
Project: PhD  

**Anaerobic field injection experiment with organic chemicals in a leachate plume**

Eighteen organic chemicals at trace level were injected for at six month period into the strongly anaerobic part of the leachate plume downgradient from the Grindsted Landfill. The imigration and fate of the compounds were monitored for nearly three years. Sorption was insignificant in the coarse sandy aquifer, but many of the organic chemicals degraded: Toluene, o-xylene, several nitrobenzenes and maybe naphthalene. Benzene was recalcitrant. The degradation rates were low and in many cases long adaptation periods were observed making short term laboratory degradation studies unsuited for studying degradation of organic chemicals in leachate plumes. However, long term batch degradation experiments and in situ microcosms installed in the plume gave results generally comparable to the observations in the plume. The plume was dominated by iron reduction, but locally methanogenesis and sulfate reduction also took place.

Department of Environmental Engineering  
Period: 01/08/1994 → 30/08/1997  
Number of participants: 9  
Acronym: 5  
Project participant:  
Foverskov, Anja (Intern)  
Skov, Bent Henning (Intern)  
Mosbæk, Hans (Intern)  
Albrechtsen, Hans-Jørgen (Intern)  
Sørensen, Jens Schaarup (Intern)  
Rügge, Kirsten (Intern)  
Refstrup, Mona (Intern)  
Bjerg, Poul Logstrup (Intern)  
Project Manager, organisational:  
Christensen, Thomas Højlund (Intern)
Bioaccumulation and toxicity of lipophilic chemical in algae, crustaceans and fish

Lipophilic Organic Chemicals, LOC’s constitute an important group of concern pollutants. LOC’s may bioconcentrate and even bioaccumulate via food webs (mostly in terrestrial systems). The compounds may be toxic not only to directly exposed populations of organisms but also cause indirect poisoning of man and other predators at the top of the food chain. While well studied with respect to toxicity and accumulation in fish, surprisingly little information has hitherto been available for other types of organisms, and the sorptive behaviour in surface waters, where algae may constitute a significant particulate phase, is generally not known. Information on sorption is important, nevertheless, not only for assessing the exposure of aquatic organisms to bioavailable toxicants, but also for the purpose of assessing the general chemical fate of LOC’s. Sedimentation mediated by sinking algae is here an important transport process moving the LOC’s from the water column to the sediments which may act as an ultimate sink and concern compartment since with no or slow biodegradation under the prevailing anaerobic conditions, large LOC concentrations may build up in time. The project aimed at contributing to fill the knowledge gaps on ecotoxicity to other organisms than fish, and further to investigate in detail the mechanisms involved in sorption and toxicity to phytoplankton algae including looking at the basic dose concept. According to current practice in aquatic ecotoxicology, concentration (total or dissolved) is used as a dose surrogate, while the real dose defining toxic exposure may either be the sorbed or bioaccumulated amount per unit of biomass or be the bioavailable concentration in partitioning equilibrium with this internal dose or biomass burden.

Department of Environmental Science and Engineering

Department of Environmental Engineering

VKI (Academy of Technical Sciences)

Utrecht University
Period: 01/08/1994 → 01/01/1998
Number of participants: 8
Project participant:
Halling-Sørensen, Bent (Intern)
Kusk, Kresten Ole (Intern)
Mayer, Philipp (Intern)
Qualmann, Signe (Intern)
Kløft, Lene (Intern)
Mayer, Philip (Ekstern)
Simjs, Dick J. (Ekstern)

Project Manager, organisational:
Nyholm, Niels (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 2,000,000.00 Danish Kroner

Bioaccumulation and toxicity of lipophilic chemical in algae, crustaceans and fish

Lipophilic Organic Chemicals, LOC’s constitute an important group of concern pollutants. LOC’s may bioconcentrate and even bioaccumulate via food webs (mostly in terrestrial systems). The compounds may be toxic not only to directly exposed populations of organisms but also cause indirect poisoning of man and other predators at the top of the food chain. While well studied with respect to toxicity and accumulation in fish, surprisingly little information has hitherto been available for other types of organisms, and the sorptive behaviour in surface waters, where algae may constitute a significant particulate phase, is generally not known. Information on sorption is important, nevertheless, not only for assessing the exposure of aquatic organisms to bioavailable toxicants, but also for the purpose of assessing the general chemical fate of LOC’s. Sedimentation mediated by sinking algae is here an important transport process moving the LOC’s from the water column to the sediments which may act as an ultimate sink and concern compartment since with no or slow biodegradation under the prevailing anaerobic conditions, large LOC concentrations may build up in time. The project aimed at contributing to fill the knowledge gaps on ecotoxicity to other organisms than fish, and further to investigate in detail the mechanisms involved in sorption and toxicity to phytoplankton algae including looking at the basic dose concept. According to current practice in aquatic ecotoxicology, concentration (total or dissolved) is used as a dose surrogate, while the real dose defining toxic exposure may either be the sorbed or bioaccumulated amount per unit of biomass or be the bioavailable concentration in partitioning equilibrium with this internal dose or biomass burden.

Department of Environmental Engineering
**Colloids in landfill leachate**

Heavy metal contents of landfill leachate sometimes are unexpectedly high. This may be related to the presence of colloidal matter with high metal contents that, due to lack of strict protocols on sampling and solid separation, sometimes are found in the sampled leachate.

**Reaktiv transport i kemisk heterogene grundvandsmagasiner**

**Tungmetallers binding i affaldsdeponier**
Impact of colloidal and particulate carrier substances on the transport of organic carbon in aquatic systems

Several studies with focus on redistribution processes of trace elements in natural waters, as a function of the general hydrochemistry, have illustrated the impact of colloidal carrier substances. These studies have also indicated the importance of organic matter on both adsorption and stability (size distribution and surface charge) of colloidal matter. However, limited attention has been paid to investigations of the interactions between colloidal material and organic matter in natural waters. The objectives of this project are: - In field studies examine changes in the colloidal and organic matter in a slowly changing salt gradient over the year. Particular attention is given against interactions between the materials and the impact of organic carbon on the stability of colloidal matter. - The mechanisms behind the distribution of organic carbon between dissolved, colloidal and particulate forms is studied in well-defined laboratory experiments by changing the hydrochemistry within the natural ranges discovered in the field study. The project is financed from the Swedish Natural Research Council and the grants are administrated by Department of Water and Environmental Studies, Linköping university, Sweden.

Department of Environmental Science and Engineering

Department of Environmental Engineering

Linköping University
Period: 01/07/1994 → 31/12/1998
Number of participants: 2
Project participant:
Düker, Anders (Ekstern)
Project Manager, organisational:
Ledin, Anna (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukommen
Amount: 594,000.00 Danish Kroner

Impact of colloidal and particulate carrier substances on the transport of organic carbon in aquatic systems

Several studies with focus on redistribution processes of trace elements in natural waters, as a function of the general hydrochemistry, have illustrated the impact of colloidal carrier substances. These studies have also indicated the importance of organic matter on both adsorption and stability (size distribution and surface charge) of colloidal matter. However, limited attention has been paid to investigations of the interactions between colloidal material and organic matter in natural waters. The objectives of this project are: - In field studies examine changes in the colloidal and organic matter in a slowly changing salt gradient over the year. Particular attention is given against interactions between the materials and the impact of organic carbon on the stability of colloidal matter. - The mechanisms behind the distribution of organic carbon between dissolved, colloidal and particulate forms is studied in well-defined laboratory experiments by changing the hydrochemistry within the natural ranges discovered in the field study. The project is financed from the Swedish Natural Research Council and the grants are administrated by Department of Water and Environmental Studies, Linköping University, Sweden.

Department of Environmental Engineering

Linköping University
Period: 01/07/1994 → 31/12/1998
Number of participants: 2
Acronym: 44
Project Manager, organisational:
Ledin, Anna (Intern)

Activities:

Measuring the effects of central softening of drinking water in households and industries in Brøndby
Period: 12 Jun 2018
Martin Rygaard (Guest lecturer)

Department of Environmental Engineering
Urban Water Systems
Description
Poster presentation
Degree of recognition: International

Related event

Nordic drinking water conference (NORDIWA 2018)
11/06/2018 → 13/06/2018
Oslo, Norway
Activity: Talks and presentations › Conference presentations

Improved indicators for assessing aquifer sustainability
Period: 11 Jun 2018
Martin Rygaard (Guest lecturer)
Department of Environmental Engineering
Urban Water Systems
Degree of recognition: International

Related event

Nordic drinking water conference (NORDIWA 2018)
11/06/2018 → 13/06/2018
Oslo, Norway
Activity: Talks and presentations › Conference presentations

Model-based interpretation of tracer tests in fractured limestone and clayey till
Period: 15 May 2018
Klaus Mosthaf (Speaker)
Peter R. Jørgensen (Other)
Rasmus Thalund-Hansen (Other)
Mette Martina Broholm (Other)
Poul Løgstrup Bjerg (Other)
Massimo Rolle (Other)
Department of Environmental Engineering
Environmental Fate & Effect of Chemicals
Degree of recognition: International

Related event

InterPore 10th Annual Meeting and Jubilee
14/05/2018 → 17/05/2018
New Orleans, United States
Activity: Talks and presentations › Conference presentations

Remote sensing quantification of methane emissions from 10 biogas plants in Denmark and Germany
Period: 14 May 2018
Anders Michael Fredenslund (Guest lecturer)
Charlotte Scheutz (Guest lecturer)
Department of Environmental Engineering
Air, Land & Water Resources

Description
A key benefit of biogas production is mitigation of anthropogenic greenhouse gas emissions by substituting fossil fuels. However, several life cycle assessment studies have shown that methane loss from biogas production may significantly reduce greenhouse gas mitigation due to the high global warming potential of methane gas. It is therefore important to minimise methane emission from biogas production to ensure the societal value and thereby the validity of providing subsidies to support biogas production.

Accurate measurement methods are needed to quantify methane emission from biogas plants and thus assess the need for taking actions to reduce leakage. Recent developments in analytical instrumentation have provided new opportunities
for accurate remote sensing of fugitive emissions. We have applied a remote sensing technique referred to as the "tracer gas dispersion method" to measure total methane emissions from 10 biogas plants. The method relies on the continuous release of a gaseous tracer combined with downwind measurements of methane and tracer gas using a mobile analytical platform, where a high precision gas analyser was installed.

Methane emission rates varied from 1.3 kg CH4 h⁻¹ to 25.5 kg CH4 h⁻¹. The average methane loss corresponded to 2.0 % of the gas production, where the loss calculated for the individual measurement campaigns on the various plants ranged from 0.3% to 21.0%.

Degree of recognition: International
Documents:
Abstract, Fredenslund, EUBCE 2018 short
Abstract, Fredenslund, EUBCE 2018, explanatory pages
Fredenslund - poster for EUBCE 2018

Related event

26th European Biomass Conference and Exhibition (EUBCE 2018)
14/05/2018 → 17/05/2018
Copenhagen, Denmark
Activity: Talks and presentations » Conference presentations

Remote sensing quantification of methane emissions from 10 biogas plants in Denmark and Germany
Period: 4 May 2018
Anders Michael Fredenslund (Guest lecturer)
Charlotte Scheutz (Guest lecturer)
Department of Environmental Engineering
Air, Land & Water Resources
Degree of recognition: International
Documents:
Abstract, Fredenslund, EUBCE 2018 short
Abstract, Fredenslund, EUBCE 2018, explanatory pages
Fredenslund - poster for EUBCE 2018

Related event

26th European Biomass Conference and Exhibition (EUBCE 2018)
14/05/2018 → 17/05/2018
Copenhagen, Denmark
Activity: Talks and presentations » Conference presentations

Forskning Døgn 2018
Period: 24 Apr 2018 → 26 Apr 2018
Luca Vezzaro (Participant)
Department of Environmental Engineering
Degree of recognition: National
Documents:
2018-04-26,FørskingsDøgn,LUVE

Related event

Forskning Døgn 2018
20/04/2018 → 26/04/2018
Activity: Attending an event » Participating in or organising workshops, courses, seminars etc.

Unge Forskere (External organisation)
Period: 19 Mar 2018
Henrik Rasmus Andersen (Chairman)
Department of Environmental Engineering
Water Technologies

Description
Dommer ved semifinale for hovedstadsregionen. Planetariet.
Degree of recognition: National

Related external organisation

Unge Forskere
astra.dk, Denmark
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Nedbrydning af pesticider i vandbehandling
Period: 15 Mar 2018
Mathilde Jørgensen Hedegaard (Guest lecturer)
Department of Environmental Engineering
Urban Water Systems
Documents:
FINALE-forsyning2020-09

Related event

Forsyning 2020: Fremtid & Forandring i forsyningssektoren
15/03/2018 → 15/03/2018
Kolding, Denmark
Activity: Talks and presentations › Conference presentations

Brancheindsats for at minimere metantab. Kvantificering - metoder og usikkerhed
Period: 13 Mar 2018
Anders Michael Fredenslund (Guest lecturer)
Charlotte Scheutz (Guest lecturer)
Department of Environmental Engineering
Air, Land & Water Resources
Degree of recognition: National

Related event

Temadag arrangeret af Foreningen Biogasbranchen
13/03/2018 → 13/03/2018
Vejle, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Hvornår er bedre godt nok? Emissioner fra dansk vandhåndtering sat op imod de Planetære Grænser
Period: 5 Mar 2018
Hjalte Jomo Danielsen Sørup (Guest lecturer)
Department of Environmental Engineering
Urban Water Systems

Description
At "Cirkulær økonomi - det nye sort"
Degree of recognition: National

Related external organisation

IDA Miljø
Ingeniørforeningen, IDA, Kalvebod Brygge 31-33, 1780, København V, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations
**Better! But is it good enough?**

*Period: 18 Jan 2018*

Hjalte Jomo Danielsen Sørup (Guest lecturer)

*Department of Environmental Engineering*

**Urban Water Systems**

**Description**
Talk at Section Seminar

**Related organisation**

**Better! But is it good enough?**

Sørup, H. J. D. (Guest lecturer)  
18 Jan 2018

Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

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**IDA Spildevandskommittéen (External organisation)**

*Period: 2017 → …*

Hjalte Jomo Danielsen Sørup (Member)  

*Department of Environmental Engineering*

**Urban Water Systems**

**Description**
Member of the The Water Pollution Committee of the Danish Society of Engineers  
Degree of recognition: National

**Related external organisation**

**IDA Spildevandskommittéen**

*Denmark*

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

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**Uvildige Ekspertpanel Deponering af radioaktivt affald i DK (External organisation)**

*Period: 2017 → …*

Steffen Foss Hansen (Chairman)

*Department of Environmental Engineering*

**Environmental Chemistry**

**Description**
Member of the independent expert panel on deposit of radioactive waste in Denmark  
Degree of recognition: National

Links:
http://ufm.dk/aktuelt/temaer/deponering-af-radioaktivt-affald-i-dk/det-uvildige-ekspertpanel-1/det-uvildige-ekspertpanel#cookieoption

**Related external organisation**

**Uvildige Ekspertpanel Deponering af radioaktivt affald i DK**

*Uddannelses- og Forskningsministeriet, Borsgade 4, 2135, København K, Denmark*

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

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**The value of DCIP geophysical surveys for contaminated site investigations**

*Period: 13 Dec 2017*

Nicola Balbarini (Guest lecturer)  
Vinni Kampman Rønde (Guest lecturer)  
Pradip Kumar Maurya (Guest lecturer)
Attenuation of a discharging chlorinated ethene (CE) plume: use of streambed point velocity probes (SBPVP), streambed passive flux meters (SBPFM) and contaminant mass discharge (CMD)

Period: 11 Dec 2017

Chlorinated ethenes (CE) are abundant groundwater contaminants and pose risk to both groundwater and surface water bodies, as plumes can migrate through aquifers to streams. After release to the environment, CE may undergo attenuation. The hyporheic zone is believed to enhance CE attenuation, however studies contradicting this have also been reported. Since dilution commonly reduces contaminant concentrations in streams to below quantification limits, use of mass balances along the pathway from groundwater to stream is unusual.

Our study is conducted at the low-land Grindsted stream, Denmark, which is impacted by a contaminant plume. CE have been observed in the stream water; hence our study site provides an unusual opportunity to study attenuation processes in a CE plume as it migrates through the groundwater at the stream bank, through the stream bed and further to the point of fully mixed conditions in the stream.

The study undertook the determination of redox conditions and CE distribution from bank to stream; streambed contaminant flux estimation using streambed Passive Flux Meters (SBPFM); and quantification of streambed water fluxes using streambed Point Velocity Probes (SBPVP). The advantage of the sPFM is that it directly measures the contaminant flux without the need for water samples, while the advantage of the SBPVP is its ability to measure the vertical seepage velocity without the need for additional geological parameters. Finally, a mass balance assessment along the plume pathway was conducted to account for any losses or accumulations.

The results show consistencies between contaminant mass discharge estimates at the bank, through the streambed and in the stream channel. Furthermore, parent-metabolite compound ratios indicate limited degradation between the bank and the point of fully mixed stream water, leaving the dominant attenuation process to be mixing in the stream channel. Since the plume at the bank mainly consists of cis-DCE and vinyl chloride, this implies high and persistent stream water concentrations of these compounds. Finally, this study demonstrates the usefulness and complementary nature of SBPFM and SBPVP measurements for assessing the attenuation processes through mass balance calculations.

Degree of recognition: International

Documents:
2017-11-30 AGU_poster_vinni
2017 AGU Fall Meeting
11/12/2017 → 15/12/2017
New Orleans, United States
Activity: Talks and presentations › Conference presentations

DTU Sustain 2017
Period: 6 Dec 2017
Steffen Foss Hansen (Organizer)
Kristian Mølhave (Organizer)
Department of Environmental Engineering
Environmental Chemistry
Department of Micro- and Nanotechnology
Molecular Windows

Description
Steering group member of DTU Sustain 2017
Degree of recognition: National
Links:
http://www.sustain.dtu.dk (Conference website)

Related event

DTU Sustain 2017
06/12/2017 → 06/12/2017
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

DTU Sustain 2017
Period: 6 Dec 2017
Stig Irving Olsen (Organizer)
Katrine Nielsen (Organizer)
Berit Godskesen (Organizer)
Viggo Aaberg Kærn (Organizer)
Department of Environmental Engineering
Urban Water Systems
Office for Innovation & Sector Services
Department of Management Engineering
Quantitative Sustainability Assessment
Degree of recognition: International

Related event

DTU Sustain 2017
06/12/2017 → 06/12/2017
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

DTU Sustain 2017
Period: 6 Dec 2017
Stig Irving Olsen (Organizer)
Katrine Nielsen (Organizer)
Berit Godskesen (Organizer)
Viggo Aaberg Kærn (Organizer)
Department of Environmental Engineering
Urban Water Systems
Office for Innovation & Sector Services
Department of Management Engineering
Quantitative Sustainability Assessment
Degree of recognition: International

Related event
DTU Sustain 2017
06/12/2017 → 06/12/2017
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

DTU Sustain 2017
Period: 6 Dec 2017
Marlene Mark Jensen (Organizer)
Department of Environmental Engineering
Water Technologies
Degree of recognition: National

Related event
DTU Sustain 2017
06/12/2017 → 06/12/2017
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The WISE project
Period: 6 Dec 2017
Katrine Nielsen (Speaker)
Department of Environmental Engineering
Urban Water Systems
Degree of recognition: International

Related event
DTU Sustain 2017
06/12/2017 → 06/12/2017
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

Period: 30 Nov 2017 → 3 Dec 2017
Liguan Li (Participant)
Department of Environmental Engineering
Water Technologies
Degree of recognition: International

Related event
30/11/2017 → 03/12/2017
Shenzen, China
Activity: Attending an event › Participating in or organising a conference
Tracking and understanding AMR dynamics across European urban water systems
Period: 30 Nov 2017 → 3 Dec 2017
Barth F. Smets (Guest lecturer)
Arnaud Dechesne (Other)
Liguan Li (Other)
Jonas Stenløkke Madsen (Other)
Joseph Nesme (Other)
Søren J. Sørensen (Other)
Marcos Quintela-Baluja (Other)
David Graham (Other)
Department of Environmental Engineering
Water Technologies
Documents:
ISARE1_BFSM

Related event
30/11/2017 → 03/12/2017
Shenzen, China
Activity: Talks and presentations › Conference presentations

Partiklers indflydelse på vandkvaliteten
Period: 16 Nov 2017
Katrine Nielsen (Invited speaker)
Department of Environmental Engineering
Urban Water Systems
Degree of recognition: National

Related event
Vand i Byer stormøde November 2017: Vandkvalitet
16/11/2017 → 16/11/2017
Taastrup, Denmark
Activity: Talks and presentations › Conference presentations

Vand i Byer stormøde November 2017
Period: 16 Nov 2017
Katrine Nielsen (Organizer)
Peter Steen Mikkelsen (Organizer)
Department of Environmental Engineering
Urban Water Systems
Degree of recognition: National

Related event
Vand i Byer stormøde November 2017: Vandkvalitet
16/11/2017 → 16/11/2017
Taastrup, Denmark
Activity: Attending an event › Participating in or organising a conference

Controls of N2O production pathways in nitritation-anammox biomass
Period: 13 Nov 2017
Marlene Mark Jensen (Invited speaker)
Department of Environmental Engineering
Water Technologies
Degree of recognition: National

Related event

Danish Microbiological Society 2017 Congress
13/11/2017 → 13/11/2017
Copenhague, Denmark
Activity: Talks and presentations › Conference presentations

DNA and RNA SIP reveal ammonium and nitrite oxidizers in groundwater fed biofilters
Period: 13 Nov 2017 → 15 Nov 2017
Arda Gükay (Speaker)
Barth F. Smets (Other)
Jane Fowler (Other)
Hans-Jørgen Albrechtsen (Other)
Karolina Tatari (Other)
Department of Environmental Engineering
Water Technologies
Degree of recognition: International

Related event

Nordic Environmental Nucleotide Network: NENUN 2017
13/11/2017 → 15/11/2017
Denmark
Activity: Talks and presentations › Conference presentations

DNA and RNA SIP reveal nitrifiers in groundwater fed biofilters
Period: 13 Nov 2017
Arda Gükay (Other)
Jane Fowler (Other)
Barth F. Smets (Other)
Hans-Jørgen Albrechtsen (Other)
Department of Environmental Engineering
Water Technologies

Description
Poster presentation
Degree of recognition: National

Related event

Danish Microbiological Society: DMS Congress 2017
13/11/2017 → 13/11/2017
Copenhague, Denmark
Activity: Talks and presentations › Conference presentations

Permissiveness of Microbial Community from Wastewater Treatment Plant towards IncP-1 Plasmid
Period: 13 Nov 2017
Liguan Li (Other)
Arnaud Dechesne (Other)
Barth F. Smets (Other)
Jonas Stenløkkke Madsen (Other)
Søren J. Sørensen (Other)
Department of Environmental Engineering
Integrated characterization of perchloroethene plume natural attenuation after thermal source zone remediation - molecular biology tools and dual isotope analysis

**Period:** 7 Nov 2017

**Alexandra Marie Murray (Speaker)**
**Lærke Brabæk (Other)**
**Inge Lise Kristensen (Other)**
**Julien Maillard (Other)**
**Anders Johansen (Other)**
**Daniel Hunkeler (Other)**
**Mette Broholm (Other)**

**Department of Environmental Engineering**
**Water Resources Engineering**
**Degree of recognition:** International

**Documents:**
- ISSM_2017_Murray_OralAbstract

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Organohalide-respiring bacteria community competition dynamics: Experiments and model-based interpretations

**Period:** 7 Nov 2017

**Alexandra Marie Murray (Speaker)**
**Massimo Rolle (Other)**
**Biao Jin (Other)**
**Julien Maillard (Other)**
**Mette Broholm (Other)**
**Christof Holliger (Other)**

**Department of Environmental Engineering**
**Water Resources Engineering**

**Description**
**Poster**
**Degree of recognition:** International

**Documents:**
- ISSMAbstract_AMurray20170421

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**Related event**

The international Society for Subsurface Microbiology (ISSM) 2017 Conference
06/11/2017 → 10/11/2017
Rotorua, New Zealand

**Activity:** Talks and presentations › Conference presentations
**Modelling Illicit Drug Fate in Sewers for Wastewater-Based Epidemiology**
Period: 26 Oct 2017 → 27 Oct 2017
Pedram Ramin (Speaker)
Peter Steen Mikkelsen (Guest lecturer)
Benedek G. Plósz (Guest lecturer)
Department of Chemical and Biochemical Engineering
PROSYS - Process and Systems Engineering Centre
Urban Water Systems
Degree of recognition: International
Links:

**Related organisation**

**Modelling Illicit Drug Fate in Sewers for Wastewater-Based Epidemiology**
Ramin, P. (Speaker), Mikkelsen, P. S. (Guest lecturer), Plósz, B. G. (Guest lecturer)
26 Oct 2017 → 27 Oct 2017
Activity: Talks and presentations › Conference presentations

**Advances in Remote Sensing for Water Monitoring**
Period: 23 Oct 2017
Peter Bauer-Gottwein (Guest lecturer)
Department of Environmental Engineering
Water Resources Engineering

**Description**
Invited lecture at G-STIC, https://www.gstic.org/
Documents:
GSTIC_pbau

**Related event**

**G-STIC**
23/10/2017 → …
Activity: Talks and presentations › Conference presentations

**4'th Nordic RAS workshop and field trip**
Period: 12 Oct 2017 → 14 Oct 2017
Erik Arvin (Participant)
Department of Environmental Engineering
Degree of recognition: International

**Related event**

**4'th Nordic RAS workshop and field trip**
12/10/2017 → 14/10/2017
Aalborg
Activity: Attending an event › Participating in or organising a conference

**Sustainability assessment of stormwater management systems and the importance of pollutants in runoff**
Period: 11 Oct 2017
Sarah Brudler (Guest lecturer)
Karsten Ambjerg-Nielsen (Other)
Christian Ammitsøe (Other)
Michael Zwicky Hauschild (Guest lecturer)
Martin Rygaard (Guest lecturer)
Department of Environmental Engineering
Urban Water Systems
Department of Management Engineering
Quantitative Sustainability Assessment
Degree of recognition: International

Related event
NORDIWA Nordic Wastewater Conference 2017
10/10/2017 → 12/10/2017
Aarhus, Denmark
Activity: Talks and presentations › Conference presentations

NORDIWA Nordic Wastewater Conference 2017
Period: 10 Oct 2017 → 12 Oct 2017
Katrine Nielsen (Organizer)
Department of Environmental Engineering
Urban Water Systems
Degree of recognition: International

Related event
NORDIWA Nordic Wastewater Conference 2017
10/10/2017 → 12/10/2017
Aarhus, Denmark
Activity: Attending an event › Participating in or organising a conference

Conceptualization of contamination using depth-discrete monitoring of dynamic PCE concentration changes during pumping
Period: 3 Oct 2017
Mette Martina Broholm (Speaker)
Annika Sidelmann Fjordbøge (Other)
Klaus Mosthaf (Speaker)
Bentje Brauns (Other)
Philip John Binning (Other)
Poul Løgstrup Bjerg (Other)
Department of Environmental Engineering
Water Resources Engineering
Office for Study Programmes and Student Affairs
Degree of recognition: International

Related event
2017 NGWA Conference on Fractured Rock and Groundwater
02/10/2017 → 03/10/2017
Burlington, United States
Activity: Talks and presentations › Conference presentations

Forced-gradient tracer tests in a fractured limestone aquifer designed and interpreted by modeling
Period: 2 Oct 2017
Klaus Mosthaf (Speaker)
Bentje Brauns (Other)
Mette Martina Broholm (Other)
Annika Sidelmann Fjordbøge (Other)
The importance of fracture flow and transport in a fractured limestone was investigated with a hydraulic pumping test combined with 6 tracer tests. The pumping test was conducted in a PCE-contaminated fractured limestone aquifer over several weeks, with head observations being collected at a set of observation wells at several depth intervals in the aquifer. The pumping test was combined with six tracer tests. Fluorescent and ionic tracers were used for injections through the screens of the observation wells and monitored at the pumping well. Before the pumping test, the geology was carefully mapped using borehole cores, flow logs, geophysics etc. 3D modeling guided with the test design and helped with the interpretation of the of the pumping and tracer test results.

The pumping test and the geologic investigations showed that the limestone aquifer was highly permeable, with fracture flow dominating the hydraulic response. Most tracer tests resulted in a very fast tracer arrival, indicating a very good connectivity between wells at a similar depth as the pumping well. Strong diffusive interaction between fractures and matrix was revealed by significant tailing in the tracer breakthrough curves. In one tracer test, tracers were injected before starting to pump to allow the tracers to diffuse more into the matrix. This resulted in lower breakthrough concentrations and longer tailing, representing mainly the back-diffusion from the matrix. Deeper wells and crushed upper layers have less connectivity to the pumping well and show slower tracer breakthroughs.

The breakthrough curves from the tracer tests were used to test different model concepts. A discrete-fracture model could be fitted best to the observed breakthrough curves. It demonstrated the importance of including fracture flow and transport in the modeling of fractured limestone sites. The calibrated model was used to analyze the spreading behavior of the contaminant plume.

Degree of recognition: International

Related event

2017 NGWA Conference on Fractured Rock and Groundwater
02/10/2017 → 03/10/2017
Burlington, United States
Activity: Talks and presentations › Conference presentations

DRIP Annual seminar 2017
Period: 28 Sep 2017 → 29 Sep 2017
Berit Godskesen (Guest lecturer)
Hans-Jørgen Albrechtsen (Guest lecturer)
Department of Environmental Engineering
Urban Water Systems

Description
Annual seminar in the DRIP project (Danish Partnership for Resource and Water efficient industrial food production)
Degree of recognition: National

Related organisation

DRIP Annual seminar 2017
Godskesen, B. (Guest lecturer), Albrechtsen, H. (Guest lecturer)
28 Sep 2017 → 29 Sep 2017
Activity: Talks and presentations › Conference presentations

Innovation workshop on lake restoration for project Vand i Mølleåen.
Period: 21 Sep 2017
Erik Arvin (Panel member)
Department of Environmental Engineering
Related event

Innovation workshop on lake restoration for project Vand i Mølleåen.
21/09/2017 → 21/09/2017
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

A local freshwater impact – proposing the groundwater indicator AGWaRe
Period: 12 Sep 2017
Ryle Nørskov Gejl (Guest lecturer)
Martin Rygaard (Guest lecturer)
Poul Løgstrup Bjerg (Guest lecturer)
Jens Rasmussen (Guest lecturer)
Department of Environmental Engineering
Urban Water Systems
Water Resources Engineering

Related event

4th Water Research Conference: The Role of Water Technology Innovation in the Blue Economy
10/09/2017 → 13/09/2017
Waterloo, Ontario, Canada
Activity: Talks and presentations › Conference presentations

Nye - Assessing the environmental and economic sustainability
Period: 12 Sep 2017
Maria Faragò (Speaker)
Sarah Brudler (Other)
Martin Rygaard (Other)
Department of Environmental Engineering
Urban Water Systems

Related event

ATV Jord og Grundvand møde: Vand på tværs - alternativ vandhåndtering og helhedstænkning
12/09/2017 → 12/09/2017
Aarhus, Denmark
Activity: Talks and presentations › Conference presentations

14th IWA/IAHR International Conference on Urban Drainage 2017
Period: 10 Sep 2017 → 15 Sep 2017
Katrine Nielsen (Participant)
Department of Environmental Engineering
Urban Water Systems
Degree of recognition: International

Related event

14th IWA/IAHR International Conference on Urban Drainage 2017
10/09/2017 → 15/09/2017
Prague, Czech Republic
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Particle-enhanced transportation of metal and PAH pollution reduces stormwater treatment efficiency based on settling and filtration
The microbiome of potable water producing biofilters: taxonomic insights and anomalies, metabolic potentials, biotechnological opportunities?

Period: 7 Sep 2017 → 8 Sep 2017
Barth F. Smets (Keynote speaker)
Department of Environmental Engineering
Water Technologies
Degree of recognition: International

International workshop on marine geomicrobiology - A matter of energy

Period: 28 Aug 2017 → 1 Sep 2017
Marlene Mark Jensen (Participant)
Department of Environmental Engineering
Water Technologies
Degree of recognition: International

Sustainable solutions for risky problems in urban water management

Period: 22 Aug 2017
Hjalte Jomo Danielsen Sørup (Speaker)
Department of Environmental Engineering
Urban Water Systems

Sustainable solutions for risky problems in urban water management

Period: 22 Aug 2017
Hjalte Jomo Danielsen Sørup (Speaker)
Department of Environmental Engineering
Urban Water Systems

University of California Berkeley, Department of Civil and Environmental Engineering
Period: 15 Aug 2017 → 28 Feb 2018
Martin Rygaard (Visiting researcher)
Department of Environmental Engineering
Urban Water Systems

Description
Sabbatical
Degree of recognition: International
Activity: Visiting an external institution › Visiting another research institution

Plasmid Host Range (Permissiveness) in Microbial Communities across Urban Water Systems
Period: 13 Aug 2017 → 17 Aug 2017
Barth F. Smets (Invited speaker)
Arnaud Dechesne (Other)
Liguan Li (Other)
Søren Johannes Sørensen (Other)
Jonas S. Madsen (Other)
Department of Environmental Engineering
Water Technologies
Degree of recognition: International
Documents:
EDAR2017_BFSM

Related event
4th International Symposium on the Environmental Dimension of Antibiotic Resistance
13/08/2017 → 17/08/2017
Lansing, MI, United States
Activity: Talks and presentations › Conference presentations

ICoN5: 5th International Conference on Nitrification
Period: 23 Jul 2017 → 27 Jul 2017
Carlos Domingo-Felez (Participant)
Department of Environmental Engineering
Water Technologies

Related event
ICoN5: 5th International Conference on Nitrification
23/07/2017 → 27/07/2017
Vienna, Austria
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

N2O dynamics of N-transforming microbial communities: from mechanistic insights to full-scale process control
Period: 23 Jul 2017 → 27 Jul 2017
Barth F. Smets (Invited speaker)
Department of Environmental Engineering
Water Technologies
Degree of recognition: International
Links:
https://icon5.univie.ac.at/welcome/

Related event
ICoN5: 5th International Conference on Nitrification
23/07/2017 → 27/07/2017
Vienna, Austria
Diversity, structure, and novel physiologies in microbial communities in rapid sand filters  
Period: 9 Jul 2017 → 13 Jul 2017  
Barth F. Smets (Invited speaker)  
Arda Gülay (Other)  
Alejandro Palomo (Other)  
Jane Fowler (Other)  
Thomas Sicheritz-Pontén (Other)  
Department of Environmental Engineering  
Water Technologies  
Department of Bio and Health Informatics  
Metagenomics  
Degree of recognition: International  
Documents:  
fems 2

Related event
The Federation of European Microbiological Societies  
09/07/2017 → 13/07/2017  
Valencia, Spain

A local freshwater impact – proposing a groundwater indicator AGWaRe  
Period: 27 Jun 2017  
Ryle Nørskov Gejl (Speaker)  
Department of Environmental Engineering  
Urban Water Systems

Related event
ISIE 2017: Science for Sustainable and Resilient Communities  
25/06/2017 → 29/06/2017  
Chicago, United States

Essential Societal Service Functions and Planetary Boundaries: The Case of Sustainable Urban Water Management  
Period: 26 Jun 2017  
Hjalte Jomo Danielsen Sørup (Speaker)  
Department of Environmental Engineering  
Urban Water Systems

Related event
9th biennial conference of the International Society for Industrial Ecology (ISIE) and the 25th annual conference of the International Symposium on Sustainable Systems and Technology (ISSST)  
25/06/2017 → 29/06/2017  
Chicago, United States

The industrial dynamics of water innovation: A comparison of China and Europe  
Period: 26 Jun 2017  
Mariú Abritta Moro (Speaker)  
Department of Environmental Engineering
Related event

International Conference on Innovation Studies
26/06/2017 → 27/06/2017
Beijing, China
Activity: Talks and presentations › Conference presentations

Adsorption of microplastics to the edible Fucus vesiculosus and possible wash off before food application
Period: 22 Jun 2017
Nanna B. Hartmann (Speaker)
Clara G. Villaro (Speaker)
Ida D.W. Koch (Speaker)
Kasper B. Sundbæk (Speaker)
Niclas S. Rasmussen (Speaker)
Susan Løvstad Holdt (Speaker)
National Food Institute
Research Group for Bioactives – Analysis and Application
Department of Environmental Engineering
Environmental Chemistry

Description
The growing demand for food accessibility, due to rapidly growing population of the world, has raised the interest of macroalgae as a food source also in the Western world. However, this combined with increased food awareness trigger a concern that accumulated microplastics in the oceans might pollute the seaweed and influence food safety and thereby applicability. One of the most common types of seaweed in Denmark is bladder wrack, Fucus vesiculosus (FC), and this specimen is also popular for the use in e.g. pesto and flour in Denmark. This study investigated if fluorescent polystyrene (PS) microplastic particles (diameter: 20 μm) adsorb to the macroalga FC and if they can be washed off afterwards with filtered seawater.

Degree of recognition: International
Documents:
ISAP_2017_abstract_Hartmann et al-Microplastic on Fucus

Related external organisation

University of Nantes
France
Activity: Talks and presentations › Conference presentations

New applications for fluorescence spectroscopy for monitoring drinking water disinfection and distribution
Period: 17 Jun 2017
Erik Arvin (External examiner)
Department of Environmental Engineering

Description
Discussion leader for Licentiate defense
Degree of recognition: International
Activity: Examinations and supervision › External examination

A Stochastic Method to Manage Delay and Missing Values for In-Situ Sensors in an Alternating Activated Sludge Process
Period: 13 Jun 2017
Peter Alexander Stentoft (Speaker)
Jan Kloppenborg Møller (Other)
Henrik Madsen (Other)
Peter Steen Mikkelsen (Other)
Thomas Munk-Nielsen (Other)

Department of Applied Mathematics and Computer Science
Dynamical Systems
Department of Environmental Engineering
Urban Water Systems

Description
Oral Presentation
Degree of recognition: International

Related event
12th IWA Specialized Conference on Instrumentation, Control and Automation
11/06/2017 → 14/06/2017
Quebec, Canada
Activity: Talks and presentations › Conference presentations

A Critical and in-depth analysis of the environmental aspect of the OECD SP dossiers
Period: 1 Jun 2017
Steffen Foss Hansen (Speaker)
Anders Baun (Other)
Rune Hjorth (Other)
Lars Michael Skjolding (Other)

Department of Environmental Engineering
Environmental Chemistry

Description
Oral presentation at the 8th International Symposium on Nanotechnology, Occupational and Environmental Health.
Elsinore. 29 May-1 June, 2017.
Degree of recognition: International

Related external organisation
National Research Center for Working Environment
Denmark
Activity: Talks and presentations › Conference presentations

WISE project - Experiences & Funding Bazaar
Period: 24 May 2017
Katrine Nielsen (Organizer)
Birgitte Neergaard (Organizer)
Berit Godske (Organizer)
Viggo Aaberg Kærn (Organizer)
Lærke Philipsen (Organizer)
Peter Steen Mikkelsen (Organizer)
Camilla Bitsch (Organizer)

Department of Environmental Engineering
Urban Water Systems
Office for Innovation & Sector Services

Related event
WISE project - Experiences & Funding Bazar
24/05/2017 → 24/05/2017
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

WISE-project - Societal needs to be solved & Professional mingling
Period: 24 May 2017
Katrine Nielsen (Organizer)
Berit Godskesen (Organizer)
Lærke Philipsen (Organizer)
Birgitte Neergaard (Organizer)
Viggo Aaberg Kærn (Organizer)
Peter Steen Mikkelsen (Organizer)
Camilla Bitsch (Organizer)
Department of Environmental Engineering
Urban Water Systems
Office for Innovation & Sector Services
Degree of recognition: National

Related event

WISE-project - Societal needs to be solved & Professional mingling
24/05/2017 → 24/05/2017
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

3th Water DTU Partner Seminar
Period: 23 May 2017 → 24 May 2017
Peter Steen Mikkelsen (Organizer)
Katrine Nielsen (Organizer)
Berit Godskesen (Organizer)
Birgitte Neergaard (Organizer)
Camilla Bitsch (Organizer)
Viggo Aaberg Kærn (Organizer)
Lærke Philipsen (Organizer)
Department of Environmental Engineering
Urban Water Systems
Office for Innovation & Sector Services
Degree of recognition: National

Related event

3th Water DTU Partner Seminar
23/05/2017 → 24/05/2017
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Frontiers International Conference on Wastewater Treatment (FICWTM2017)
Period: 21 May 2017 → 24 May 2017
Carlos Domingo-Felez (Participant)
Department of Environmental Engineering
Water Technologies

Related event
Low nitrous oxide production in intermittent-feed high performance nitritating reactors

Period: 21 May 2017 → 24 May 2017
Qingxian Su (Keynote speaker)
Department of Environmental Engineering
Water Technologies

Description
Flash presentation
Degree of recognition: International

Related event

Oversvømmelsessimulering vs. detaljegrad i 1D modeller
Period: 11 May 2017
Roland Löwe (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Invited speech on EVA temadag
Degree of recognition: National

Related event

water in urban area
Period: 11 May 2017
Berit Godskesen (Organizer)
Karsten Amnbjerg-Nielsen (Organizer)
Department of Environmental Engineering
Urban Water Systems

Description
Water in urban areas, meeting (stormøde), May 11th, Odense, Denmark - Bæredygtighed, Vand og Klimatilpasning
Degree of recognition: National
Links:

Related event

water in urban area: Sustainability, Water and Climate adaptation
11/05/2017 → 11/05/2017
Odense, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
Applying LCA in decision making - the need and the future perspective
Period: 10 May 2017
Yan Dong (Speaker)
Simona Miraglia (Other)
Stefano Manzo (Other)
Stylianos Georgiadis (Other)
Hjalte Jomo Danielsen Sarup (Other)
Elena Boriani (Other)
Tine Hald (Other)
Sebastian Thøns (Other)
Michael Zwicky Hauschild (Other)
Department of Management Engineering
Quantitative Sustainability Assessment
Centre for oil and gas – DTU
Transport DTU
Transport Modelling
Department of Applied Mathematics and Computer Science
Statistics and Data Analysis
Department of Environmental Engineering
Urban Water Systems
National Food Institute
Research Group for Genomic Epidemiology
Department of Civil Engineering
Section for Structural Engineering

Documents:
AbstraApplying LCA in policy decision making_Final
Links:
https://brussels.setac.org/welcome/

Related event
SETAC Europe: 27th Annual Meeting – Environmental Quality Through Transdisciplinary Collaboration
07/05/2017 → 13/07/2017
Brussels, Belgium
Activity: Talks and presentations › Conference presentations

Intermittent aeration regimes are effective tools to manage size of bio-granules and microbial communities in PN/A SBRs.
Period: 10 May 2017
Jan-Michael Blum (Speaker)
Department of Environmental Engineering
Water Technologies

Description
The presentation was given at the 10th International Conference on Biofilm Reactors at University College Dublin, Ireland.
Degree of recognition: International

Related event
10th International Conference on Biofilm Reactors
09/05/2017 → 12/05/2017
Dublin, Ireland
Balancing complexity and uncertainty in model-based estimation of micropollutant fluxes in integrated urban drainage-wastewater systems
Period: 9 May 2017
Luca Vezzaro (Invited speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Presentation held at the SETAC 2017 conference (special session on "Looking across organizational boundaries: exchanging ideas on mechanistic modelling between SETAC and the International Water Association (IWA)")
Degree of recognition: International
Documents: 20170509_MPmodelComplexity_SETAC_LUVE

Related event
SETAC Europe: 27th Annual Meeting – Environmental Quality Through Transdisciplinary Collaboration
07/05/2017 → 13/07/2017
Brussels, Belgium
Activity: Talks and presentations › Conference presentations

Developments in Integrated Urban Drainage
Period: 9 May 2017
Luca Vezzaro (Invited speaker)
Lorenzo Benedetti (Other)
Wolfgang Rauch (Other)
Peter M. Bach (Other)
Department of Environmental Engineering
Urban Water Systems

Description
Presentation held at the SETAC 2017 conference (special session on "Looking across organizational boundaries: exchanging ideas on mechanistic modelling between SETAC and the International Water Association (IWA)")
Degree of recognition: International
Documents: 20170509_integratedModels_SETAC_LUVE

Related event
SETAC Europe: 27th Annual Meeting – Environmental Quality Through Transdisciplinary Collaboration
07/05/2017 → 13/07/2017
Brussels, Belgium
Activity: Talks and presentations › Conference presentations

Differential adhesion and the spatial positioning effect on early stage microbial aggregation
Period: 9 May 2017 → 12 May 2017
Bastiaan Cockx (Other)
Jan-Ulrich Kreft (Other)
Barth F. Smets (Other)
Department of Environmental Engineering
Water Technologies
Degree of recognition: International

Related event
10th International Conference on Biofilm Reactors
Feasibility-test of a complete autotrophic nitrogen removal process treating the effluent of an industrial anaerobic digester
Period: 9 May 2017 → 12 May 2017
Hannah Feldman (Other)
Xavier Flores Alsina (Other)
Kasper Kjellberg (Other)
Jan-Michael Blum (Other)
Borja Valverde Pérez (Other)
Gürkan Sin (Other)
Barth F. Smets (Other)
Krist V. Gernaey (Other)

Department of Chemical and Biochemical Engineering
PROSYS - Process and Systems Engineering Centre
Department of Environmental Engineering
Degree of recognition: International

Related event
10th International Conference on Biofilm Reactors
09/05/2017 → 12/05/2017
Dublin, Ireland
Activity: Talks and presentations › Conference presentations

Biodegradation of hydrophobic chemicals in mixtures at low concentrations - Covering the chemical space of petroleum hydrocarbons
Period: 8 May 2017
Heidi Birch (Speaker)

Department of Environmental Engineering
Environmental Chemistry
Degree of recognition: International

Related event
SETAC Europe: 27th Annual Meeting – Environmental Quality Through Transdisciplinary Collaboration
07/05/2017 → 13/07/2017
Brussels, Belgium
Activity: Talks and presentations › Conference presentations

Applying LCA in decision making- the need and the future perspective
Period: 7 May 2017 → 11 May 2017
Yan Dong (Guest lecturer)
Simona Miraglia (Guest lecturer)
Stefano Manzo (Guest lecturer)
Stylianos Georgiadis (Guest lecturer)
Hjalte Jomo Danielsen Sarup (Guest lecturer)
Elena Boriani (Guest lecturer)
Tine Hald (Guest lecturer)
Sebastian Thöns (Guest lecturer)
Michael Zwicky Hauschild (Guest lecturer)

Department of Management Engineering
Quantitative Sustainability Assessment
Description
There is nowadays a need of including sustainable considerations in the policy and decision making. Sound decision making requires evidence-based support, i.e. decision analysis to help decision makers in identifying the best alternative based on the associated impacts. Decision analysis includes four steps: 1) structure decision problem; 2) assess possible impacts associated with alternatives; 3) determine stakeholder preferences and 4) evaluate alternatives. Decision analysis can be performed applying different tools, such as cost-benefit analysis (CBA), risk assessment, and life cycle assessment (LCA).

LCA is a decision analysis tool that focuses on environmental impacts. One limit is that LCA is based on defined impact categories and therefore does not provide information for those impacts and consequences out of the LCA scope. However, the LCA framework closely follows the decision analysis scheme and has the potential to be integrated with other decision analysis tools to enhance their assessment of environmental impacts.

To understand why LCA is needed in the policy decision context, we looked into the decision support for policy in several disciplines. Taking sustainable transport policy as an example, the traditional decision analysis tool for choosing the best alternative is CBA. CBA mainly analyses socio-economic impacts, such as travel time savings and costs, while only some environmental impacts are considered; i.e. the damage costs of greenhouse gas emissions, particulate matters, SOx, NOx and noise. Therefore, current transport policy making rarely reflect a full environmental profile of the suggested alternatives. Making decisions based on incomplete information may lead to sub-optimal solutions, especially where the environment is a major concern. There is a growing attention of conducting LCA in transport. Some identified environmental hotspots, such as consumer and household behavior, which may be the focus for future policies. Others assess the environmental impacts associated with building infrastructures and vehicle use. These studies verify that LCA can successfully quantify the environmental profile of alternatives in transport policy, if the relevant physical changes, e.g. vehicle travel distance and new infrastructures, are well-defined. However, before integrating LCA with other decision analysis methods for decision support, the study system, objectives, scopes, evaluation metrics and uncertainty handling need to be aligned.

Degree of recognition: International
Links:
https://brussels.setac.org/

Related event

SETAC Europe: 27th Annual Meeting – Environmental Quality Through Transdisciplinary Collaboration
07/05/2017 → 13/07/2017
Brussels, Belgium
Activity: Talks and presentations › Conference presentations

2017 GEMS Spring Meeting
Period: 2 May 2017
Steffen Foss Hansen (Participant)
Department of Environmental Engineering
Environmental Chemistry
Degree of recognition: International
Documents:
Nanomaterial consumer products in a consolidated database wb comments

Related event
**7th International Conference**  
**Period:** 2 May 2017 → 5 May 2017  
Kamilla Marie Speht Kaarsholm (Participant)  
Henrik Rasmus Andersen (Chairman)  
Traek Manasfi (Participant)  
Jean-Luc Boudenne (Participant)  
Department of Environmental Engineering  
Water Technologies

**Description**  
Effect of UV treatment on DBPs formation in chlorinated seawater swimming pools- a laboratory study

The study aim was to investigate the effect of UV treatment followed by chlorination on DBP formation was studied using laboratory experiments. Three groups of DBPs were investigated including THMs, HANs and HAAs. DBP level measured after post-UV chlorination was compared to dark control sample which was not subjected to UV exposure. Bromine substitution was investigated to analyse its effects on the formation of DBPs. Finally, overall cytotoxicity and genotoxicity were estimated for the toxic potency of compounds before and after treatment.  

**Degree of recognition:** International  
**Documents:**  
- UV for seawater pools

**Related event**  
7th International Conference : Swimming Pool and Spa  
02/05/2017 → 05/05/2017  
Kos, Greece  
Activity: Attending an event › Participating in or organising a conference

**7th International Conference**  
**Period:** 2 May 2017 → 5 May 2017  
Kamilla Marie Speht Kaarsholm (Participant)  
Henrik Rasmus Andersen (Chairman)  
Department of Environmental Engineering  
Water Technologies

**Description**  
Destruction of DBPs and their precursors in swimming pool water by combined UV-treatment and ozonation

The study aim was to investigate the effect of a combined treatment system on DBP formation. As both ozone and chlorine preferably react with electrophilic groups in compounds, we hypothesise that reactivity to chlorine, created by the UV treatment of dissolved organic matter in pool water, might also mean that there is increased reactivity to ozone and that ozonation might remove the chlorine reactivity created by UV treatment. Therefore, we first performed an experiment to range-find the effect of swimming pool water UV activation on chlorine reactivity. Secondly, an experiment was carried out to characterise the effect of adding various doses of ozone to pool water, with or without UV pre-treatment, before chlorination to study the effect on chlorine reactivity and the formation of chlorination by-products. Finally, the possible effect on chlorination by-product formation was investigated by a repeated, combined UV-ozone treatment interchanged with chlorination (repeated cycles of UV followed by ozone with subsequent chlorination). Toxicity estimation was used to evaluate water quality.  

**Degree of recognition:** International  
**Documents:**  
combined UV and ozone treatment for swimming pool water

**Related event**  
7th International Conference : Swimming Pool and Spa
Destruction of DBPs and their precursors in swimming pool water by combined UV-treatment and ozonation
Period: 2 May 2017 → 5 May 2017
Waqas Akram Cheema (Speaker)
Department of Environmental Engineering
Water Technologies

Description
The study aim was to investigate the effect of a combined treatment system on DBP formation. As both ozone and chlorine preferably react with electrophilic groups in compounds, we hypothesise that reactivity to chlorine, created by the UV treatment of dissolved organic matter in pool water, might also mean that there is increased reactivity to ozone and that ozonation might remove the chlorine reactivity created by UV treatment. Therefore, we first performed an experiment to range-find the effect of swimming pool water UV activation on chlorine reactivity. Secondly, an experiment was carried out to characterise the effect of adding various doses of ozone to pool water, with or without UV pre-treatment, before chlorination to study the effect on chlorine reactivity and the formation of chlorination by-products. Finally, the possible effect on chlorination by-product formation was investigated by a repeated, combined UV-ozone treatment interchanged with chlorination (repeated cycles of UV followed by ozone with subsequent chlorination). Toxicity estimation was used to evaluate water quality.

Degree of recognition: International
Documents:
combined UV and ozone treatment for swimming pool water

Related event
7th International Conference: Swimming Pool and Spa
02/05/2017 → 05/05/2017
Kos, Greece
Activity: Talks and presentations › Conference presentations

Effect of UV treatment on DBPs formation in chlorinated seawater swimming pools - a laboratory study
Period: 2 May 2017 → 5 May 2017
Waqas Akram Cheema (Speaker)
Department of Environmental Engineering
Water Technologies

Description
The study aim was to investigate the effect of UV treatment followed by chlorination on DBP formation was studied using laboratory experiments. Three groups of DBPs were investigated including THMs, HANs and HAAs. DBP level measured after post-UV chlorination was compared to dark control sample which was not subjected to UV exposure. Bromine substitution was investigated to analyse its effects on the formation of DBPs. Finally, overall cytotoxicity and genotoxicity were estimated for the toxic potency of compounds before and after treatment.

Degree of recognition: International
Documents:
UV for seawater pools

Related event
7th International Conference: Swimming Pool and Spa
02/05/2017 → 05/05/2017
Kos, Greece
Activity: Talks and presentations › Conference presentations

EGU General Assembly 2017
Period: 27 Apr 2017
Teis Nørgaard Mikkelsen (Speaker)
Department of Environmental Engineering
Atmospheric Environment

Description
N2O emission from plant surfaces – light stimulated and a global phenomenon PICO Presentation. Teis N. Mikkelsen, Dan Bruhn, Kim Pilegaard & Per Ambus
Degree of recognition: International
Documents:
PICO presentation EGU 2017

Related event
EGU General Assembly 2017: European GEosciences Union 2017
24/04/2017 → 28/04/2017
Vienna, Austria
Activity: Talks and presentations › Conference presentations

Seminar on climate adaptation for politicians and water company board members
Period: 27 Apr 2017
Erik Arvin (Participant)
Department of Environmental Engineering
Degree of recognition: Local

Related event
Seminar on climate adaptation for politicians and water company board members
27/04/2017 → 27/04/2017
Roskilde, Denmark
Activity: Attending an event › Participating in or organising a conference

Forskning og projekter inden for klimatilpasning
Period: 26 Apr 2017
Hjalte Jomo Danielsen Sørup (Speaker)
Department of Environmental Engineering
Urban Water Systems
Related external organisation
The Danish Society of Engineers, IDA
Kalvebod Brygge 31-33, DK-1790, Copenhagen V, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Klimatilpasning af vandinfrastruktur
Period: 5 Apr 2017
Hjalte Jomo Danielsen Sørup (Speaker)
Department of Environmental Engineering
Urban Water Systems
Related organisation
Klimatilpasning af vandinfrastruktur
Sørup, H. J. D. (Speaker)
5 Apr 2017
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Nanoworld Conference
Period: 4 Apr 2017
Steffen Foss Hansen (Chairman)
Department of Environmental Engineering
Environmental Chemistry

Related event

Nanoworld Conference
Period: 4 Apr 2017
Steffen Foss Hansen (Speaker)
Department of Environmental Engineering
Environmental Chemistry
Links:

Related event

Nanoworld Conference
Period: 1 Apr 2017
Steffen Foss Hansen (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Member of Panel on Work Environment at DTU Environment
Degree of recognition: Local

Related external organisation

Member of Panel on Work Environment at DTU Environment
Activity: Membership » Membership of committees, commissions, boards, councils, associations, organisations, or similar

Konstruktion og test af kunstige regnserier
Period: 29 Mar 2017
Hjalte Jomo Danielsen Sørup (Speaker)
Department of Environmental Engineering
Urban Water Systems

Related external organisation

The Danish Society of Engineers, IDA
Kalvebod Brygge 31-33, DK-1780, Copenhagen V, Denmark
Activity: Talks and presentations » Talks and presentations in private or public companies and organisations

Release and control of chemicals from plastic pipes in water supply
Period: 27 Mar 2017
Erik Arvin (Invited speaker)
Department of Environmental Engineering
Erik Arvin VandCenterSyd møde 27 marts 2017

Related event

Workshop on release and control of chemicals from plastic pipes in water supply
27/03/2017 → 27/03/2017
Odense, Denmark
Activity: Talks and presentations › Conference presentations

Kinetic considerations of two Sulfurospirillum spp. competing for tetrachloroethene
Period: 26 Mar 2017 → 29 Mar 2017
Geraldine Buttet (Other)
Alexandra Marie Murray (Other)
Melissa Burion (Other)
C. Holliger (Other)
J Maillard (Speaker)
Department of Environmental Engineering
Water Resources Engineering
Degree of recognition: International
Documents:
Maillard_abstract_final (1)

Related event

Dehalocon II: A Conference on Anaerobic Reductive Dehalogenation
26/03/2017 → 29/03/2017
Leipzig, Germany
Activity: Talks and presentations › Conference presentations

Forsyning 2020: Fremtid og forandring i forsyningssektoren
Period: 9 Mar 2017
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Systems
Degree of recognition: National

Related event

Forsyning 2020: Fremtid og forandring i forsyningssektoren
09/03/2017 → 09/03/2017
Kolding, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Microbial processes in rapid sandfilters - removal of ammonium and organic micropollutants (pesticides)
Period: 8 Mar 2017
Hans-Jørgen Albrechtsen (Invited speaker)
Department of Environmental Engineering
Urban Water Systems
Degree of recognition: International

Related event

New Technologies and Innovative Solutions in the Danish Water Sector
07/03/2017 → 08/03/2017
Tallinn, Estonia
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities
Integration of geological, geophysical and contaminant monitoring technologies for contaminated site investigation
Period: 7 Mar 2017
Nicola Balbarini (Guest lecturer)
Pradip Kumar Maurya (Other)
Vinni Kampman Rende (Other)
Anders Vest Christiansen (Other)
Knud Erik Klint (Other)
Poul Løgstrup Bjerg (Other)
Philip John Binning (Other)
Department of Environmental Engineering
Water Resources Engineering
Office for Study Programmes and Student Affairs

Related event

ATV jord og grundvand 2017: vintermøde
07/03/2017 → 08/03/2017
Vejle, Denmark
Activity: Talks and presentations › Conference presentations

SRA Policy Forum: Risk Governance for Key Enabling Technologies
Period: 2 Mar 2017
Steffen Foss Hansen (Organizer)
Department of Environmental Engineering
Environmental Chemistry

Description
Chairman. Synthetic Biology Applications and State of Science. Risk Governance of Key Emerging Technologies. Venice, Italy, 1-3 March 2017
Degree of recognition: International

Related event

SRA Policy Forum: Risk Governance for Key Enabling Technologies
01/03/2017 → 03/03/2017
Venice, Italy
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

A pumping and tracer test in limestone with modeling interpretation – experiences and results
Period: 1 Mar 2017
Klaus Mosthaf (Speaker)
Bentje Brauns (Other)
Annika Sidellmann Fjordbøge (Other)
Jens Schaarup Sørensen (Other)
Bent Henning Skov (Other)
Flemming Møller (Other)
Mette Martina Broholm (Other)
Poul Løgstrup Bjerg (Other)
Philip John Binning (Other)
Niels D. Overheu (Other)
Anna Toft (Other)
Henriette Kern-Jespersen (Other)
Magnus Marius Rohde (Other)
Christian Helweg (Other)
Related event

Fagmøde: Forurening af kalkmagasiner: Konceptuelle modeller, transport, spredningsprocesser og modellering
01/03/2017 → 01/03/2017
København, Denmark
Activity: Talks and presentations › Conference presentations

Fagmøde: Forurening af kalkmagasiner
Period: 1 Mar 2017
Niels D. Overheu (Organizer)
Henriette Kern-Jespersen (Organizer)
Philip John Binning (Organizer)
Klaus Mosthaf (Organizer)
Annika Sidelmann Fjordbøge (Organizer)
Mette Martina Broholm (Organizer)
Poul Løgstrup Bjerg (Organizer)

Department of Environmental Engineering
Water Resources Engineering
Degree of recognition: National

Related event

Fagmøde: Forurening af kalkmagasiner: Konceptuelle modeller, transport, spredningsprocesser og modellering
01/03/2017 → 01/03/2017
København, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Formidling af "kalkprojektet" & Introduction of the Limestone Wiki
Period: 1 Mar 2017
Klaus Mosthaf (Speaker)
Poul Løgstrup Bjerg (Speaker)

Department of Environmental Engineering
Water Resources Engineering
Degree of recognition: National

Related event

Fagmøde: Forurening af kalkmagasiner: Konceptuelle modeller, transport, spredningsprocesser og modellering
01/03/2017 → 01/03/2017
København, Denmark
Activity: Talks and presentations › Conference presentations

Hvor finder man forureningen ved Akacievej?
Period: 1 Mar 2017
Annika Sidelmann Fjordbøge (Speaker)
Klaus Mosthaf (Other)
Bentje Brauns (Other)
Poul Løgstrup Bjerg (Other)
Philip John Binning (Other)
Mette Martina Broholm (Other)
Henriette Kern-Jespersen (Other)
Related event

Fagmøde: Forurening af kalkmagasiner: Konceptuelle modeller, transport, spredningsprocesser og modellering
01/03/2017 → 01/03/2017
København, Denmark
Activity: Talks and presentations › Conference presentations

Kalkgeologi og transportprocesser samt intro til Akacievej
Period: 1 Mar 2017
Mette Martina Broholm (Speaker)
Annika Sidelmann Fjordbøge (Other)
Klaus Mosthaf (Other)
Poul Løgstrup Bjerg (Other)
Peter Roll Jakobsen (Other)
Rasmus Jakobsen (Other)
Jens Galsgaard (Other)
Magnus Marius Rohde (Other)
Henriette Kern-Jespersen (Other)
Anna Toft (Other)

Department of Environmental Engineering
Water Resources Engineering
Degree of recognition: National

Related event

Fagmøde: Forurening af kalkmagasiner: Konceptuelle modeller, transport, spredningsprocesser og modellering
01/03/2017 → 01/03/2017
København, Denmark
Activity: Talks and presentations › Conference presentations

Modeller til strømning og stoftransport i kalk
Period: 1 Mar 2017
Poul Løgstrup Bjerg (Speaker)
Klaus Mosthaf (Other)
Annika Sidelmann Fjordbøge (Other)
Mette Martina Broholm (Other)
Philip John Binning (Other)

Department of Environmental Engineering
Water Resources Engineering
Degree of recognition: National

Related event

Fagmøde: Forurening af kalkmagasiner: Konceptuelle modeller, transport, spredningsprocesser og modellering
01/03/2017 → 01/03/2017
København, Denmark
Activity: Talks and presentations › Conference presentations

Risikovurdering af Akacievej
Period: 1 Mar 2017
Poul Løgstrup Bjerg (Speaker)
Which data is most useful for the assessment of a contaminated limestone site? How can it be obtained?

Period: 1 Mar 2017
Klaus Mosthaf (Speaker)
Bentje Brauns (Other)
Annika Sidelmann Fjordbøge (Other)
Jens Schaarup Sørensen (Other)
Bent Henning Skov (Other)
Flemming Møller (Other)
Mette Martina Broholm (Other)
Poul Løgstrup Bjerg (Other)
Philip John Binning (Other)
Niels D. Overheu (Other)
Anna Toft (Other)
Henriette Kern-Jespersen (Other)
Magnus Marius Rohde (Other)
Christian Helweg (Other)
John U. Bastrup (Other)

Department of Environmental Engineering
Water Resources Engineering
Degree of recognition: National

Related event

Fagmøde: Forurening af kalkmagasiner: Konceptuelle modeller, transport, spredningsprocesser og modellering
01/03/2017 → 01/03/2017
København, Denmark
Activity: Talks and presentations › Conference presentations

2017 IUVA Americas Conference
Period: 5 Feb 2017 → 8 Feb 2017
Waqas Akram Cheema (Speaker)

Department of Environmental Engineering
Water Technologies

Description
presented topic “Effect of UV treatment on formation of disinfection by-products in chlorinated seawater swimming pools”
Degree of recognition: International

Related event

2017 IUVA Americas Conference
05/02/2017 → 08/02/2017
Austin, United States
Activity: Talks and presentations › Conference presentations

**Miljøteknisk Topmøde**
Period: 2 Feb 2017
Hans-Jørgen Albrechtsen (Participant)
Department of Environmental Engineering

**Description**
Miljøteknisk Topmøde

**Related event**
**Miljøteknisk Topmøde: Vintermøde (Brancheforeningen Dansk Miljøteknologi)**
02/02/2017 → 02/02/2017
Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Miljøteknisk Topmøde**
Period: 2 Feb 2017
Hans-Jørgen Albrechtsen (Participant)
Department of Environmental Engineering
Urban Water Systems

**Description**
Drikkevand - er den danske holdning til vandbehandling tidssvarende?

**Related event**
**Miljøteknisk Topmøde: Vintermøde (Brancheforeningen Dansk Miljøteknologi)**
02/02/2017 → 02/02/2017
Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**11th annual Danish Water Forum (DWF) 2017**
Period: 30 Jan 2017
Camilla Tang (Speaker)
Department of Environmental Engineering
Urban Water Systems

**Related event**
**11th annual Danish Water Forum (DWF) 2017**
30/01/2017 → 30/01/2017
Frederiksberg, Denmark
Activity: Talks and presentations › Conference presentations

**Science for Environment Policy, Issue 480: A service from the European Commission (Journal)**
Period: 12 Jan 2017
Ursula S. McKnight (Reviewer)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Banned pesticides continue to affect toxicity in streams

**Related journal**
National Research Council of Italy
Period: 9 Jan 2017 → 9 Mar 2017
Raphael Schneider (Visiting researcher)

Department of Environmental Engineering
Water Resources Engineering

Description
external research stay during PhD studies

External stay at the Hydrology Research Group of CNR IRPI in Perugia, Italy: http://hydrology.irpi.cnr.it/

Activity: Visiting an external institution › Visiting another research institution

Birkerød Water Supply (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Erik Arvin (Member)

Department of Environmental Engineering

Description
Board member
Degree of recognition: Local

Related external organisation

Birkørs Water Supply
Biskop Svanes vej, 3460, Birkerød, Denmark
Activity: Membership › Board duties in companies, associations, or public organisations

Rudersdal Supply (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Erik Arvin (Member)

Department of Environmental Engineering

Description
Board member
Degree of recognition: Local

Related external organisation

Rudersdal Supply
Activity: Membership › Board duties in companies, associations, or public organisations

Chemical Processes and Materials (Journal)
Period: 2016 → …
Steffen Foss Hansen (Reviewer)

Department of Environmental Engineering
Environmental Chemistry

Description
Associate Editor
Degree of recognition: International

Links:
http://chempm.org/ (Homepage of Chemical Processes and Materials)

Related journal
Chemical Processes and Materials
Local database
Activity: Research › Journal editor

Continuing education coordinator at DTU Environment
Period: 2016 → …
Steffen Foss Hansen (Lecturer)
Department of Environmental Engineering
Environmental Chemistry
Degree of recognition: Local
Links:
http://www.env.dtu.dk/english/Teaching/Continuing-Education (DTU Environment's Continuing education website )
Activity: Other

NanoImpact (Journal)
Period: 2016 → …
Steffen Foss Hansen (Reviewer)
Department of Environmental Engineering
Environmental Chemistry
Description
Associate Editor
Degree of recognition: International
Links:
https://www.journals.elsevier.com/nanoimpact (Homepage of NanoImpact)
Related journal
NanoImpact
2452-0748
Scopus rating (2017): CiteScore 3.61 SJR 0.872 SNIP 0.634, Web of Science (2017): Indexed yes
Central database
Activity: Research › Journal editor

Pedagogical teaching coordinator at DTU Environment
Period: 2016 → …
Steffen Foss Hansen (Other)
Department of Environmental Engineering
Environmental Chemistry
Degree of recognition: Local
Activity: Other

Steering group member of the project "Plastfri Roskilde Fjord" (Event)
Period: 2016 → 2018
Steffen Foss Hansen (Chairman)
Department of Environmental Engineering
Environmental Chemistry
Degree of recognition: National
Links:
http://plasticchange.dk/vores-loesninger/plastfri-roskilde-fjord/
Related event
Steering group member of the project "Plastfri Roskilde Fjord"
01/09/2016 → …
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
Potentialer og udfordringer med målerdata i vandforsyningen
Period: 16 Dec 2016
Jonas Kjeld Kirstein (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Presentation given at DTU challenge "Water supply" with 3Vand (VCS, HOFOR and Aarhus Vand)
Participation and presentation at DTU Challenge "Water Supply"

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

American Geophysical Union Fall meeting
Period: 12 Dec 2016 → 16 Dec 2016
Teis Nørgaard Mikkelsen (Participant)
Department of Environmental Engineering
Atmospheric Environment

Description
Abstract ID and Title: 177175: Solar UV irradiation-induced production of N2O from plant surfaces - low emissions rates but all over the world. Final Paper Number: B11E-0509 Presentation Type: Poster Session Date and Time: Monday, 12 December 2016; 08:00 - 12:20 Session Number and Title: B11E: Global Nitrous Oxide Budget: Magnitude, Sources, and Drivers I Posters Location: Moscone South; Poster Hall

American Geophysical Union Fall meeting

Related event
American Geophysical Union Fall meeting
12/12/2016 → 16/12/2016
San Francisco, United States
Activity: Attending an event › Participating in or organising a conference

9th International membrane science and technology conference (IMSTEC)
Period: 5 Dec 2016 → 8 Dec 2016
Agata Zarebska (Speaker)
Department of Environmental Engineering
Water Technologies

Description
Influence of mechanical wastewater pretreatment on membrane fouling during municipal wastewater treatment by forward osmosis

Oral presentation

Related event
9th International Membrane Science & Technology Conference
05/12/2016 → 08/12/2016
Adelaide, Australia
Activity: Talks and presentations › Conference presentations

DTU Sustain 2016
Period: 30 Nov 2016
Related event

**DTU Sustain 2016**
30/11/2016 → ...
Activity: Attending an event › Participating in or organising a conference

**What does it take to practice sustainable flood risk management?**
Period: 30 Nov 2016
Hjalte Jomo Danielsen Sørup (Speaker)
Department of Environmental Engineering
Urban Water Systems

Related event

**DTU Sustain 2016**
30/11/2016 → ...
Activity: Talks and presentations › Conference presentations

**Danske Vandværker, Temalørdag, Hotel Falster, Nykøbing F**
Period: 26 Nov 2016
Hans-Jørgen Albrechtsen (Participant)
Department of Environmental Engineering
Urban Water Systems

Related event

**Danske Vandværker, Temalørdag, Hotel Falster, Nykøbing F**
Nykøbing F, Denmark
Activity: Attending an event › Participating in or organising a conference

**Danske Vandværker, Temalørdag, Roskilde**
Period: 12 Nov 2016
Hans-Jørgen Albrechtsen (Invited speaker)
Department of Environmental Engineering
Urban Water Systems

**Description**
Fordele og ulemper ved forskellige blødgøringsteknologier på vandværket

Related event

**Danske Vandværker, Temalørdag, Roskilde**
Roskilde, Denmark
**Dansk Vand Konference**  
**Period:** 9 Nov 2016  
**Jonas Kjeld Kirstein (Speaker)**  
Department of Environmental Engineering  
Urban Water Systems  

**Description**  
Fra big data til smart data – driftsopptimering med højopløste sektionsdata i vandforsyningen  

http://www.danva.dk/Admin/Public/DWSDownload.aspx?File=%2fFiles%2fFilier%2fArrangementer%2f2016%2fDVK+2016+pr%c3%a6sentationer%2f11.1+Fra+big+data+til+smart+data.pdf (Link to presentation)

**Related event**

**Dansk Vand Konference**  
08/11/2016 → 09/11/2016  
Århus, Denmark  
Activity: Talks and presentations › Conference presentations

**Kortlægning af den bakterielle lattergasproduktion i aktivt slam ved hjælp af stabile isotoper**  
**Period:** 9 Nov 2016  
**Marlene Mark Jensen (Speaker)**  
Department of Environmental Engineering  
Water Technologies

**Related event**

**Dansk Vand Konference**  
08/11/2016 → 09/11/2016  
Århus, Denmark  
Activity: Talks and presentations › Conference presentations

**Modificering af regnserier så de reflekterer et ændret klima**  
**Period:** 9 Nov 2016  
**Hjalte Jomo Danielsen Sørup (Speaker)**  
Department of Environmental Engineering  
Urban Water Systems

**Related event**

**Dansk Vand Konference 2016**  
08/11/2016 → 09/11/2016  
Aarhus, Denmark  
Activity: Talks and presentations › Conference presentations

**SOMmic – Microbial Contribution and Impact on Soil Organic Matter, Structure and Genesis**  
**Period:** 9 Nov 2016 → 11 Nov 2016  
**Stefan Trapp (Speaker)**  
Department of Environmental Engineering  
Environmental Chemistry  
Documents:  
Proceedings_SOMmic_Workshop_2016-11
SOMmic – Microbial Contribution and Impact on Soil Organic Matter, Structure and Genesis
Leipzig, Germany
Activity: Talks and presentations › Conference presentations

Integrering af ferskvandspåvirkning i livscyklusvurdering af tre vandteknologier
Period: 8 Nov 2016
Ryle Nørskov Gejl (Speaker)
Department of Environmental Engineering
Urban Water Systems

Related event

Dansk Vand Konference 2016
08/11/2016 → 09/11/2016
Aarhus, Denmark
Activity: Talks and presentations › Conference presentations

Phytotechnologies
Period: 8 Nov 2016
Lauge Peter Westergaard Clausen (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry

Description
Presentation of the applications of phytotechnologies

Related event

Workshop vedr. grønne løsninger/Refshaleøen
08/11/2016 → 08/11/2016
Søborg, Denmark
Activity: Talks and presentations › Conference presentations

7th SETAC World Congress
Period: 6 Nov 2016 → 10 Nov 2016
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry
Documents:
SETAC-Orlando-Abstract-Book

Related event

7th SETAC World Congress: SETAC North America 37th Annual Meeting
06/11/2016 → 10/11/2016
Orlando, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

7th SETAC World Congress
Period: 6 Nov 2016 → 10 Nov 2016
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry
Documents:
SETAC-Orlando-Abstract-Book
Related event

7th SETAC World Congress: SETAC North America 37th Annual Meeting
06/11/2016 → 10/11/2016
Orlando, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

7th SETAC World Congress
Period: 6 Nov 2016 → 10 Nov 2016
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry
Documents:
SETAC-Orlando-Abstract-Book

Related event

7th SETAC World Congress: SETAC North America 37th Annual Meeting
06/11/2016 → 10/11/2016
Orlando, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

7th SETAC World Congress
Period: 6 Nov 2016 → 10 Nov 2016
Philipp Mayer (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry
Documents:
SETAC-Orlando-Abstract-Book

Related event

7th SETAC World Congress: SETAC North America 37th Annual Meeting
06/11/2016 → 10/11/2016
Orlando, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

7th SETAC World Congress
Period: 6 Nov 2016 → 10 Nov 2016
Philipp Mayer (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry
Documents:
SETAC-Orlando-Abstract-Book

Related event

7th SETAC World Congress: SETAC North America 37th Annual Meeting
06/11/2016 → 10/11/2016
Orlando, United States
Activity: Talks and presentations › Conference presentations

Developing a strategy to improve the environmental risk assessment of difficult to test multi-component substances
Period: 2 Nov 2016 → 4 Nov 2016
Philipp Mayer (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry
Documents:
RIFM ECETOC WS RA of Multiconstituent Substances

Related event
RIFM/ECETOC Workshop
02/11/2016 → 04/11/2016
Kissimmee, United States
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Environmental Protection and Urban Water Systems
Hans-Jørgen Albrechtsen (Invited speaker)
Department of Environmental Engineering
Urban Water Systems

Related event
Chinese Mayors Training Programme
31/10/2016 → 04/11/2016
Copenhagen, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

DRIP Workshop
Hans-Jørgen Albrechtsen (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Feasibility of Direct Potable Reuse in California
Documents:
DRIP Direct Potable Reuse in California – 21061025

Related event
DRIP Workshop
25/10/2016 → 26/10/2016
Fredericia, Denmark
Activity: Talks and presentations › Conference presentations

Sustainability assessment - eco-efficiency
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Systems

Related event
DRIP Workshop
25/10/2016 → 26/10/2016
Fredericia, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Supersites for Superior Forest Science: Launching Supersites for Superior Forest Science - Novelty, Needs and Networking
Period: 24 Oct 2016 → Oct 2017
Teis Nørgaard Mikkelsen (Other)
Department of Environmental Engineering
Atmospheric Environment

Description
Presentation by Rainer Matyssek at the IUFRO Task Force on Climate Change and Forest Health, Beijing, China. IUFRO regional Asia Oceania congres.
Documents:
IUFRO_China_Matyssek_Oct_2016

Related event
IUFRO regional Asia Oceania congress
24/10/2016 → 27/10/2016
Beijing, China
Activity: Talks and presentations › Conference presentations

C-accounting and the role of LCA in waste management
Thomas Højlund Christensen (Keynote speaker)
Department of Environmental Engineering
Atmospheric Environment
Water Technologies
Documents:
16 ICWMT Beijing T H Christensen

Related event
The 11th International Conference on Waste Management and Technology
21/10/2016 → 24/10/2016
Beijing, China
Activity: Talks and presentations › Conference presentations

IWA World Water Congress & Exhibition
Period: 11 Oct 2016
Martin Rygaard (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Life Cycle Assessment Of Cloudburst Management Plans In Adaptation To Climate Change In Copenhagen, Denmark

Related event
IWA World Water Congress & Exhibition: Shaping Our Water Future
09/10/2016 → 14/10/2016
Brisbane, Australia
Activity: Talks and presentations › Conference presentations

Referee panel member (External organisation)
Teis Nørgaard Mikkelsen (Member)
Department of Environmental Engineering
Atmospheric Environment

Description
Assessment of proposals submitted to the call "NOK 40 million for climate research projects within an open thematic framework"
Member of panel for assessment terrestrial ecosystems

Body type: The Research Council of Norway
Degree of recognition: International

Related external organisation

Referee panel member
Activity: Membership › Membership in review committee

Soil and Plant Contamination - Modelling and Simulation of Processes
Stefan Trapp (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry
Documents:
program_04102016_mk_rja

Related event

International Symposium on Persistent Toxic Substances - ISPTS
11/10/2016 → 14/10/2016
Leipzig, Germany
Activity: Talks and presentations › Conference presentations

IWA World Water Congress & Exhibition
Period: 10 Oct 2016
Martin Rygaard (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
GISMOWA - GIS Assisted Monitoring Of Drinking Water Quality

Related event

IWA World Water Congress & Exhibition: Shaping Our Water Future
09/10/2016 → 14/10/2016
Brisbane, Australia
Activity: Talks and presentations › Conference presentations

International Society of Exposure Science
Philipp Mayer (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry

Related event

International Society of Exposure Science 2016: 26th Annual Meeting: Interdisciplinary Approaches to Health and the Environment
09/10/2016 → 13/10/2016
Utrecht, Netherlands
Activity: Talks and presentations › Conference presentations

International Society of Exposure Science 26th Annual Meeting - ISES2016
Philipp Mayer (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry

Related event
International Society of Exposure Science 26th Annual Meeting - ISES2016
09/10/2016 → 13/10/2016
Utrecht, Netherlands
Activity: Talks and presentations › Conference presentations

IWA World Water Congress & Exhibition
Hans-Jørgen Albrechtsen (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Optimizing nitrification in biological rapid sand filters for drinking water production

Related event
IWA World Water Congress & Exhibition: Shaping Our Water Future
09/10/2016 → 14/10/2016
Brisbane, Australia
Activity: Talks and presentations › Conference presentations

IWA World Water Congress & Exhibition
Hans-Jørgen Albrechtsen (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Towards the development of an automated ATP measuring platform to monitor microbial quality of drinking water

Related event
IWA World Water Congress & Exhibition: Shaping Our Water Future
09/10/2016 → 14/10/2016
Brisbane, Australia
Activity: Talks and presentations › Conference presentations

International Conference of Phytotechnologies
Period: 28 Sep 2016
Lauge Peter Westergaard Clausen (Speaker)
Department of Environmental Engineering
Environmental Chemistry

Description
Oral presentation
Toxicity testing with the willow tree transpiration test
- 15 years of results

Related event
International Conference of Phytotechnologies: Toxicity testing with the willow tree transpiration test - 15 years of results
26/09/2016 → 29/09/2016
Hangzhou, China
Activity: Talks and presentations › Conference presentations

LCA – Life-Cycle-Assessment - modeling with an industrial waste example
Period: 27 Sep 2016 → 30 Sep 2016
Thomas Højlund Christensen (Invited speaker)
Department of Environmental Engineering
Atmospheric Environment
Water Technologies
Documents:
16 Crete Thomas Christensen Invited lecture

Related event
5th International Conference on Industrial and Hazardous waste management
27/09/2016 → 30/09/2016
Crete, Greece
Activity: Talks and presentations › Conference presentations

When is it produced, why is it produced and how to prevent nitrous oxide emissions? Main findings from a large nitrous oxide project in Denmark
Period: 27 Sep 2016
Marlene Mark Jensen (Invited speaker)
Department of Environmental Engineering
Water Technologies

Related event
Swedish Water & Waterwater Fair 2016: Leading Edge Wastewater Treatment
27/09/2016 → 27/10/2016
Jönköping, Sweden
Activity: Talks and presentations › Conference presentations

Advances in FACE and manipulation technique
Period: 26 Sep 2016 → 29 Sep 2016
Teis Nørgaard Mikkelsen (Speaker)
Department of Environmental Engineering
Atmospheric Environment

Related event
FACEing the future : food production and ecosystems under a changing climate
26/09/2016 → 29/09/2016
Giessen, Germany
Activity: Talks and presentations › Conference presentations

FACEing the future
Period: 26 Sep 2016 → 29 Sep 2016
Teis Nørgaard Mikkelsen (Chairman)
Department of Environmental Engineering
Atmospheric Environment

Description
Yields, food quality and phenotypes
Related event

FACEing the future: food production and ecosystems under a changing climate
26/09/2016 → 29/09/2016
Giessen, Germany
Activity: Attending an event › Participating in or organising a conference

Integration of freshwater impact in lifecycle assessment of three water supply technologies
Period: 21 Sep 2016
Ryle Nørskov Gejl (Speaker)
Department of Environmental Engineering
Urban Water Systems

Related event

22nd SETAC Europe LCA Case Study Symposium
20/09/2016 → 22/09/2016
Montpellier, France
Activity: Talks and presentations › Conference presentations

N2O Expert Meeting and Workshop
Period: 21 Sep 2016 → 22 Sep 2016
Carlos Domingo-Felez (Participant)
Department of Environmental Engineering
Water Technologies

Description
10 minutes presentation about current research on DTU-Miljø

N2O expert meeting and workshop held at the Ruhr-Universität Bochum on September 2016. Two days of presentations and discussions about analytical methods, full-scale measurement campaigns and modelling of biological N2O turnover

Related event

N2O Expert Meeting and Workshop
21/09/2016 → 22/09/2016
Bochum, Germany
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Chinese Academy of Sciences
Period: 5 Sep 2016 → 15 Dec 2016
Grith Martinsen (Visiting researcher)
Department of Environmental Engineering
Water Resources Engineering

Description
External SDC stay: External stay at Institute of Geography and Natural Resources Research at Chinese Academy of Sciences in Beijing, China

Teaching, field work, data collection and collaboration
Activity: Visiting an external institution › Visiting another research institution

Hydrology: SDC master course
Period: 5 Sep 2016 → 23 Sep 2016
Grith Martinsen (Lecturer)
Department of Environmental Engineering
Water Resources Engineering

**Description**
At the SDC master degree Water & Environment

**Teaching assistant**
Degree of recognition: Local

**Related event**

**Hydrology: SDC master course**
05/09/2016 → 23/09/2016
Denmark
Activity: Talks and presentations › Conference presentations

**MEWE and biofilms IWA specialist conference**
Period: 4 Sep 2016 → 7 Sep 2016
Jane Fowler (Organizer)
Department of Environmental Engineering
Water Technologies

**Description**
Vice chairperson

**Related event**

**MEWE and biofilms IWA specialist conference**
04/09/2016 → 07/09/2016
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

**EuroTech Postdoc seminar**
Period: 31 Aug 2016 → 2 Sep 2016
Agata Zarebska (Participant)
Department of Environmental Engineering
Water Technologies

**Description**
Intensive, highly interactive, and fun crash course in the soft skills underlying professional success for postdoctoral researchers from EuroTech Universities: - Selling your science and yourself! by Jen Rolfe (UK) - Global mindset and intercultural competence! by Christine McCarthy (DE) - Networking and career planning - how to use your network for your next career step! by Barbara Wagner (DE)

Participant

**Related event**

**EuroTech Postdoc seminar**
31/08/2016 → 02/09/2016
Munich, Germany
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**High-resolution rainfall time series for future climate**
Period: 30 Aug 2016
Hjalte Jomo Danielsen Sørup (Speaker)
Department of Environmental Engineering
Urban Water Systems

**Related event**
4th Nordic Conference on Climate Change Adaptation: From Research to Actions and Transformation
29/08/2016 → 31/08/2016
Bergen, Norway
Activity: Talks and presentations › Conference presentations

Environmental impacts of flood control measures in climate change adaptation strategies
Period: 29 Aug 2016
Sarah Brudler (Speaker)
Department of Environmental Engineering
Urban Water Systems

Related event
4th Nordic Conference on Climate Change Adaptation: From Research to Actions and Transformation
29/08/2016 → 31/08/2016
Bergen, Norway
Activity: Talks and presentations › Conference presentations

IOA-PAG International Conference
Waqas Akram Cheema (Speaker)
Department of Environmental Engineering
Water Technologies

Description
presented topic "Treatment of Swimming Pool Water with UV Followed by Ozone"
Degree of recognition: International

Related event
International Ozone Association Pan American Group: 2016 Annual Conference
28/08/2016 → 31/08/2016
Las Vegas, United States
Activity: Talks and presentations › Conference presentations

16th Nordic Filtration Symposium - Filtration for Circular Economy
Agata Zarebska (Speaker)
Department of Environmental Engineering
Water Technologies

Description
Oral presentation

Related event
16th Nordic Filtration Symposium - Filtration for Circular Economy
24/08/2016 → 26/08/2016
Lappeenranta, Finland
Activity: Talks and presentations › Conference presentations

ESA Earth Observation Summer School
Period: 1 Aug 2016 → 12 Aug 2016
Raphael Schneider (Participant)
Department of Environmental Engineering
Water Resources Engineering
Related event

**ESA Earth Observation Summer School**
01/08/2016 → 12/08/2016
Frascati, Italy
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Estimating mass discharge of contaminant plumes downstream of landfills: Benefits of geophysics**
Period: 26 Jul 2016
Nicola Balbarini (Guest lecturer)
Pradip Kumar Maurya (Guest lecturer)
Vinni Kampman Rønde (Guest lecturer)
Anders Vest Christiansen (Guest lecturer)
Poul Legstrup Bjerg (Guest lecturer)
Knud Erik Klint (Guest lecturer)
Philip John Binning (Guest lecturer)
Department of Environmental Engineering
Water Resources Engineering
Office for Study Programmes and Student Affairs

Related event

**Groundwater Quality Conference (GQ16)**
24/07/2016 → 28/07/2016
Shenzhen Kylin Villa, China
Activity: Talks and presentations › Conference presentations

**Groundwater Quality Conference (GQ16)**
Ursula S. McKnight (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
McKnight_GQ16_abstract

Related event

**The 9th IAHS Conference on Groundwater Quality**
Massimo Rolle (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Diffusion, Coulombic interactions and multicomponent ionic transport

Related event

**The 9th IAHS Conference on Groundwater Quality: Safeguarding Groundwater Quality in a Changing World**
24/07/2016 → 28/07/2016
Shenzhen, China
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
The 9th IAHS Conference on Groundwater Quality
Massimo Rolle (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Diffusive-dispersive mass transfer in the capillary fringe.............

Related event
The 9th IAHS Conference on Groundwater Quality: Safeguarding Groundwater Quality in a Changing World
24/07/2016 → 28/07/2016
Shenzhen, China
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The 9th IAHS Conference on Groundwater Quality
Nicola Balbarini (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Estimating mass discharge of contaminant plumes downstream of landfills............

Related event
The 9th IAHS Conference on Groundwater Quality: Safeguarding Groundwater Quality in a Changing World
24/07/2016 → 28/07/2016
Shenzhen, China
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The 9th IAHS Conference on Groundwater Quality
Mette Martina Broholm (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Integrated characterization of the development in natural attenuation.........

Related event
The 9th IAHS Conference on Groundwater Quality: Safeguarding Groundwater Quality in a Changing World
24/07/2016 → 28/07/2016
Shenzhen, China
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The 9th IAHS Conference on Groundwater Quality
Klaus Mosthaf (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Modeling contaminant plumes in fractured limestone aquifers

Related event
The 9th IAHS Conference on Groundwater Quality: Safeguarding Groundwater Quality in a Changing World
24/07/2016 → 28/07/2016
Shenzhen, China
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The 9th IAHS Conference on Groundwater Quality
Biao Jin (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Modeling position-specific isotope fractionation of organic..............

Related event

The 9th IAHS Conference on Groundwater Quality: Safeguarding Groundwater Quality in a Changing World
24/07/2016 → 28/07/2016
Shenzhen, China
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The 9th IAHS Conference on Groundwater Quality
Ursula S. McKnight (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Re-thinking stressor interactions - the role of groundwater...............}

Related event

The 9th IAHS Conference on Groundwater Quality: Safeguarding Groundwater Quality in a Changing World
24/07/2016 → 28/07/2016
Shenzhen, China
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The 9th IAHS Conference on Groundwater Quality
Poul Legstrup Bjerg (Invited speaker)
Department of Environmental Engineering
Water Resources Engineering

Related event

The 9th IAHS Conference on Groundwater Quality: Safeguarding Groundwater Quality in a Changing World
24/07/2016 → 28/07/2016
Shenzhen, China
Activity: Talks and presentations › Conference presentations

Who are the water innovators?
Period: 7 Jul 2016
Mariú Abritta Moro (Speaker)
Department of Environmental Engineering
Water Technologies
Department of Management Engineering
Technology and Innovation Management
Degree of recognition: International

Related event

16th International Schumpeter Society Conference
06/07/2016 → 08/07/2016
Montreal, Canada
Activity: Talks and presentations › Conference presentations

Accounting for multiple functions in environmental life cycle assessment of storm water management solutions
Period: 29 Jun 2016
Sarah Brudler (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Oral presentation

Related event

9th International Conference on Planning and Technologies for Sustainable Urban Water Management (NOVATECH)
28/06/2016 → 01/07/2016
Lyon, France
Activity: Talks and presentations › Conference presentations

Developing Fast and Reliable Flood Models
Period: 29 Jun 2016
Cecilie Thrysøe (Lecturer)
Department of Environmental Engineering
Urban Water Systems

Related event

9th International Conference on Planning and Technologies for Sustainable Urban Water Management (NOVATECH)
28/06/2016 → 01/07/2016
Lyon, France
Activity: Talks and presentations › Conference presentations

Sustainable flood risk management – What is sustainable?
Period: 29 Jun 2016
Hjalte Jomo Danielsen Sørup (Speaker)
Department of Environmental Engineering
Urban Water Systems

Related event

9th International Conference on Planning and Technologies for Sustainable Urban Water Management (NOVATECH)
28/06/2016 → 01/07/2016
Lyon, France
Activity: Talks and presentations › Conference presentations

An International Conference Linking Science and Policy
Poul Løgstrup Bjerg (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Abstract for SanFrancisco2016-pesticide

Related event

An International Conference Linking Science and Policy: Toward Sustainable Groundwater in Agriculture
28/06/2016 → 30/06/2016
San Francisco, United States
Activity: Attending an event › Participating in or organising a conference

8th INTERNATIONAL WATER & HEALTH SEMINAR
Kai Tang (Participant)
Department of Environmental Engineering
Water Technologies
Description
Polishing of pharmaceuticals in conventionally treated wastewater with intermittently fed Moving Bed Biofilm Reactors (MBBR)
Documents:
International water and health seminar (kaitang DTU)

Related event

8th INTERNATIONAL WATER & HEALTH SEMINAR
27/06/2016 → 29/06/2016
Cannes, France
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

European Conference on Plastics in Freshwater Environments
Sinja Rist (Participant)
Department of Environmental Engineering
Environmental Chemistry
Documents:
poster_sinja_rist

Related event

European Conference on Plastics in Freshwater Environments
21/06/2016 → 22/06/2016
Berlin, Germany
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Advanced Applications of Spectrophotometry and Surface Analysis
Period: 16 Jun 2016
Agata Zarebska (Participant)
Department of Environmental Engineering
Water Technologies

Related event

Advanced Applications of Spectrophotometry and Surface Analysis
16/06/2016 → 16/06/2016
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
University Consortium for Field-Focused Groundwater Contamination Research
Poul Løgstrup Bjerg (Participant)
Department of Environmental Engineering
Water Resources Engineering

Description

Related event

University Consortium for Field-Focused Groundwater Contamination Research: University of Guelph,
13/06/2016 → 15/06/2016
Ontario, Canada
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

natur & miljø 2016
Period: 8 Jun 2016
Poul Løgstrup Bjerg (Speaker)
Department of Environmental Engineering
Water Resources Engineering
Links:
http://www.naturomiljo2016.dk

Related event

natur & miljø 2016: Den store nationale konference for natur- og miljøområdet
08/06/2016 → 09/06/2016
Nyborg, Denmark
Activity: Talks and presentations › Conference presentations

12th International Conference on Renewable Resources and Biorefineries
Period: 30 May 2016 → 1 Jun 2016
Martina D’Este (Speaker)
Department of Environmental Engineering
Residual Resource Engineering

Related event

12th International Conference on Renewable Resources and Biorefineries
30/05/2016 → 01/06/2016
Ghent, Belgium
Activity: Talks and presentations › Conference presentations

Congressi Stefano Franscini
Period: 29 May 2016 → 3 Jun 2016
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry
Documents:
Sjoholm

Related event

Congressi Stefano Franscini
29/05/2016 → 03/06/2016
Ascona, Switzerland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**SETAC Europe 26th Annual Meeting**
Period: 22 May 2016 → 26 May 2016
Nanna B. Hartmann (Participant)
Department of Environmental Engineering
Environmental Chemistry
Documents:
SETAC_nanoplastics_FINAL_online

**Related event**
**SETAC Europe 26th Annual Meeting: Environmental contaminants from land to sea: continuities and interface in environmental toxicology and chemistry**
22/05/2016 → 26/05/2016
Nantes, France
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**SETAC Europe 26th Annual Meeting**
Period: 22 May 2016 → 26 May 2016
Nanna B. Hartmann (Participant)
Department of Environmental Engineering
Environmental Chemistry
Documents:
SETAC_Nantes_nanoplastics_final_clean

**Related event**
**SETAC Europe 26th Annual Meeting: Environmental contaminants from land to sea: continuities and interface in environmental toxicology and chemistry**
22/05/2016 → 26/05/2016
Nantes, France
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**SETAC Europe 26th Annual Meeting**
Period: 22 May 2016 → 26 May 2016
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry

**Related event**
**SETAC Europe 26th Annual Meeting: Environmental contaminants from land to sea: continuities and interface in environmental toxicology and chemistry**
22/05/2016 → 26/05/2016
Nantes, France
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**SETAC Europe 26th Annual Meeting**
Period: 22 May 2016 → 26 May 2016
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry

**Related event**
SETAC Europe 26th Annual Meeting: Environmental contaminants from land to sea: continuities and interface in environmental toxicology and chemistry
22/05/2016 → 26/05/2016
Nantes, France
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
22/05/2016 → 26/05/2016
Nantes, France
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**SETAC Europe 26th Annual Meeting**
Period: 22 May 2016 → 26 May 2016
Ursula S. McKnight (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
McKnight_Setac2016-abstract

Related event

**SETAC Europe 26th Annual Meeting: Environmental contaminants from land to sea: continuities and interface in environmental toxicology and chemistry**
22/05/2016 → 26/05/2016
Nantes, France
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**SETAC Europe 26th Annual Meeting**
Period: 22 May 2016 → 26 May 2016
Stefan Trapp (Speaker)
Department of Environmental Engineering
Environmental Chemistry
Documents:
SETAC abstract book, Nantes, France 2016

Related event

**SETAC Europe 26th Annual Meeting: Environmental contaminants from land to sea: continuities and interface in environmental toxicology and chemistry**
22/05/2016 → 26/05/2016
Nantes, France
Activity: Talks and presentations › Conference presentations

**SETAC Europe 26th Annual Meeting**
Period: 22 May 2016 → 26 May 2016
Sara Nørgaard Sørensen (Speaker)
Department of Environmental Engineering
Environmental Chemistry

Related event

**SETAC Europe 26th Annual Meeting: Environmental contaminants from land to sea: continuities and interface in environmental toxicology and chemistry**
22/05/2016 → 26/05/2016
Nantes, France
Activity: Talks and presentations › Conference presentations

**7th International Water Resources Management Conference of ICWRS**
Period: 18 May 2016 → 20 May 2016
Grith Martinsen (Participant)
Department of Environmental Engineering
Water Resources Engineering
Presented my poster at the poster session

Participated in IAHS conference in Bochum, Germany

**Related event**

*7th International Water Resources Management Conference of ICWRS: The spatial dimensions of water management - Redistribution of benefits and risks*

18/05/2016 → 20/05/2016  
Bochum, Germany

Activity: Attending an event › Participating in or organising a conference

**ESA Living Planet Symposium 2016**

**Period:** 12 May 2016

Raphael Schneider (Speaker)

Department of Environmental Engineering  
Water Resources Engineering

**Description**

Presenting the abstract “Combining Envisat and CryoSat-2 altimetry to inform hydrodynamic models” submitted to that conference

**Related event**

**ESA Living Planet Symposium 2016**

09/05/2016 → 13/05/2016  
Prague, Czech Republic

Activity: Talks and presentations › Conference presentations

**EU Climate Cafe meeting in Roskilde**

**Period:** 11 May 2016 → 13 May 2016

Teis Nørgaard Mikkelsen (Organizer)

Department of Environmental Engineering  
Atmospheric Environment

**Description**

Climate-CAFE is the acronym for “Climate Change Adaptability of cropping and Farming systems for Europe”. The project Climate-CAFE aims at assessing the « adaptive capacity » to climate change of Europeans arable cropping and farming systems, through the modelling and simulation of innovative strategies co-designed with actors. Started the 4th of February 2015, this project brings together under the coordination of Eric Justes (INRA Toulouse, UMR AGIR), 12 European research teams who met in Toulouse for the kick-off then. The second meeting is organized by Roskilde University, Denmark. The meeting is an opportunity to share and coordinate work in progress and to enforce work relations across the country teams during two and a half days of face to face contact and interaction

**EU Climate Cafe meeting in Roskilde**

**Related event**

**EU Climate Cafe meeting in Roskilde: Climate-CAFÉ 2nd meeting Roskilde**

11/05/2016 → 13/05/2016  
Roskilde, Denmark

Activity: Attending an event › Participating in or organising a conference

**EGU General Assembly 2016**

**Period:** 21 Apr 2016

Poul Løgstrup Bjerg (Speaker)

Department of Environmental Engineering  
Water Resources Engineering
Related event

EGU General Assembly 2016
17/04/2016 → 22/04/2016
Vienna, Austria
Activity: Talks and presentations › Conference presentations

EGU General Assembly 2016
Period: 21 Apr 2016
Antonio Delre (Speaker)
Department of Environmental Engineering
Residual Resource Engineering

Description
Oral presentation about greenhouse gas emission quantification from wastewater treatment plant

Participation at European Geosciences Union - General Assembly - Vienna 17-22 April, 2016 with an oral presentation and a poster presentation

Documents:
Delre_EGU2016-ERE3.7

Links:

Related event

EGU General Assembly 2016
17/04/2016 → 22/04/2016
Vienna, Austria
Activity: Talks and presentations › Conference presentations

Perturbing high-resolution precipitation time series to represent future climates
Period: 18 Apr 2016
Hjalte Jomo Danielsen Sarup (Speaker)
Department of Environmental Engineering
Urban Water Systems

Related event

EGU General Assembly 2016
17/04/2016 → 22/04/2016
Vienna, Austria
Activity: Talks and presentations › Conference presentations

European Geosciences Union General Assembly 2016
Period: 17 Apr 2016 → 22 Apr 2016
Ursula S. McKnight (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
EGU2016-11980

Related event
European Geosciences Union General Assembly 2016: European Geosciences Union General Assembly 2016
17/04/2016 → 22/04/2016
Vienna, Austria
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**ARTEK Event 2016 - International Conference**
Period: 12 Apr 2016 → 14 Apr 2016
Steffen Davidsen (Speaker)
Department of Environmental Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

**Related event**
**ARTEK Event 2016 – International Conference: Sanitation in Cold Climate Regions**
12/04/2016 → 14/04/2016
Sisimiut, Greenland
Activity: Talks and presentations › Conference presentations

**Where to direct modelling efforts for a faster road towards resource recovery?**
Period: 31 Mar 2016
Borja Valverde Pérez (Invited speaker)
Department of Environmental Engineering
Water Technologies

**Related event**
**5 th IWA/WEF Wastewater Treatment Modelling Seminar 2016: Where to direct modelling efforts for a faster road towards resource recovery?**
02/04/2016 → 06/04/2016
Annecy, France
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

**Advanced Materials Characterization**
Period: 30 Mar 2016
Agata Zarebska (Participant)
Department of Environmental Engineering
Water Technologies

**Related event**
**Advanced Materials Characterization**
30/03/2016 → 30/03/2016
Brøndby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**2nd Young Water Professionals Denmark Conference and Workshop**
Period: 10 Mar 2016
Kai Tang (Participant)
Department of Environmental Engineering
Water Technologies

**Description**
Influence of dissolved organic carbon on biodegradation of pharmaceuticals by suspended biofilms in wastewater
Documents:
YWPDK_2nd_conf_abstract (kaitang DTU)
Links:
http://ywp.dk/?page_id=784
2nd Young Water Professionals Denmark Conference and Workshop
10/03/2016 → 11/03/2016
Aarhus, Denmark
Activity: Attending an event › Participating in or organising a conference

DWF Gå-hjem-møde: Aktuelle forsknings- of innovationsinitiativer og calls på vandområdet
Period: 10 Mar 2016
Hans-Jørgen Albrechtsen (Speaker)
Department of Environmental Engineering
Urban Water Systems

Description
Opening speaker and chairman

MIKE POWERED BY DHI SEMINAR 2016
Period: 10 Mar 2016
Morten Borup (Invited speaker)
Department of Environmental Engineering
Urban Water Systems

Konstruktion og test af kunstige regnserier: hvad er godt og godt nok?
Period: 29 Feb 2016
Hjalte Jomo Danielsen Sørup (Speaker)
Ida Bülow Gregersen (Speaker)
Department of Environmental Engineering
Urban Water Systems

Reviewer for Grant Proposals, Bio-Based Industries Joint Undertaking (EU Horizon 2020) (External organisation)
Period: 22 Feb 2016 → 26 Feb 2016
Dimitar Borisov Karakashev (Participant)
Department of Environmental Engineering
Residual Resource Engineering
Degree of recognition: International
Related external organisation

Reviewer for Grant Proposals, Bio-Based Industries Joint Undertaking (EU Horizon 2020)
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

2016 IUVA World Congress
Period: 31 Jan 2016 → 3 Feb 2016
Waqs Akram Cheema (Speaker)
Department of Environmental Engineering
Water Technologies

Description
presented topic " Destruction of disinfection by products and their precursors in swimming pool water by combined UV treatment and ozonation"
Degree of recognition: International

Related event

2016 IUVA World Congress
31/01/2016 → 03/02/2016
vancouver, Canada
Activity: Talks and presentations › Conference presentations

Member of the Environmental, health and safety network at the Technical University of Denmark (Event)
Period: 2015 → …
Steffen Foss Hansen (Chairman)
Department of Environmental Engineering
Environmental Chemistry
Degree of recognition: Local

Related event

Member of the Environmental, health and safety network at the Technical University of Denmark
05/01/2015 → …
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

DTU Sustain 2015
Period: 17 Dec 2015
Steffen Foss Hansen (Organizer)
Department of Environmental Engineering
Environmental Chemistry
Documents:
sustain2015abstracts
Links:
http://www.sustain.dtu.dk/

Related event

DTU Sustain 2015
17/12/2015 → …
Activity: Attending an event › Participating in or organising a conference

DTU Sustain Conference 2015
Period: 17 Dec 2015
Martina D’Este (Participant)
Department of Environmental Engineering
Residual Resource Engineering

**Description**
Poster presentation

**Related event**

**DTU Sustain Conference 2015**
17/12/2015 → 17/12/2015
Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Department of Environmental Engineering
Residual Resource Engineering
Documents:
Bisinella_Sustain2015_abstract

**Related event**

**DTU Sustain Conference 2015**
Period: 17 Dec 2015
Valentina Bisinella (Speaker)

**The freshwater impact of Water Utilities**
Period: 17 Dec 2015
Ryle Nørskov Gejl (Speaker)

Department of Environmental Engineering
Urban Water Systems

**Related event**

**DTU Sustain 2015**
17/12/2015 → …
Activity: Talks and presentations › Conference presentations

**Application of microbial communities in environmental biotechnology: from wastewater treatment to resource recovery**
Period: 1 Dec 2015
Marlene Mark Jensen (Invited speaker)

Department of Environmental Engineering

**Related event**

**Application of microbial communities in environmental biotechnology: from wastewater treatment to resource recovery**
01/12/2015 → 01/12/2015
Copenhagen, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

**Frem mod det energineutrale vandselskab**
Period: 30 Nov 2015
Marlene Mark Jensen (Invited speaker)

Department of Environmental Engineering

**Description**
Frem mod det energineutrale vandselskab. Workshop arrangeret af Dansk Miljøteknologi, DANVA og Dansk Industri
Related event

Frem mod det energineutrale vandselskab
30/11/2015 → 30/11/2015
Skanderborg, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Micropol & Ecohazard 2015
Period: 25 Nov 2015
Fabio Polesel (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Oral presentation
Documents:
PLOSZ_WWTP_Removal_assessment_FINAL_FINAL

Related event

9th IWA Specialist Conference on Assessment and Control of Micropolutants and Hazardous Substances in Water
22/11/2015 → 25/12/2015
Singapore, Singapore
Activity: Talks and presentations › Conference presentations

Micropol & Ecohazard 2015
Period: 25 Nov 2015
Fabio Polesel (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Oral presentation
Documents:
MPOL-170-POLESEL_TORRESI_Abstract_Revised

Related event

9th IWA Specialist Conference on Assessment and Control of Micropolutants and Hazardous Substances in Water
22/11/2015 → 25/12/2015
Singapore, Singapore
Activity: Talks and presentations › Conference presentations

Micropol & Ecohazard 2015
Fabio Polesel (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Poster presentation
Documents:
MPOL165_Plant_uptake_Poster_A1_portrait_FINAL

Related event

9th IWA Specialist Conference on Assessment and Control of Micropolutants and Hazardous Substances in Water
22/11/2015 → 25/12/2015
Singapore, Singapore
Drikkevandsnedbør i rør og tanke - en kilde til bekymring  
Period: 17 Nov 2015  
Sarah Christine Boesgaard Christensen (Speaker)  
Department of Environmental Engineering  
Urban Water Engineering  
Documents:  
Sarah_C_B_Christensen_Praesentation_DANSKVAND_UPLOAD_WEB

Related event
Dansk Vand Konference 2015  
17/11/2015 → 18/11/2015  
Aarhus, Denmark  
Activity: Talks and presentations › Conference presentations

Tilsætning af spormetaller stimulerer nitrifikation i sandfiltre  
Period: 17 Nov 2015  
Hans-Jørgen Albrechtsen (Keynote speaker)  
Department of Environmental Engineering

Related event
Dansk Vand Konference 2015  
17/11/2015 → 18/11/2015  
Aarhus, Denmark  
Activity: Talks and presentations › Conference presentations

The freshwater impact of Water Utilities  
Period: 8 Nov 2015  
Ryle Nørskov Gejl (Speaker)  
Department of Environmental Engineering  
Urban Water Systems

Related event
Dansk Vand Konference 2015  
17/11/2015 → 18/11/2015  
Aarhus, Denmark  
Activity: Talks and presentations › Conference presentations

ATV Jord og Grundvand: Vandindvindingens påvirkning af ferskvandsressourcen - Water Footprint, vandbalance og miljøindikatorer  
Period: 5 Nov 2015  
Martin Rygaard (Organizer)  
Department of Environmental Engineering  
Urban Water Engineering  
Description  
Organizing ATV Jord og Grundvand seminar

Related event
ATV Jord og Grundvand: Vandindvindingens påvirkning af ferskvandsressourcen - Water Footprint, vandbalance og miljøindikatorer  
05/11/2015 → 05/11/2015  
Copenhagen, Denmark
**ATV Jord og Grundvand: Vandindvindingens påvirkning af ferskvandsressourcen - Water Footprint, vandbalance og miljøindikatorer**

*Period:* 5 Nov 2015

*Martin Rygaard* (Speaker)

*Department of Environmental Engineering*

*Urban Water Engineering*

**Description**

Water Footprint. Hvad er det? Hvordan kan det bruges i vandforsyningen?

**Related event**

*ATV Jord og Grundvand: Vandindvindingens påvirkning af ferskvandsressourcen - Water Footprint, vandbalance og miljøindikatorer*  
05/11/2015 → 05/11/2015  
Copenhagen, Denmark

**Amsterdam International Water Week 2015**

*Period:* 4 Nov 2015

*Martin Rygaard* (Participant)

*Department of Environmental Engineering*

*Urban Water Engineering*

**Description**

Participant in expert panel

Expert meeting on remineralization of drinking water

**Related event**

*Amsterdam International Water Week 2015: Remineralization Workshop*  
04/11/2015 → 04/11/2015  
Amsterdam, Netherlands

**Activity:** Attending an event › Participating in or organising workshops, courses, seminars etc.

**Optimal drinking water quality in a Danish context**

*Period:* 4 Nov 2015

*Martin Rygaard* (Invited speaker)

*Department of Environmental Engineering*

*Urban Water Engineering*

**Related event**

*Amsterdam International Water Week 2015: Remineralization Workshop*  
04/11/2015 → 04/11/2015  
Amsterdam, Netherlands

**Activity:** Talks and presentations › Conference presentations

**SETAC**

*Period:* 1 Nov 2015 → 5 Nov 2015

*Philipp Mayer* (Participant)

*Department of Environmental Engineering*

*Environmental Chemistry*
Description
173 Equilibrium sampling for a thermodynamic assessment of contaminated sediments
Documents:
173 Equilibrium sampling for a thermodynamic assessment of contaminated sediments
SETAC-SLC-Abstract-Book

Related event

SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

SETAC
Period: 1 Nov 2015 → 5 Nov 2015
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
WP139 Sorptive capacities of lipids determined by passive dosing of non-polar organic chemicals
Documents:
WP139 Sorptive capacities of lipids determined by passive dosing of non-polar organic chemicals
SETAC-SLC-Abstract-Book

Related event

SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

SETAC
Period: 1 Nov 2015 → 5 Nov 2015
Stine Nørgaard Schmidt (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
WP195 Effect of narcotics on membrane-bound mitochondrial processes in fish
Documents:
WP195 Effect of narcotics on membrane-bound mitochondrial processes in fish
SETAC-SLC-Abstract-Book

Related event

SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

SETAC
Period: 1 Nov 2015 → 5 Nov 2015
Stine Nørgaard Schmidt (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
WP135 Linking algal growth inhibition to chemical activity
Documents:
WP135 Linking algal growth inhibition to chemical activity
SETAC-SLC-Abstract-Book

Related event
SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

SETAC
Period: 1 Nov 2015 → 5 Nov 2015
Stefan Trapp (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
84 The Role of Dissipation Processes in Plants for Modeling Bioaccumulation
Documents:
84 The Role of Dissipation Processes in Plants for Modeling Bioaccumulation
SETAC-SLC-Abstract-Book

Related event
SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

SETAC
Period: 1 Nov 2015 → 5 Nov 2015
Nanna B. Hartmann (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
RP033 Dissolution of Metal Nanoparticles: Methods for Determining the Contributions to Nanoparticle Toxicity
Documents:
RP033 Dissolution of Metal Nanoparticles - Methods for Determining the Contributions to Nanoparticle Toxicity
SETAC-SLC-Abstract-Book

Related event
SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

SETAC
Period: 1 Nov 2015 → 5 Nov 2015
Nanna B. Hartmann (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
WP086 Evaluation of methods to quantify dissolution of metal nanomaterials
Hydrophobic organic contaminants (HOCs) reaching the aquatic environment are largely stored in sediments. The risk of contaminated sediments is challenging to assess since traditional exhaustive extraction methods yield total HOC concentrations, whereas freely dissolved concentrations (C\text{free}) govern diffusive uptake and partitioning. Equilibrium sampling of sediment was introduced 15 years ago to measure C\text{free}, and it has since developed into a straightforward, precise and sensitive approach for determining C\text{free} and other exposure parameters that allow for thermodynamic assessment of polluted sediments. Glass jars with µm-thin silicone coatings on the inner walls can be used for ex situ equilibration while a device housing several silicone-coated fibers can be used for in situ equilibration. In both cases, parallel sampling with varying silicone thicknesses can be applied to confirm valid equilibrium sampling (method incorporated QA/QC). The measured equilibrium concentrations in silicone (CSil) can then be divided by silicone/water partition ratios to yield C\text{free}. CSil can also be compared to CSil from silicone equilibrated with biota in order to determine the equilibrium status of the biota relative to the sediment. Furthermore, concentrations in lipid at thermodynamic equilibrium with sediment (Clip?Sed) can be calculated via lipid/silicone partition ratios CSil × KLip:Sil, which has been done in studies with limnic, river and marine sediments. The data can then be compared to lipid-normalized concentrations in aquatic organisms or to regulatory thresholds. Finally, CSil can also be converted into chemical activities (a), which express the energetic level of the chemicals, drive several spontaneous processes and are well linked to the potential for baseline (mixture) toxicity. This overview lecture will focus at the latest developments in equilibrium sampling concepts and methods. Further, we will explain how these approaches can provide a new basis for a thermodynamic assessment of polluted sediments.

Links:
Poster
Authors: Lucia Vergauwen, Stine Schmidt, Ellen Michiels, Evelyn Stinckens, Walid Maho, Ronny Blust, Adrian Covaci, Philipp Mayer, Dries Knapen
Titel: Effect of narcotics on membrane-bound mitochondrial processes in fish

Around 70% of industrial chemicals are hydrophobic compounds which are assumed to elicit toxicity through narcosis by accumulating in membranes and disrupting membrane integrity and function. Although narcosis has been recognized as an important toxicity mechanism for decades, ecotoxicological research has been mostly limited to the development of quantitative structure activity relations (QSARs) to predict toxicity, resulting in insufficient understanding of the exact mechanisms involved. In this study we investigate specific aspects of the mechanism of narcosis in fish using both alternative in vivo (zebrafish embryo) and in vitro tests. We applied a passive dosing method to expose zebrafish embryos up to 5 days post fertilization to linear dilution series of a set of non-polar narcotics (phenanthrene and three chlorobenzene structure analogues). In addition to increasing mortality, we observed decreasing growth, heart rate and motility with increasing exposure concentration of all narcotics, consistent with the general assumption of reduced cardiorespiratory function. At the cellular level, the cell membrane is expected to be the first target of narcotics. Since the mitochondrial and endoplasmic reticulum membrane are known to closely interact with the cell membrane, we hypothesize that narcotics can be further partitioned into these organelle membranes where they can disrupt essential membrane-bound processes. The electron transport chain (ETC) is an example of a crucial mitochondrial membrane-bound process and is therefore a potential target. We found that in zebrafish embryos ETC activity was increased at low exposure concentrations, suggesting a compensatory response, while it decreased when exposure concentrations reached levels causing reduced motility, heart rate and eventually mortality. The effect of narcotic compounds on ETC activity was confirmed in vitro: we observed inhibition of the ETC after adding the compounds directly to a homogenate of control embryos. To further investigate effects on the energy production system, and to characterize the observed compensatory response, we are currently measuring the effect of narcotics on ATP synthase activity both in vivo and directly in vitro. Although narcosis is commonly considered a non-specific mechanism of toxicity acting by membrane disruption in general, we illustrate how we can increase our understanding of narcosis by focussing on specific membrane types and membrane-bound processes.

Related event

SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

SETAC
Period: 1 Nov 2015 → 5 Nov 2015
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
and Stine Nørgaard Schmidt

Poster
Authors: Stine Schmidt, James Armitage, Jon Arnot, Philipp Mayer
Titel: Linking algal growth inhibition to chemical activity
Unitless chemical activity, expressing the energetic level of a compound relative to its energetic level in pure liquid [0-1], has proven useful to quantify the effective exposure to hydrophobic organic compounds through both aerial and aqueous media. Several studies have linked toxicity to chemical activity, as opposed to e.g. the total concentration. Baseline toxicity (narcosis) for neutral hydrophobic organic compounds has been shown to initiate in the narrow chemical activity range of 0.01 to 0.1. This presentation focuses on linking algal growth inhibition to chemical activity with the aims to (1) further challenge the current chemical activity range for baseline toxicity, and (2) extend the utilisation of the chemical activity concept across compounds and species. The first part of the presentation focuses on results from a recently published study, in which toxicity data for 39 non-polar liquids were applied to challenge the chemical activity range for baseline toxicity. For each compound, the effective activity (Ea50) was estimated as the ratio of the effective concentration (EC50) and water solubility. Of these ratios, 90% were within the expected chemical activity range of 0.01 to 0.1. This presentation focuses on linking algal growth inhibition to chemical activity with the aims to (1) further challenge the current chemical activity range for baseline toxicity, and (2) extend the utilisation of the chemical activity concept across compounds and species. The first part of the presentation focuses on results from a recently published study, in which toxicity data for 39 non-polar liquids were applied to challenge the chemical activity range for baseline toxicity. For each compound, the effective activity (Ea50) was estimated as the ratio of the effective concentration (EC50) and water solubility. Of these ratios, 90% were within the expected chemical activity range of 0.01 to 0.1. On a practical level, these findings suggest EC50 values for baseline toxicity to be at or above 1% of water solubility. On an environmental risk assessment level, predicted no-effect concentrations (PNECs) for baseline toxicity could even be set as a percentage of saturation, and this approach can easily be extended to baseline toxicity of mixtures. However, EC50 values well below 1% of saturation can still occur and indicate the potential for excess toxicity through a specific or reactive mode of action. The second part of the presentation focuses on extending the utilisation of the chemical activity concept. More specifically, the chemical activity concept is applied to a much larger range of algal toxicity data, including a wide range of solids and liquids, covering several expected modes of action and also several algal species. High-quality toxicity data are carefully selected from peer-
reviewed scientific literature and QSAR databases. This presentation shows how the chemical activity concept can be used to compare and combine toxicity data across compounds and species in order to characterize toxicity – and further how the concept can be used in environmental risk assessment.

Links:
https://www.researchgate.net/publication/264980441_Linking_algal_growth_inhibition_to_chemical_activity_Baseline_toxicity_required_1_of_saturation

Related event

SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

SETAC
Period: 1 Nov 2015 → 5 Nov 2015
Philipp Mayer (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
and Stine Nørgaard Schmidt

Poster
Sorptive capacities of lipids determined by passive dosing of non-polar organic chemicals
Authors: Annika Jahnke, Amelie Kierkegaard, Damien Bolinius, Philipp Mayer, Jan Holm bäck, Matthew MacLeod

Lipids often are considered the major partitioning phase for non-polar organic chemicals. What is referred to as "lipid", however, is a complex matrix consisting of a highly variable mixture of neutral ('storage') and polar ('membrane') lipids that usually is operationally defined by the extraction protocol. Furthermore, depending on an organism's fraction of lipids and the properties of a chemical, other sorptive phases (e.g. proteins) may be particularly important. The aim of the present study was to expand our previous studies of the sorptive capacities of pure storage lipids into other pure phases and more realistic media, i.e. extractable organic matter (EOM) obtained by lipid extraction of various biota samples. Our experimental protocol included: i) extraction of biota tissues; ii) passive dosing of replicates of each EOM sample with cyclic volatile methylsiloxanes (cVMS), chlorobenzenes and polychlorinated biphenyls via a common headspace over an olive oil donor phase to transfer the same chemical activity into the samples; iii) sampling of EOM and olive oil controls at different time points; iv) purge-and-trap extraction of the model chemicals onto ENV+ SPE cartridges, elution and GC/MS analysis; v) characterization of the lipid composition in all samples via NMR. Our experiments demonstrate that the sorptive capacities of the EOM samples do not differ significantly from the olive oil controls if the EOM consists of neutral lipids only. However, the EOM samples show small but statistically significant differences in their sorptive capacities for the (semi)volatile model chemicals if other components such as phosphatidylcholine (PC) and cholesterol are present in quantifiable amounts. Based on the lipid composition quantified by NMR and literature data for the chemicals' partition ratios between PC/water and storage lipid/water, we modeled the chemicals' partitioning into the EOM and compared the model results to the measured concentrations. The study provides a new basis for unravelling biomagnification, since an increase in concentration with trophic level can be divided into a sorption capacity effect and an increase in chemical activity.

Links:
https://www.researchgate.net/publication/279204513_Differences_between_Lipids_Extracted_from_Five_Species_Are_Not_Sufficient_To_ Explain_Biomagnification_of_Nonpolar_Organic_Chemicals

Related event

SETAC: Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting
01/11/2015 → 05/11/2015
Salt Lake City, Utah, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Foundational aspects of the concept of chemical activity
Philipp Mayer (Lecturer)
Department of Environmental Engineering
Environmental Chemistry

Documents:
2015 Foundational aspects of the concept of chemical activity
Final Workshop Programme. Snowbird, Utah 29-30 October 2015

Related event
ECETOC: Defining the role of chemical activity in environmental risk assessment within the context of mode of action: Practical guidance and advice
29/10/2015 → 30/10/2015
Snowbird Resort, Utah, United States
Activity: Talks and presentations › Conference presentations

Workshop on sensor technologies
Period: 29 Oct 2015
Sarah Christine Boesgaard Christensen (Speaker)
Department of Environmental Engineering

Related event
1st Water DTU Seminar
28/10/2015 → 29/10/2015
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

EFSA Food Focal Point
Period: 27 Oct 2015
Sarah Christine Boesgaard Christensen (Participant)
Department of Environmental Engineering
Urban Water Engineering

Description
Expert correspondent on drinking water quality

Related external organisation
European Food Safety Authority
Denmark
Activity: Other

The 60th Annual Midwest Groundwater Conference
Vinni Kampman Rønde (Participant)
Department of Environmental Engineering
Water Resources Engineering

Description
Devlin, J.F., Cremeans, M., Osorno, T., Rønde, V.K., McKnight, U.S., Bjerg, P. 2015
Point Measurements to Quantify Groundwater Discharge to a Stream, Grindsted, Denmark

Related event
The 60th Annual Midwest Groundwater Conference
13/10/2015 → 15/10/2015
Bentonville, Arkansas, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
Raphael M. G. Flavigny (External organisation)
Period: 12 Oct 2015
Henrik Rasmus Andersen (Participant)
Department of Environmental Engineering
Urban Water Engineering

Description
A Novel Aerobic Process for Carbon and Nitrogen Removal from Wastewater using a Biofilm with Passive Aeration

PhD committee for Raphael M. G. Flavigny at Murdoch University
Degree of recognition: International

Related external organisation

Raphael M. G. Flavigny
Murdoch University, Australia
Activity: Membership › Membership in review committee

Risikofaktorer i spildevand og sygdomsrisiko ved oversvømmelser
Period: 5 Oct 2015
Hans-Jørgen Albrechtsen (Invited speaker)
Department of Environmental Engineering

Related event

Sygdomsrisiko ved oversvømmelser og skybrudssikring
05/10/2015 → 05/10/2015
København, Denmark
Activity: Talks and presentations › Conference presentations

Sardinia 2015 - 15th International Waste Management and Landfill Symposium
Valentina Bisinella (Speaker)
Department of Environmental Engineering
Residual Resource Engineering

Related event

Sardinia 2015 - 15th International Waste Management and Landfill Symposium
05/10/2015 → 09/10/2015
Cagliari, Italy
Activity: Talks and presentations › Conference presentations

Biological rapid sand filters - optimizing nitrification
Period: 30 Sep 2015
Hans-Jørgen Albrechtsen (Keynote speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event

3rd NordicRAS Workshop on Recirculating Aquaculture Systems
30/09/2015 → 01/10/2015
Molde, Norway
Activity: Talks and presentations › Conference presentations

Aerobic TCE degradation of willows and four strains of the root colonizing bacteria B. cepacia
Period: 29 Sep 2015
Lauge Peter Westergaard Clausen (Speaker)
Department of Environmental Engineering
Environmental Chemistry

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Dialogmøde om disruptive teknologiers indflydelse på infrastrukturen
Period: 23 Sep 2015
Hans-Jørgen Albrechtsen (Panel member)
Department of Environmental Engineering
Urban Water Engineering

Related event
ATV Dialogmøde om disruptive teknologiers indflydelse på infrastrukturen
23/09/2015 → 23/09/2015
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

International Congress on Education, Innovation and Learning Technologies
Period: 21 Sep 2015 → 23 Sep 2015
Steffen Foss Hansen (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Oral presentation on New rooms for blended learning
Documents:
programa provisional ICEILT2015

Related event
International Congress on Education, Innovation and Learning Technologies
21/09/2015 → 23/09/2015
Granada, Spain, Spain
Activity: Attending an event › Participating in or organising a conference

International Congress on Education, Innovation and Learning Technologies
Period: 21 Sep 2015 → 23 Sep 2015
Lauge Peter Westergaard Clausen (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Oral presentation on New rooms for blended learning
Documents:
programa provisional ICEILT2015

Related event
International Congress on Education, Innovation and Learning Technologies
21/09/2015 → 23/09/2015
Granada, Spain, Spain
Activity: Attending an event › Participating in or organising a conference
International Congress on Education, Innovation and Learning Technologies  
Period: 21 Sep 2015 → 23 Sep 2015  
Steffen Foss Hansen (Speaker)  
Department of Environmental Engineering  
Environmental Chemistry  
Documents:  
01-09-2015 Hansen and Clausen 2015 Educating Future Environmental Engineers - Granada - SFH

Related event

International Congress on Education, Innovation and Learning Technologies  
21/09/2015 → 23/09/2015  
Granada, Spain, Spain  
Activity: Talks and presentations › Conference presentations

Robust on-line operation of integrated urban wastewater system – combining measurements, models and forecasts  
Period: 20 Sep 2015 → 23 Sep 2015  
Luca Vezzaro (Invited speaker)  
Department of Environmental Engineering  
Urban Water Engineering  
Description  
Keynote presentation at the 10th international conference on Urban Drainage Modelling (10UDM), Mont-Sainte-Anne, Quebec, Canada, 20-23 September 2015

Related external organisation

Unknown external organisation  
Activity: Talks and presentations › Conference presentations

Panel Debate: Sustainable Urban Transformation  
Period: 11 Sep 2015  
Hans-Jørgen Albrechtsen (Panel member)  
Department of Environmental Engineering  
Related event

Chinese Mayors Training Programme  
07/09/2015 → 11/09/2015  
Copenhagen, Denmark  
Activity: Talks and presentations › Conference presentations

Environmental Protection and Urban Water Systems  
Period: 10 Sep 2015  
Hans-Jørgen Albrechtsen (Invited speaker)  
Department of Environmental Engineering  
Related event

Chinese Mayors Training Programme  
07/09/2015 → 11/09/2015  
Copenhagen, Denmark  
Activity: Talks and presentations › Conference presentations

14th International Conference on Environmental Science and Technology  
Period: 3 Sep 2015 → 5 Sep 2015
Ravi Kumar Chhetri (Speaker)
Department of Environmental Engineering

Description
Combined Sewer Overflow Pretreatment with Chemical Coagulation and a Particle Settler for Improved Peracetic Acid Disinfection
Documents:
CEST2015_fullpaper_00921
Links:
http://cest.gnest.org/node/1

Related event
14th International Conference on Environmental Science and Technology: CEST2015
03/09/2015 → 05/09/2015
Rhodes, Greece
Activity: Talks and presentations › Conference presentations

Monica Garcia (Participant)
Department of Environmental Engineering

Water Resources Engineering

Description
Development of a global indicator of the restoration level of degraded ecosystems, to comply with the Target 15 of the Aichi Biodiversity targets from the Convention for Biological Diversity.

Body type: GEO-BON
Degree of recognition: International
Documents:
GBCI_Version1.2_low_Biodiversity_Index

Related external organisation
Development of Global Biodiversity Indicators (Group On Earth Observations Biodiversity Observation Network) GEO-BON
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

International Conference on Emerging Water Desalination Technologies in Municipal and Industrial Applications
Agata Zarebska (Speaker)
Department of Environmental Engineering

Urban Water Engineering

Description
Fouling characterization of FO biomimetic aquaporin membranes used for water recovery from municipal wastewater

Oral presentation
Links:

Related event
International Conference on Emerging Water Desalination Technologies in Municipal and Industrial Applications
28/08/2015 → 29/08/2015
San Diego, United States
Activity: Talks and presentations › Conference presentations

150 year jubilee for Environmental Engineering at DTU
Period: 27 Aug 2015
Vinni Kampman Rønde (Participant)
Department of Environmental Engineering
Water Resources Engineering

Description
Ursula S. McKnight Anne T. Sonne John F. Devlin Poul L. Bjerg
Documents:
2015-08-27 150 year jubilee_Vinni

Related event

150 year jubilee for Environmental Engineering at DTU
27/08/2015 → 27/08/2015
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

150 year jubilee for Environmental Engineering at DTU
Period: 27 Aug 2015
Mette Martina Broholm (Participant)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Broholm DTU Env jubilee

Related event

150 year jubilee for Environmental Engineering at DTU
27/08/2015 → 27/08/2015
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

150 year jubilee for Environmental Engineering at DTU
Period: 27 Aug 2015
Martin Rygaard (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
LCA as development and decision support tool to implement wastewater resource recovery

Related event

150 year jubilee for Environmental Engineering at DTU
27/08/2015 → 27/08/2015
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

150 year jubilee for Environmental Engineering at DTU
Period: 27 Aug 2015
Martin Rygaard (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Optimal drinking water quality - considerations of health, environment and aesthetics

Related event
150 year jubilee for Environmental Engineering at DTU
27/08/2015 → 27/08/2015
Kgs. Lyngby, Denmark
Activity: Other

150 year jubilee for Environmental Engineering at DTU
Period: 27 Aug 2015
Hans-Jørgen Albrechtsen (Chairman)
Department of Environmental Engineering

Description
Water in the City: Water Fit for Purpose: Seminar 7

Related event
150 year jubilee for Environmental Engineering at DTU
27/08/2015 → 27/08/2015
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

150 year jubilee for Environmental Engineering at DTU
Period: 27 Aug 2015
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Urban Water Systems: Safe and optimal water supply – Going beyond the adequate

Related event
150 year jubilee for Environmental Engineering at DTU
27/08/2015 → 27/08/2015
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Invertebrates in Water distribution systems
Period: 27 Aug 2015
Sarah Christine Boesgaard Christensen (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Oral presentation

Related event
150 year jubilee for Environmental Engineering at DTU
27/08/2015 → 27/08/2015
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Conference presentations
What is the right water quality for the given purpose?
Period: 27 Aug 2015
Hans-Jørgen Albrechtsen (Keynote speaker)
Department of Environmental Engineering

Related event
150 year jubilee for Environmental Engineering at DTU
27/08/2015 → 27/08/2015
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

IWA Specialized Conference: Biofilms in Drinking Water Systems: from Treatment to Tap
Period: 26 Aug 2015
Hans-Jørgen Albrechtsen (Organizer)
Department of Environmental Engineering
Description
Biological rapid sand filtration in drinking water treatment: Insights, controls, potentials, limitations: Roundtable discussion
As moderator giving a summary of the discussion.

Related event
IWA Specialized Conference: Biofilms in Drinking Water Systems: from Treatment to Tap
23/08/2015 → 26/08/2015
Arosa, Switzerland
Activity: Attending an event › Participating in or organising a conference

IWA Specialized Conference: Biofilms in Drinking Water Systems: from Treatment to Tap
Period: 26 Aug 2015
Hans-Jørgen Albrechtsen (Chairman)
Department of Environmental Engineering
Description
Biological rapid sand filtration in drinking water treatment: Insights, controls, potentials, limitations: Roundtable Discussion

Related event
IWA Specialized Conference: Biofilms in Drinking Water Systems: from Treatment to Tap
23/08/2015 → 26/08/2015
Arosa, Switzerland
Activity: Attending an event › Participating in or organising a conference

Measuring and enhancing process kinetics of rapid gravity filters
Period: 24 Aug 2015
Florian Benedikt Wagner (Invited speaker)
Department of Environmental Engineering
Urban Water Systems
Description
Contribution to seminar "Biological rapid sand filtration for drinking water treatment: Update on insights, control, potentials, and limitations"

Related event
IWA Specialized Conference: Biofilms in Drinking Water Systems: from Treatment to Tap
23/08/2015 → 26/08/2015
Arosa, Switzerland
Activity: Talks and presentations › Conference presentations
Equilibrium Sampling of Hydrophobic Organic Contaminants in Sediment
Philipp Mayer (Lecturer)
Department of Environmental Engineering
Environmental Chemistry
Documents:
Short intro guide on How to use the VidyoRoom Video Conference System at ENV

Related event

250th American Chemical Society National Meeting
16/08/2015 → 20/08/2015
Boston, United States
Activity: Talks and presentations › Conference presentations

4th Summer School on Data Assimilation
Period: 20 Jul 2015 → 31 Jul 2015
Raphael Schneider (Participant)
Department of Environmental Engineering
Water Resources Engineering

Related event

4th Summer School on Data Assimilation: Summer School on Data Assimilation and its applications in Oceanography, Hydrology, Risk & Safety and Reservoir Engineering
20/07/2015 → 31/07/2015
Brasov, Romania
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

8th Conference of the International Society for Industrial Ecology
Period: 10 Jul 2015
Martin Rygaard (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Life cycle assessment as decision support tool in early stage development of a new technology for wastewater resource recovery

Related event

8th Conference of the International Society for Industrial Ecology
07/07/2015 → 10/07/2015
Guildford, United Kingdom
Activity: Talks and presentations › Conference presentations

Seminar
Period: 10 Jul 2015
Arnaud Dechesne (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Spatial heterogeneity & spatial dynamic of soil bacteria: what importance?

Related event
8th Conference of the International Society for Industrial Ecology
 Period: 7 Jul 2015 → 10 Jul 2015
 Anders Damgaard (Participant)
 Department of Environmental Engineering
 Residual Resource Engineering

Description
8th Conference of the International Society for Industrial Ecology

Related event
8th Conference of the International Society for Industrial Ecology
07/07/2015 → 10/07/2015
Guildford, United Kingdom
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The role of biochar in achieving carbon neutral bioenergy systems
Period: 7 Jul 2015 → 10 Jul 2015
Koldo Saez de Bikuna Salinas (Lecturer)
Department of Environmental Engineering
Atmospheric Environment

Description
In dedicated bioenergy systems, indirect land use changes may put in risk the sustainability of these renewable energy sources. Gasification can play a key role in bringing carbon neutrality through permanent C sequestration of stable biochar when this is use as soil amendment in the fields where the energy crops are cultivated. The importance of considering the background system development over time is highlighted, since it will affect the substituted energy sources. This should be an additional aspect to consider when performing life cycle assessments of dedicated bioenergy systems.

Documents:
The role of biochar in achieving carbon neutral bioenergy systems_ISIE_final

Related event
8th Conference of the International Society for Industrial Ecology
07/07/2015 → 10/07/2015
Guildford, United Kingdom
Activity: Talks and presentations › Conference presentations

Review of proposal for Czech Science Foundation. (External organisation)
Period: 4 Jul 2015
Henrik Rasmus Andersen (Member)
Urban Water Engineering
Department of Environmental Engineering
Degree of recognition: International

Related external organisation
Review of proposal for Czech Science Foundation.
Activity: Membership › Membership in review committee

22nd IOA World Congress and Exhibition
Period: 1 Jul 2015
Kamilla Marie Speht Kaarsholm (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Ozonation for degradation of pharmaceutical in hospital wastewater

Related event
22nd IOA World Congress and Exhibition : Ozone and Advanced Oxidation: Leading-edge science and technologies
28/06/2015 → 03/07/2015
Barcelona, Spain
Activity: Talks and presentations › Conference presentations

22nd IOA World Congress and Exhibition
Period: 29 Jun 2015
Kamilla Marie Speht Kaarsholm (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Effect of ozonation on THM formation in swimming pool water – laboratory study

Related event
Health Risks, Precaution and Innovation
Period: 24 Jun 2015
Steffen Foss Hansen (Speaker)
Department of Environmental Engineering
Environmental Chemistry
Documents:
ANSES 2015

Related event
Health Risks, Precaution and Innovation
24/06/2015 → 24/06/2015
Paris, France
Activity: Talks and presentations › Conference presentations

member of the “Environment and Global Changes” Panel, Fundação para a Ciência e a Tecnologia, I.P. (FCT), the Portuguese public funding agency for R&D (External organisation)
Period: 24 Jun 2015 → 26 Jun 2015
Dimitar Borisov Karakashev (Participant)
Department of Environmental Engineering
Residual Resource Engineering

Description
Degree of recognition: International

Related external organisation
member of the “Environment and Global Changes” Panel, Fundação para a Ciência e a Tecnologia, I.P. (FCT), the Portuguese public funding agency for R&D
Tekboost sparringsdag  
Period: 24 Jun 2015  
Henrik Rasmus Andersen (Consultant)  
Department of Environmental Engineering  

Description  
Deltager som match til firmaet O3Nordic  
Deltager som match til firmaet O3Nordic

Related external organisation  
Væksthus Hovedstadsregionen  
Fruebjergvej 3, 2100, København Ø, Denmark  
Activity: Public and private sector consultancy › Consultancy

Regeneration of brownfield mega sites  
Period: 10 Jun 2015  
Lauge Peter Westergaard Clausen (Other)  
Department of Environmental Engineering  
Environmental Chemistry  

Related external organisation  
Unknown external organisation  
Activity: Talks and presentations › Conference presentations

Assessing the risks posed by multiple stressors to water resources  
Period: 9 Jun 2015  
Poul Løgstrup Bjerg (Invited speaker)  
Department of Environmental Engineering  
Water Resources Engineering  
Links: http://www.aquaconsoil.org/

Related event  
13th International UFZ-Deltares Conference on Sustainable Use and Management of Soil, Sediment and Water Resources  
09/06/2015 → 12/06/2015  
Copenhagen, Denmark  
Activity: Talks and presentations › Conference presentations

Assessing the risks posed by multiple stressors to water resources  
Period: 9 Jun 2015 → 12 Jun 2015  
Poul Løgstrup Bjerg (Keynote speaker)  
Department of Environmental Engineering  
Water Resources Engineering  
Documents: Book of abstract - AquaConSoil conference

Related event  
13th International UFZ-Deltares Conference on Sustainable Use and Management of Soil, Sediment and Water Resources
Seaweed Symposium for Growth in the Blue Bio-economy
Period: 5 May 2015 → 7 May 2015
Martina D'Este (Participant)

Department of Environmental Engineering
Residual Resource Engineering

Related event

Seaweed Symposium for Growth in the Blue Bio-economy
05/05/2015 → 07/05/2015
Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Hans-Jørgen Albrechtsen (Invited speaker)
Department of Environmental Engineering

Related event

One Health Forum: Tværministerielt Forum
27/04/2015 → 27/04/2015
2860 Søborg, DTU FOOD, Denmark
Activity: Talks and presentations › Conference presentations

WP 4.2: Qualitative and quantitative methods for exposure assessment for nanomaterials
Period: 22 Apr 2015 → 23 Apr 2015
Biase Liguori (Speaker)

Department of Environmental Engineering
Environmental Chemistry

Description
Annual Meeting Danish Centre for Nanosafety

Sensitivity Analysis of NanoSafer: Assess the Relative Weight of the Determinant Factors for Exposure Assessment

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

ATV Jord og grundvand
Period: 14 Apr 2015
Martin Rygaard (Organizer)

Department of Environmental Engineering
Urban Water Engineering

Related event

ATV Jord og grundvand: Kvaliteten af grund- og drikkevand i forhold til sundhed og økonomi
14/04/2015 → …
Gentofte, Denmark
ATV Jord og grundvand
Period: 14 Apr 2015
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering
Documents:
Martin Rygaard ATV JG 150414

Related event
ATV Jord og grundvand: Kvaliteten af grund- og drikkevand i forhold til sundhed og økonomi
14/04/2015 → …
Gentofte, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

European Geosciences Union General Assembly 2015
Period: 14 Apr 2015
Raphael Schneider (Speaker)
Water Resources Engineering
Department of Environmental Engineering

Description
Oral presentation at EGU 2015, session HS6.3: Integrating flood and surface water remote sensing with hydrodynamic modelling: from local to global scales

Related event
European Geosciences Union General Assembly 2015
12/04/2015 → 17/04/2015
Vienna, Austria
Activity: Talks and presentations › Conference presentations

Drones and Hydraulics
Period: 8 Apr 2015 → 9 Apr 2015
Filippo Bandini (Speaker)
Department of Environmental Engineering
Water Resources Engineering

Description
Poster presentation
Evaluation of different water surface ranging technologies for lightweight UAVs

Related event
Drones and Hydraulics: At the Service of Water Professionals
08/04/2015 → 09/04/2015
Paris, France
Activity: Talks and presentations › Conference presentations

Theoretical aspects of ensemble data assimilation for the Earth system
Period: 5 Apr 2015 → 10 Apr 2015
Morten Borup (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

**Description**
5 days of presentations and discussions regarding ensemble data assimilation.

Les Houches workshop: "Theoretical aspects of ensemble data assimilation for the Earth system".

**Related event**

*Theoretical aspects of ensemble data assimilation for the Earth system*
05/04/2015 → 10/04/2015
Les Houches, France
Activity: Talks and presentations › Conference presentations

**6th International Conference Swimming Pool & Spa**
Henrik Rasmus Andersen (Participant)
Department of Environmental Engineering
Urban Water Engineering

**Description**
Scientific committee

**Related event**

**6th International Conference Swimming Pool & Spa**
17/03/2015 → 20/03/2015
Amsterdam, Netherlands
Activity: Attending an event › Participating in or organising a conference

**6th International Conference Swimming Pool & Spa**
Kamilla Marie Speht Kaarsholm (Speaker)
Department of Environmental Engineering
Urban Water Engineering

**Description**
Laboratory studies on the effect of ozonation on THM formation in swimming pool water
Documents:
Hansen - ozonation 150318 final - pool&spa conference Amsterdam 2015
Links:
http://iwcconferences.com/swimming-pool-spa-conference/ (conference home page)

**Related event**

**6th International Conference Swimming Pool & Spa**
17/03/2015 → 20/03/2015
Amsterdam, Netherlands
Activity: Talks and presentations › Conference presentations

**Qatar National Research Fund (External organisation)**
Period: 27 Feb 2015
Henrik Rasmus Andersen (Member)
Urban Water Engineering
Department of Environmental Engineering

**Description**
Proposal review for National Priorities Research Program (NPRP).
Degree of recognition: International
Related external organisation

**Qatar National Research Fund**
Activity: Membership › Membership in review committee

**Miljøministeriets Vandtopmøde: Globale Udfordringer**
Period: 25 Feb 2015
Hans-Jørgen Albrechtsen (Invited speaker)
Department of Environmental Engineering

Related event

**Miljøministeriets Vandtopmøde**
25/02/2015 → 25/02/2015
Industriens Hus, København V, Denmark
Activity: Talks and presentations › Conference presentations

Alternatives to groundwater based water supply: what are the challenges and opportunities?
Period: 29 Jan 2015
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event

**9th Annual Danish Water Research Meeting 2015**
29/01/2015 → 29/01/2015
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Phosphorus addition can increase nitrification in biological rapid sand filters for drinking water treatment
Period: 29 Jan 2015
Florian Benedikt Wagner (Speaker)
Department of Environmental Engineering
Urban Water Systems

Related event

**9th Annual Danish Water Research Meeting 2015**
29/01/2015 → 29/01/2015
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

**15th International Symposium on Microbial Ecology**
Period: 2014
Uli Klümper (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Deep sequencing of soil transconjugal pools reveals unexpected phylogenetic diversity of bacteria receiving broad host range plasmids.

Oral presentation

Related event

**15th International Symposium on Microbial Ecology**
24/08/2014 → 29/08/2014
Seoul, Korea, Republic of
Activity: Talks and presentations › Conference presentations

**ESOF Marie Skłodowska-Curie actions Conference**
Period: 2014
Alejandro Palomo (Participant)
Department of Environmental Engineering
Urban Water Engineering

**Related event**

**ESOF Marie Skłodowska-Curie actions Conference**
19/06/2014 → 20/06/2014
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Examiner, Environmental Regulation and History, International Master of Science in Environmental Risk, Roskilde University**
Period: 2014 → …
Steffen Foss Hansen (External examiner)
Department of Environmental Engineering
Environmental Chemistry
Degree of recognition: Regional
Activity: Examinations and supervision › External examination

**Journal of Applied Phycology (Journal)**
Period: 2014 → …
Jonathan Myerson van Wagenen (Reviewer)
Department of Environmental Engineering
Residual Resource Engineering

**Description**
Journal of Applied Phycology

**Related journal**
Journal of Applied Phycology
0921-8971
Central database
Activity: Research › Peer review of manuscripts

**Nordic Environmental NUcleotide Network**
Period: 2014
Alejandro Palomo (Participant)
Department of Environmental Engineering
Urban Water Engineering

**Description**
Functional gene approach to study nitrifier diversity

**Related event**

**Nordic Environmental NUcleotide Network**
12/12/2014 → 14/12/2014
Helsinki, Finland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Steering group member of the Joint Nanotechnology Project CIEL, ECOS and Öko Institut (External organisation)
Steffen Foss Hansen (Chairman)
Department of Environmental Engineering
Environmental Chemistry
Degree of recognition: International
Links:

Related external organisation

Steering group member of the Joint Nanotechnology Project CIEL, ECOS and Öko Institut
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Alternative water supply and advanced water treatment
Period: 11 Dec 2014
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event
Årligt evalueringsmøde om tilsynsaftale med drikkevand
11/12/2014 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

International Water Association Young Water Professionals Denmark General Assembly
Period: 11 Dec 2014
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Alternative water supply options - it's not about history, it's about quality

Related event
International Water Association Young Water Professionals Denmark General Assembly
11/12/2014 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Controlling factors for nitrification in biological drinking water rapid sand filters: Nitrification and nutrients
Period: 2 Dec 2014
Florian Benedikt Wagner (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Oral contribution at Krüger A/S Water Supply Department - workshop on biological treatment

Related external organisation
**Workshop Evaluation Committee**

Period: 1 Dec 2014  
Monica Garcia (Invited speaker)  
Department of Environmental Engineering  
Water Resources Engineering  

**Description**  
Technical implications of adopting different methods of estimating evapotranspiration for index insurance purposes.


**Related event**

Workshop Evaluation Committee: Weather Risk Management in West Africa. Drought insurance with remote sensing  
01/12/2014 → 02/12/2014  
Rome, Italy  
Activity: Talks and presentations › Conference presentations

**SETAC Europe 20th LCA Case Study Symposium**

Period: 26 Nov 2014  
Martin Rygaard (Speaker)  
Department of Environmental Engineering  
Urban Water Engineering  

**Description**  
Platform presentation

**Related event**

SETAC Europe 20th LCA Case Study Symposium  
24/11/2014 → 26/11/2014  
Novi Sad, Serbia  
Activity: Talks and presentations › Conference presentations

**Conference on Energy and Environment for the Future**

Period: 25 Nov 2014  
Pernille Aabye Marker (Participant)  
Department of Environmental Engineering  
Water Resources Engineering  

**Description**  
Posterpræsentation

**Documents:**  
24nov2014_InnoFond_A1_portrait_v2

**Related event**

Conference on Energy and Environment for the Future: Sustainable energy for a fossil free society and environmentally friendly technologies  
Copenhagen, Denmark  
Activity: Attending an event › Participating in or organising a conference
Microbial water quality in clean water tanks following inspection and cleaning
Period: 24 Nov 2014
Florian Benedikt Wagner (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Oral presentation of poster at conference

Related event
2014 IWA World Water Congress & Exhibition
21/09/2014 → 26/09/2014
Lisbon, Portugal
Activity: Talks and presentations › Conference presentations

Dansk Vand Konference 2014
Period: 19 Nov 2014
Martin Rygaard (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Platform presentation
Optimering af vandforsyningens moniteringsstrategi ved hjælp af GIS-analyse

Related event
Dansk Vand Konference 2014
18/11/2014 → 19/11/2014
Århus, Denmark
Activity: Talks and presentations › Conference presentations

Phosphorus limitations of nitrification in biological sand filters for drinking water treatment – A study at 3 different scales
Period: 19 Nov 2014
Florian Benedikt Wagner (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Oral conference presentation in technical session.

Related event
AWWA Water Quality Technology Conference & Exposition
16/11/2014 → 20/11/2014
New Orleans, LA, United States
Activity: Talks and presentations › Conference presentations

Rensning af hospitalsspildevand.: Driftsresultater af første års drift med fixed-film teknologi
Period: 19 Nov 2014
Henrik Rasmus Andersen (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
20 min lecture given together with Kim Sundmark from Krüger.
Dette foredrag er knyttet til projektet MERMISS (30985).

Related event

Dansk Vand Konference 2014
18/11/2014 → 19/11/2014
Århus, Denmark
Activity: Talks and presentations › Conference presentations

Treatment of worm infested rapid sand filters
Period: 19 Nov 2014
Sarah Christine Boesgaard Christensen (Speaker)
Department of Environmental Engineering
Urban Water Engineering
Documents:
Christensen_Sarah_Ormebekæmpelse

Related event

Dansk Vand Konference 2014
18/11/2014 → 19/11/2014
Århus, Denmark
Activity: Talks and presentations › Conference presentations

HyGEM Workshop
Period: 17 Nov 2014
Pernille Aabye Marker (Speaker)
Department of Environmental Engineering
Water Resources Engineering
Documents:
HyGEM_workshop_17nov2014

Related event

HyGEM Workshop
17/11/2014 → …
Højbjerg, Denmark
Activity: Talks and presentations › Conference presentations

IP06 DesiCSO - Desinfektion af "Combined Sewer Overflow", CSO
Period: 11 Nov 2014
Henrik Rasmus Andersen (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Teaser on the project content.

Related event

Fremtidens klimarobuste by
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

The Danish Microbiological Society Annual Congress 2014
Period: 10 Nov 2014
Lasse Pedersen (Participant)
Department of Environmental Engineering

Description
Poster: Reducing diffusion limitation shifts the dominant nitrate reduction metabolism from incomplete denitrification to dissimilatory nitrate reduction to ammonium

Abstract

Related event
The Danish Microbiological Society Annual Congress 2014
10/11/2014 → …
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

New Marselisborg Wastewater Treatment Plant
Period: 30 Oct 2014
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Description
Presentation on "Water Symbiosis” in relation to future wastewater treatment in Denmark
Documents:
Martin Rygaard Vandsymbiose

Related event
New Marselisborg Wastewater Treatment Plant
30/10/2014 → …
Aarhus, Denmark
Activity: Talks and presentations › Conference presentations

Expert panel for Research Council of Norway (External organisation)
Teis Nørgaard Mikkelsen (Participant)
Department of Environmental Engineering
Atmospheric Environment

Description
Panel member Research Council of Norway (Projects on ecosystem effects )
Degree of recognition: International

Related external organisation
Expert panel for Research Council of Norway
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

IARU Sustainability Science Congress
Koldo Saez de Bikuna Salinas (Participant)
Department of Environmental Engineering
Atmospheric Environment

Description
Biotic Stocks Potential: an improved indicator for Land Use impact assessment? In line with the Performance Economy thinking, a focus shift from managing and measuring environmental flows to stocks is suggested for the case of Biotic Production Potential (BPP) within Land Use Impact assessment in LCA. The difference between BPP and Biotic Stocks Potential is illustrated with a study case, where the bias taken when looking at flows can be seen. The focus of most impact indicators within LCA on environmental flows is put into question here, opening a debate for a possible thinking
shift from flows to environmental stocks management.

Documents:
Poster_IARU_final

Related event

IARU Sustainability Science Congress
22/10/2014 → 24/10/2014
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

8th Intercontinental Landfill Research Symposium
Anders Damgaard (Participant)
Department of Environmental Engineering
Residual Resource Engineering

Description
ICLRS conference, Crystal River, Florida, USA
Documents:
Damgaard_ICLRS_Abstract_2014

Related event

8th Intercontinental Landfill Research Symposium
19/10/2014 → 22/10/2014
Crystal River, Florida, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

University of the Aegean
Henrik Rasmus Andersen (Visiting researcher)
Urban Water Engineering
Department of Environmental Engineering

Description
Research visit to University of the Aegean: WATERMICROPOL project

Visit to University of the Aegean with the purpose to co-supervise PhD projects, develop analytical methods and experimental methods for investigating degradation of micropollutants in wastewater treatment+anaerobic digestors and participate in the WATERMICROPOL project. Planning new projects.

University of the Aegean is the project leader on the WATERMICROPOL project. DTU-ENV exchange students and PhD candidates.
Activity: Visiting an external institution › Visiting another research institution

Optimise Workshop
Monica Garcia (Participant)
Department of Environmental Engineering
Water Resources Engineering

Description
Participation as a representative of Denmark (Member) in the workshop related to Cost action

Related event

Optimise Workshop
07/10/2014 → 10/10/2014
Milano, Italy
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Biogeochemical Interfaces in Soil**
Lasse Pedersen (Speaker)
Department of Environmental Engineering

**Description**
Oral presentation: Reducing diffusion limitation shifts the dominant nitrate reduction metabolism from incomplete denitrification to dissimilatory nitrate reduction to ammonium

**Related event**
**Biogeochemical Interfaces in Soil**
06/10/2014 → 10/12/2014
Leipzig, Germany
Activity: Talks and presentations › Conference presentations

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**International Workshop On Urban Pluvial Flood Modelling**
Period: 6 Oct 2014
Morten Borup (Participant)
Department of Environmental Engineering
Urban Water Engineering

**Related event**
**International Workshop On Urban Pluvial Flood Modelling**
06/10/2014 → …
Exeter, United Kingdom
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

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**Phytotoxicity of Sodium Fluoride and Uptake of Fluoride in Willow Trees**
Period: 2 Oct 2014
Lauge Peter Westergaard Clausen (Speaker)
Department of Environmental Engineering
Environmental Chemistry

**Related event**
**International Conference of Phytoremediation**
30/09/2014 → 02/10/2014
Haraklion, Greece
Activity: Talks and presentations › Conference presentations

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**Phosphorus Limitations in Rapid Sand Filters Studied with Different Packed Column Assays**
Period: 24 Sep 2014
Florian Benedikt Wagner (Speaker)
Department of Environmental Engineering
Urban Water Engineering

**Description**
Oral presentation of poster at conference.
Design of Chemical Disinfection of Combined Sewer Overflows (CSO) by Peracetic Acid & Performic Acids

Period: 23 Sep 2014

Henrik Rasmus Andersen (Speaker)

Department of Environmental Engineering
Urban Water Engineering

Description
We investigated the possibility of applying performic acid (PFA) and peracetic acid (PAA) for disinfection of combined sewer overflow (CSO) in existing CSO management infrastructures. The disinfection power of PFA and PAA towards Escherichia coli (E. coli) and Enterococcus were studied in batch-scale and pre-field experiments. In the batch-scale experiment, 2.5 mg•L-1 PAA removed approximately 4 log unit of E. coli and Enterococcus from CSO with a 360 min contact time. The removal of E. coli and Enterococcus from CSO was always around or above 3 log units using 2–4 mg•L-1 PFA; with a 20 min contact time in both batch-scale and pre-field experiments. There were no toxicological effect measured by Vibrio fischeri when CSO was disinfected with PFA, a slight toxic effect was observed on CSO disinfected with PAA.
**Konference Fremtidens Drikkevand**

**Period:** 11 Sep 2014

Mathilde Jørgensen Hedegaard (Participant)

Department of Environmental Engineering

Urban Water Engineering

Documents:

Konference Fremtidens Drikkevand

**Related event**

**konference fremtidens drikkevand**

11/09/2014 → …

København V, Denmark

Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**IBBA Methane emission workshop**

**Period:** 4 Sep 2014

Antonio Delre (Speaker)

Department of Environmental Engineering

Residual Resource Engineering

**Description**

Presentation about "Full-scale quantification of methane (CH4) emission from wastewater treatment plants and biogas facilities" Presentation and Abstract can be found in "Links" section.

Inter Baltic Biogas Arena (IBBA) - Methane emission workshop

The biogas technology pursues the objective to produce methane as a renewable energy source. but it also has a strong effect on the climate change due to its global warming potential of 25. In this regard, the reliable measurement of stationary and diffuse emission sources are important. In the past years, numerous efforts were made to estimate methane emissions from biogas plants. It is however important that results from different countries are comparable to be able to combine the data from the different countries and give a European description of the situation.

Links:

http://conference.sgc.se/?pg=1445795 (Workshop Program)


http://conference.sgc.se/ckfinder/userfiles/files/DelreDTU.pdf (Abstract of "Full-scale quantification of CH4 emissions from wastewater treatment plants and biogas facilities".)

**Related event**

**IBBA Methane emission workshop**

04/09/2014 → …

Kiel, Germany

Activity: Talks and presentations › Conference presentations

**Water pricing and sustainable water management in Northern China**

**Period:** 29 Aug 2014

Claus Davidsen (Invited speaker)

Department of Environmental Engineering

Water Resources Engineering

**Description**
Presentation for a Chinese delegation lead by Vice Minister Zhang Ye from the Office of South-to-North Water Diversion Project Commission of the State Council. The presentation was given at the Ministry of Environment, Copenhagen and was organized by the China-EU Water Platform.

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

2nd International Conference on Algal Biorefinery
Martina D’Este (Speaker)
Department of Environmental Engineering
Residual Resource Engineering

Related event

2nd International Conference on Algal Biorefinery: A potential source of food, feed, biochemicals, biofuels and biofertilizers
27/08/2014 → 29/08/2014
Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

Mixotrophy or Cyclic Autotrophy/heterotrophy for Microalgal Cultivation on Media Containing Organic Carbon
Period: 27 Aug 2014
Jonathan Myerson van Wagenaen (Lecturer)
Department of Environmental Engineering
Residual Resource Engineering

Related event

Mixotrophy or Cyclic Autotrophy/heterotrophy for Microalgal Cultivation on Media Containing Organic Carbon
27/08/2014 → 29/08/2014
Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

Aberdeen Catchment Science Summer School
Raphael Schneider (Participant)
Department of Environmental Engineering
Water Resources Engineering

Related event

Aberdeen Catchment Science Summer School
17/08/2014 → 22/08/2014
Aberdeen, United Kingdom
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

International Conference of Phytoremediation of Polluted Soils
Lauge Peter Westergaard Clausen (Speaker)
Department of Environmental Engineering
Environmental Chemistry

Description
Oral presentation

Phytotoxicity of Sodium Fluoride and Uptake of Fluoride in Willow Trees
Related event

International Conference of Phytoremediation of Polluted Soils
29/07/2014 → 30/07/2014
Vigo, Spain
Activity: Talks and presentations › Conference presentations

Phytotoxicity of Sodium Fluoride and Uptake of Fluoride in Willow Trees

Related event

International Conference of Phytoremediation of Polluted Soils
29/07/2014 → 30/07/2014
Vigo, Spain
Activity: Talks and presentations › Conference presentations

Global Energy and Carbon Cycles
Monica Garcia (Participant)
Department of Environmental Engineering
Water Resources Engineering
Links:
http://gewex.org/2014conf/info.html

Related event

Global Energy and Carbon Cycles
14/07/2014 → 17/07/2014
Den Haage, Netherlands
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

IASC-ERS Summer School on Compositional Data Analysis
Period: 7 Jul 2014
Maklawe Essonanawe Edjabou (Participant)
Department of Environmental Engineering
Residual Resource Engineering
Links:
http://ima.udg.edu/Recerca/EIO/pages/AnunciCoDACourse2014_IASC.pdf

Related event

IASC-ERS Summer School on Compositional Data Analysis
07/07/2014 → 11/07/2014
Girona, Spain
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
2014 AGU Fall Meeting
Klaus Mosthaf (Participant)
Department of Environmental Engineering
Water Resources Engineering

Description
Comparison of different modeling approaches to simulate contaminant transport in a fractured limestone aquifer

Related event

2014 AGU Fall Meeting
15/12/2014 → 19/12/2014
San Francisco, CA, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Estimating household food waste in Denmark: Case study of single family households
Period: 26 Jun 2014
Maklawe Essonanawe Edjabou (Speaker)
Department of Environmental Engineering
Residual Resource Engineering
Links:
http://orbit2014.com/?mod=mainpage&cla=mainpage&fun=access&temp=startpage

Related event

9th International Conference ORBIT 2014: New Challenges, New Responses in 21st Century
26/06/2014 → 28/06/2014
Gödöllő, Hungary
Activity: Talks and presentations › Conference presentations

Mixotrophy or Cyclic Autotrophy/Heterotrophy for Microalgal Cultivation on Media Containing Organic Carbon?
Period: 23 Jun 2014
Jonathan Myerson van Wagenen (Lecturer)
Department of Environmental Engineering
Residual Resource Engineering

Related event

5th Congress of the International Society for Applied Phycology
22/06/2014 → 27/06/2014
Sydney, Australia
Activity: Talks and presentations › Conference presentations

Euroscience Open Forum 2014
Period: 21 Jun 2014 → 24 Jun 2014
Denisa Cupi (Speaker)
Department of Environmental Engineering
Environmental Chemistry

Description
EURODOC: the views of a young scientist, what are the challenges? What does EURODOC offer?

Life after a PhD: How professional career advisers support researchers in Europe.

Related event
ESOF Marie Skłodowska-Curie actions Conference
Period: 19 Jun 2014
Vaibhav Diwan (Speaker)
Urban Water Engineering
Department of Environmental Engineering

Description
Poster presentation of the PhD projects under the MERMAID-ITN at DTU.

Related event
ESOF Marie Skłodowska-Curie actions Conference
19/06/2014 → 20/06/2014
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

ICCA-LRI and JRC Workshop 2014
Period: 17 Jun 2014
Philipp Mayer (Invited speaker)
Environmental Chemistry

Description
Assessing toxicity with partitioning based methods and chemical activity.
Philipp Mayer.

Related event
ICCA-LRI and JRC Workshop 2014
17/06/2014 → 18/06/2014
Lugano, Switzerland
Activity: Talks and presentations › Conference presentations

Using stochastic dynamic programming to optimize use of surface water and groundwater in China
Period: 11 Jun 2014
Claus Davidsen (Invited speaker)
Water Resources Engineering

Description
Oral presentation of PhD project at COWI, division on "Economics, Management and Planning".

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Bologna IAHS 2014
Period: 4 Jun 2014
Claus Davidsen (Speaker)
Department of Environmental Engineering
Water Resources Engineering

Related event

04/06/2014 → 06/06/2014
Bologna, Italy
Activity: Talks and presentations › Conference presentations

**Functional gene approach to study nitrifier diversity**
Period: 13 May 2014
Vaibhav Diwan (Speaker)
Department of Environmental Engineering
Urban Water Engineering

**Description**
The talk consisted of past, present and future work in relation to using the functional gene approach to study nitrifier diversity.

Co-authors: Sanin Musovic (PostDoc) and Alejandro Palomo González (PhD student)

Related event

Nordic Environmental NUcleotide Network
12/12/2014 → 14/12/2014
Helsinki, Finland
Activity: Talks and presentations › Conference presentations

SETAC Europe 24th Annual Meeting
Period: 11 May 2014 → 15 May 2014
Koldo Saez de Bikuna Salinas (Participant)
Department of Environmental Engineering
Atmospheric Environment

**Description**
Given that land is a limited resource, the possibility of establishing an absolute scale is suggested as normalization in Land Use impact assessments in LCA. The case of Biotic Production Potential and bioenergy is taken to illustrate the existence of a "Land Use Optimal Point". It is hypothesized that the problem of available land for bioenergy production can be solved through linear programming, by finding the perfect compromise between the fossil fuel displacement potential (through e.g. business-as-usual yield maximization) and carbon stock maximization (through e.g. forestry systems or reforestation programs). As a result, high yielding bioenergy crops (e.g. short rotation coppices) that displace carbon intensive energy sources (e.g. coal) may make sense from a land use perspective in a transitioning energy system. On the other hand, low performing bioenergy crops (e.g. rapeseed) substituting other energy sources may fall beyond the Land Use optimality frontier, meaning that a more efficient way of mitigating Global Warming would be reforestation for latter cases.

Documents:
Poster_SETAC_final

Related event

SETAC Europe 24th Annual Meeting
11/05/2014 → 15/05/2014
Basel, Switzerland
Activity: Attending an event › Participating in or organising a conference

European Geosciences Union General Assembly 2014
Period: 30 Apr 2014
Claus Davidsen (Speaker)
Department of Environmental Engineering
Water Resources Engineering

Related event

**European Geosciences Union General Assembly 2014**
27/04/2014 → 02/05/2014
Vienna, Austria
Activity: Talks and presentations › Conference presentations

**Kan den miljøteknologiske sektor levere?**
Period: 29 Apr 2014
Henrik Rasmus Andersen (Participant)
Department of Environmental Engineering
Urban Water Engineering

**Description**
Participation in InnoMT yearly meeting. InnoMT is a registered participant in the project. www.innoMT.dk.

Inno-MTs annual meeting.

Related event

**Kan den miljøteknologiske sektor levere?: Inno-MT's årskonference 2014**
29/04/2014 → 29/04/2014
Munkebo, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Swiss LCA Discussion Forum**
Period: 11 Apr 2014
Jakob Thaysen Rørbech (Invited speaker)
Department of Environmental Engineering
Residual Resource Engineering
Documents:
Speaker - abstract
Links:
http://www.lcaforum.ch/

Related event

**Swiss LCA Discussion Forum: Abiotic resources – New impact assessment approaches in view of resource efficiency and resource critically**
11/04/2014 → …
Zürich, Switzerland
Activity: Talks and presentations › Conference presentations

**Den kemiske strategi for et godt badevand**
Period: 10 Apr 2014
Kamilla Marie Speht Kaarsholm (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event

**Dansk Svømmebadsteknisk Forening - Årsmede 2014**
09/04/2014 → 10/04/2014
Denmark
Activity: Talks and presentations › Conference presentations
Site characterization and in-situ remediation in fractured geologic media contaminated by chlorinated solvents
Period: 28 Mar 2014
Mette Martina Broholm (Invited speaker)
Department of Environmental Engineering
Water Resources Engineering
Documents:
Site characterization and in-situ remediation in fractured geologic media contaminated by chlorinated solvents

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Informationsmøde: Rammerne for MUDP 2014
Period: 27 Mar 2014
Henrik Rasmus Andersen (Participant)
Department of Environmental Engineering
Urban Water Engineering

Related event

Informationsmøde: Rammerne for MUDP 2014
27/03/2014 → 27/03/2014
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

53rd Annual Meeting of Society of Toxicology and ToxExpo
Period: 24 Mar 2014 → 27 Mar 2014
Denisa Cupi (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Poster presentation
Documents:
Cupi Baun 2014 THE INFLUENCE OF UV LIGHT ON THE GENOTOXICITY OF ENGINEERED NANOPARTICLES

Related event

53rd Annual Meeting of Society of Toxicology and ToxExpo
24/03/2014 → 27/03/2014
Phoenix, AZ, United States
Activity: Attending an event › Participating in or organising a conference

University of the Aegean
Henrik Rasmus Andersen (Visiting researcher)
Urban Water Engineering

Description
Visit to University of the Aegean with the purpose to co-supervise PhD projects and participate in the WATERMICROPOL project. Planning new projects.

University of the Aegean is the project leader on the WATERMICROPOL project. DTU-ENV exchange students and PhD candidates.
**Effekt af pH på dannelsen af biprodukter ved desinfektion i svømmebade**  
Period: 5 Mar 2014  
Kamilla Marie Speht Kaarsholm (Invited speaker)  
Department of Environmental Engineering  
Urban Water Engineering

**Related event**  
Svømmehallkompetanse 2014  
05/03/2014 → 06/03/2014  
Hamar, Norway  
Activity: Talks and presentations › Conference presentations

**Klimatilpasning i offentligt privat samarbejde**  
Period: 5 Mar 2014  
Martin Rygaard (Invited speaker)  
Department of Environmental Engineering  
Urban Water Engineering

**Related event**  
Klimatilpasning i offentligt privat samarbejde: Forum for Offentligt Privat Samarbejde  
05/03/2014 → 05/03/2014  
Hellerup, Denmark  
Activity: Talks and presentations › Conference presentations

**Ozonbehandling til fjernelse af mikroforureningsstoffer i udløb fra renseanlæg**  
Period: 5 Mar 2014  
Henrik Rasmus Andersen (Invited speaker)  
Department of Environmental Engineering  
Urban Water Engineering  
Documents:  
Andersen_Ozon

**Related event**  
Miljøfremmede stoffer og næste generations spildevandsrensning: Innovationsnetværk for Miljøteknologi  
05/03/2014 → 05/03/2014  
Copenhagen, Denmark  
Activity: Talks and presentations › Conference presentations

**Pollution of water resources**  
Period: 2 Mar 2014  
Mathilde Jørgensen Hedegaard (Lecturer)  
Department of Environmental Engineering  
Urban Water Engineering

**Related event**  
Water water everywhere and not a drop to drink  
01/03/2014 → 02/03/2014  
Helsingør, Denmark  
Activity: Talks and presentations › Conference presentations
**Water water everywhere and not a drop to drink**

**Period:** 1 Mar 2014

Martin Rygaard (Invited speaker)

Department of Environmental Engineering

Urban Water Engineering

**Description**

Scientific and technological challenges and solutions.

**Related event**

**Water water everywhere and not a drop to drink**

01/03/2014 → 02/03/2014

Helsingør, Denmark

Activity: Talks and presentations › Conference presentations

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**International Seminar "Dynamic processes in capillary fringes"**

**Period:** 24 Feb 2014 → 25 Feb 2014

Arnaud Dechesne (Invited speaker)

Department of Environmental Engineering

Urban Water Engineering

**Description**

Microbial motion in the vadose zone.

**Documents:**

Flyer & schedule for the international DyCap meeting in Karlsruhe, Feb.2014

**Related event**

**International Seminar "Dynamic processes in capillary fringes"**

24/02/2014 → 25/02/2014

Karlsruhe, Germany

Activity: Talks and presentations › Conference presentations

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**Elsevier (Publisher)**

**Period:** 22 Feb 2014

Henrik Rasmus Andersen (Reviewer)

Department of Environmental Engineering

Urban Water Engineering

**Description**

Chemosphere

Review of manuscript.

**Related Publisher**

**Elsevier**

Netherlands

Local database

Activity: Research › Peer review of manuscripts

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**8th Annual Meeting of the Danish Water Research and Innovation Platform**

**Period:** 30 Jan 2014

Luca Locatelli (Speaker)

Department of Environmental Engineering

Urban Water Engineering
Oral presentation

Abstract submission and oral presentation

Documents:
Modelling the impact of implementing Water Sensitive Urban Design on at a catchment scale_template_modifiedVer1

Related event

8th Annual Meeting of the Danish Water Research and Innovation Platform
30/01/2014 → 30/01/2014
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Pesticidnedbrydning
Period: 22 Jan 2014
Mathilde Jørgensen Hedegaard (Lecturer)
Department of Environmental Engineering
Urban Water Engineering

Description
Oplæg om fjernelse af pesticider i sandfiltre
Documents:
DANVA temadag om biologiske sandfiltre

Related event

DANVA: Temadag om biologiske sandfiltre til drikkevandsbehandling
22/01/2014 → …
Skanderborg, Denmark
Activity: Talks and presentations › Conference presentations

Phosphorus limitations when ammonium removal is incomplete
Period: 22 Jan 2014
Florian Benedikt Wagner (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event

DANVA: Temadag om biologiske sandfiltre til drikkevandsbehandling
22/01/2014 → …
Skanderborg, Denmark
Activity: Talks and presentations › Conference presentations

Water resources management in Northern China
Period: 7 Jan 2014
Claus Davidsen (Lecturer)
Department of Environmental Engineering
Water Resources Engineering

Description
Oral presentation at ETH, Institute of Environmental Engineering, Zürich

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations
**Rudersdal Supply (External organisation)**
Period: 1 Jan 2014 → 31 Dec 2017
Erik Arvin (Participant)
Department of Environmental Engineering

**Description**
Rudersdal Supply manage water supply and wastewater for Rudersdal municipality

**Body type:** Limited company

**Related external organisation**
Rudersdal Supply
*Activity:* Membership › Board duties in companies, associations, or public organisations

**Research Council Norway (External organisation)**
Period: 2013 → 2014
Steffen Foss Hansen (Chairman)
Department of Environmental Engineering
Environmental Chemistry

**Description**
Assessor of Grant Applications related to NANO2021 Innovasjonsprosjekter i næringslivet innen nanoteknologi og avanserte materialer

**Degree of recognition:** International

**Related external organisation**
Research Council Norway
Norway
*Activity:* Membership › Membership in review committee

**Water quality and water treatment**
Period: 4 Dec 2013
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

**Related event**
HOFOR Temadag
04/12/2013 → 04/12/2013
Copenhagen, Denmark
*Activity:* Talks and presentations › Conference presentations

**Microbial growth in clean water tanks**
Period: 20 Nov 2013
Sarah Christine Boesgaard Christensen (Speaker)
Department of Environmental Engineering
Urban Water Engineering

**Related event**
Dansk Vand Konference 2013
19/11/2013 → 20/11/2013
Aarhus, Denmark
*Activity:* Talks and presentations › Conference presentations
Assessing the permissiveness of complex bacterial communities towards conjugal plasmids – A novel method

Period: 18 Nov 2013
Uli Klümper (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event

2013 Congress of The Danish Microbiological Society
18/11/2013 → 18/11/2013
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

SETAC North America 34th annual meeting
Period: 17 Nov 2013 → 21 Nov 2013
Sara Nørgaard Sørensen (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Co-author of poster
Documents:
Poster

Related event

SETAC North America 34th annual meeting
17/11/2013 → 21/11/2013
Nashville, TN, United States
Activity: Attending an event › Participating in or organising a conference

SETAC North America 34th annual meeting
Period: 17 Nov 2013 → 21 Nov 2013
Aiga Mackevica (Participant)
Department of Environmental Engineering
National Food Institute
Environmental Chemistry

Related event

SETAC North America 34th annual meeting
17/11/2013 → 21/11/2013
Nashville, TN, United States
Activity: Attending an event › Participating in or organising a conference

Bioresource Technology (Journal)
Period: 13 Nov 2013
Dimitar Borisov Karakashev (Reviewer)
Department of Environmental Engineering
Residual Resource Engineering

Related journal

Bioresource Technology
0960-8524
Bioresource Technology (Journal)
Period: 13 Nov 2013
Dimitar Borisov Karakashev (Reviewer)
Department of Environmental Engineering
Residual Resource Engineering

Related journal
Bioresource Technology
0960-8524

Related event
Tang og multitrofisk produktion
Period: 6 Nov 2013
Susan Løvstad Holdt (Invited speaker)
National Institute of Aquatic Resources
Department of Environmental Engineering
National Food Institute
Residual Resource Engineering

Related event
ATV Temamøde Marin akvakultur: Perspektiver og potentialer
06/11/2013 → 06/11/2013
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

Influence of the water louse, Asellus aquaticus, on bacterial survival in drinking water systems
Period: 5 Nov 2013
Sarah Christine Boesgaard Christensen (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event
AWWA Water Quality Technology Conference
03/11/2013 → 07/11/2013
Long Beach, CA, United States
Activity: Talks and presentations › Conference presentations

Nutrient limitations in drinking water rapid sand filters with incomplete ammonium removal
Period: 23 Oct 2013
Florian Benedikt Wagner (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event
**DWBiofilters Workshop Berlin**  
23/10/2013 → 24/10/2013  
Berlin, Germany  
Activity: Talks and presentations › Conference presentations

**IDA: Pesticidforskning - nyt om miljø, sundhed og regulering**  
Period: 30 Sep 2013  
Mathilde Jørgensen Hedegaard (Participant)  
Department of Environmental Engineering  
Urban Water Engineering  
Documents:  
Pesticidforskning - nyt om miljø, sundhed og regulering _ IDA

**Related event**

**IDA: Pesticidforskning - nyt om miljø, sundhed og regulering**  
30/09/2013 → …  
Odense, Denmark  
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Timbre Workshop and Field Sampling**  
Period: 17 Sep 2013 → 18 Sep 2013  
Lauge Peter Westergaard Clausen (Speaker)  
Department of Environmental Engineering  

**Description**  
Oral presentation.  
Phytoremediation of the former Soviet air-base at Szprotawa.  
Documents:  
Workshop__presentation

**Related event**

**Timbre Workshop and Field Sampling**  
17/09/2013 → 18/09/2013  
Szprotawa, Poland  
Activity: Talks and presentations › Conference presentations

**Timbre Workshop and Field Sampling**  
Period: 17 Sep 2013 → 18 Sep 2013  
Stefan Trapp (Speaker)  
Department of Environmental Engineering  
Environmental Chemistry  

**Description**  
Oral presentation. Phytoremediation - possibilities and perspectives  
Phytoremediation of the former Soviet air-base at Szprotawa  
Documents:  
Workshop__presentation

**Related event**

**Timbre Workshop and Field Sampling**  
17/09/2013 → 18/09/2013  
Szprotawa, Poland  
Activity: Talks and presentations › Conference presentations
Timbre Workshop and Field Sampling
Period: 17 Sep 2013 → 18 Sep 2013
Mette Algreen Nielsen (Speaker)
Department of Environmental Engineering
Environmental Chemistry
Water Resources Engineering

Description
Oral presentation. Phytoremediation - possibilities and perspectives
Phytoremediation of the former Soviet air-base at Szprotawa

Documents:
Workshop presentation

Related event
Timbre Workshop and Field Sampling
17/09/2013 → 18/09/2013
Szprotawa, Poland
Activity: Talks and presentations › Conference presentations

Innovations konference
Period: 12 Sep 2013
Susan Løvstad Holdt (Invited speaker)
National Institute of Aquatic Resources
Department of Environmental Engineering
National Food Institute
Residual Resource Engineering

Description
Presented: Tang som ressource - mulighed for udvikling og produktion af ingredienser.
Fødevareingredienser - et dansk væksteventyr
Sundhed, Fødevareforsyning, Bæredygtighed, Fødevaresikkerhed

Related event
Innovations konference: Fødevareingredienser- et dansk væksteventyr
12/09/2013 → 12/09/2013
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Teaching in the course Hydrology at the Sino-Danish Center (SDC)
Period: 8 Sep 2013 → 3 Oct 2013
Claus Davidsen (Lecturer)
Department of Environmental Engineering
Water Resources Engineering

Description
Teaching assistant and lecturer in the hydrology course, 1st semester at the M.Sc. in Water and Environment.

Related external organisation
Sino-Danish Center (SDC) at the Chinese Academy of Sciences (CAS)
Beijing, China
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities
Goldschmidt 2013
Anne Graham Uldahl (Participant)
Environmental Chemistry
Department of Environmental Engineering

Related event
Goldschmidt 2013
25/08/2013 → 30/08/2013
Florence, Italy
Activity: Attending an event › Participating in or organising a conference

Period: 3 Jul 2013
Panagiotis Kougias (Chairman)
Department of Environmental Engineering
Residual Resource Engineering
Description

Related event
03/07/2013 → 05/07/2013
Billund, Denmark
Activity: Talks and presentations › Conference presentations

8th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials
Period: 3 Jul 2013 → 5 Jul 2013
Sara Nørgaard Sørensen (Speaker)
Department of Environmental Engineering
Environmental Chemistry

Documents:
ICEENN Abstract Sara Soerensen

Related event

8th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials
03/07/2013 → 05/07/2013
Aix-en-Provence, France
Activity: Talks and presentations › Conference presentations

Oral presentation at the Copenhagen Resource Institute: Using stochastic dynamic programming to support catchment-scale water resources management in China
Period: 27 Jun 2013
Claus Davidsen (Lecturer)
Department of Environmental Engineering
Water Resources Engineering

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

13th World Congress on Anaerobic Digestion
Period: 25 Jun 2013 → 28 Jun 2013
Panagiotis Kougias (Speaker)
Department of Environmental Engineering
Residual Resource Engineering

Description
Anaerobic digestion foaming in Danish full-scale biogas plants: a survey on causes and solutions

Related event

13th World Congress on Anaerobic Digestion
25/06/2013 → 28/06/2013
Santiago De Compostela, Spain
Activity: Talks and presentations › Conference presentations

Investigating the use of stochastic forecast for RTC of urban drainage systems
Period: 25 Jun 2013
Roland Löwe (Lecturer)
Department of Applied Mathematics and Computer Science
Dynamical Systems
Urban Water Engineering

Related event

8th International Conference on Planning and Technologies for Sustainable Urban Water Management
23/06/2013 → 27/06/2013
Lyon, France
Activity: Talks and presentations › Conference presentations

Ph.D. research and challenges for foreign researchers doing research in China.
Period: 16 May 2013
Claus Davidsen (Invited speaker)
Department of Environmental Engineering
Water Resources Engineering

**Description**
Invited speaker and expert board member.

**Related event**

**China-EU Water Platform: International Conference on Research Cooperation - Water, Urbanisation, Research**
16/05/2013 → 16/05/2013
Jinan, China
Activity: Talks and presentations › Conference presentations

**23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry Europe 2013**
Period: 12 May 2013 → 16 May 2013
Sara Nørgaard Sørensen (Participant)
Department of Environmental Engineering
Environmental Chemistry

**Description**
Considerations and Recommendations to Standard Testing with Daphnia magna
Documents:
Poster SETAC SANS

**Related event**

**23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry Europe 2013**
12/05/2013 → 16/05/2013
Glasgow, United Kingdom
Activity: Attending an event › Participating in or organising a conference

**A Tool to Support Optimal Industrial Wastewater Treatment Design and Analysis**
Period: 24 Apr 2013 → 26 Apr 2013
Gürkan Sin (Lecturer)
Department of Chemical and Biochemical Engineering
Computer Aided Process Engineering Center
Department of Environmental Engineering

**Description**
Related event

Asset management for enhancing energy efficiency in water and wastewater systems
24/04/2013 → 26/04/2013
Marbella, Spain
Activity: Talks and presentations › Conference presentations

Design of future municipal wastewater treatment plants: A mathematical approach to manage complexity and identify optimal solutions
Period: 24 Apr 2013 → 26 Apr 2013
Krist V. Gernaey (Lecturer)
Department of Chemical and Biochemical Engineering
Computer Aided Process Engineering Center
Department of Environmental Engineering
Center for Process Engineering and Technology

Description

Related event

Asset management for enhancing energy efficiency in water and wastewater systems
24/04/2013 → 26/04/2013
Marbella, Spain
Activity: Talks and presentations › Conference presentations

Computer-aided modeling framework: a generic template as a modeling tool
Period: 20 Apr 2013 → 25 Apr 2013
Gürkan Sin (Speaker)
Department of Chemical and Biochemical Engineering
Computer Aided Process Engineering Center
Department of Environmental Engineering

Description
**Related event**

**9th European Congress of Chemical Engineering**  
21/04/2013 → 25/04/2013  
The Hague, Netherlands  
Activity: Talks and presentations › Conference presentations

**Efficient Information and Data Management in Synthesis and Design of Processing Networks**  
Period: 20 Apr 2013 → 25 Apr 2013  
Gürkan Sin (Lecturer)  
Department of Chemical and Biochemical Engineering  
Computer Aided Process Engineering Center  
Department of Environmental Engineering

**Description**  
Oral Conference Presentation: A. Quaglia, G. Sin, R. Gani, 2013, "Efficient Information and Data Management in Synthesis and Design of Processing Networks"

**Related event**

**9th European Congress of Chemical Engineering**  
21/04/2013 → 25/04/2013  
The Hague, Netherlands  
Activity: Talks and presentations › Conference presentations

**Efficient Information and Data Management in Synthesis and Design of Processing Networks**  
Period: 20 Apr 2013 → 25 Apr 2013  
Rafiqul Gani (Lecturer)  
Department of Chemical and Biochemical Engineering  
Computer Aided Process Engineering Center  
Department of Environmental Engineering

**Description**  
Oral Conference Presentation: A. Quaglia, G. Sin, R. Gani, 2013, "Efficient Information and Data Management in Synthesis and Design of Processing Networks"

**Related event**

**9th European Congress of Chemical Engineering**  
21/04/2013 → 25/04/2013  
The Hague, Netherlands  
Activity: Talks and presentations › Conference presentations

**Effect of pH on DBP formation**  
Period: 10 Apr 2013  
Henrik Rasmus Andersen (Lecturer)  
Department of Environmental Engineering  
Urban Water Engineering

**Related event**

**5th International Conference Swimming Pool & Spa**  
09/04/2013 → 12/04/2013  
Rome, Italy  
Activity: Talks and presentations › Conference presentations
European Geosciences Union General Assembly 2013  
Period: 10 Apr 2013  
Claus Davidsen (Speaker)  
Department of Environmental Engineering  
Water Resources Engineering

**Description**

Oral presentation with the title "Using stochastic dynamic programming to support catchment-scale water resources management in China" in session HS5.3, Advances in Modeling of Coupled Hydrologic-Socioeconomic Systems.

Oral presentation at EGU 2013, session HS5.3, Advances in Modeling of Coupled Hydrologic-Socioeconomic Systems.

Links:

**Related event**

European Geosciences Union General Assembly 2013  
07/04/2013 → 12/04/2013  
Vienna, Austria  
Activity: Talks and presentations › Conference presentations

**Ude af øje, ude af sind, ude af kontrol: - er det sådan vores afløbssystemer skal fungere?**

Period: 13 Mar 2013  
Roland Löwe (Lecturer)  
Department of Applied Mathematics and Computer Science  
Dynamical Systems  
Urban Water Engineering

**Related event**

**Stochastic runoff forecasting and real time control of urban drainage systems**

Period: 11 Mar 2013  
Roland Löwe (Lecturer)  
Department of Applied Mathematics and Computer Science  
Dynamical Systems  
Urban Water Engineering

**Related event**

**Environmental Health 2013**

Period: 6 Mar 2013  
Steffen Foss Hansen (Chairman)  
Department of Environmental Engineering  
Environmental Chemistry
Description
Session on Research

Chair on session on Research
Documents:
Conference programme

Related event

Environmental Health 2013 : Science and Policy to Protect Future Generations
03/03/2013 → 06/03/2013
Boston, United States
Activity: Attending an event › Participating in or organising a conference

Environmental Health 2013
Period: 3 Mar 2013 → 6 Mar 2013
Steffen Foss Hansen (Organizer)

Department of Environmental Engineering
Environmental Chemistry

Description
Chairman
Degree of recognition: International

Related event

Environmental Health 2013 : Science and Policy to Protect Future Generations
03/03/2013 → 06/03/2013
Boston, United States
Activity: Attending an event › Participating in or organising a conference

Armax and Greybox Modeling in Water Systems
Period: 1 Mar 2013
Roland Löwe (Lecturer)

Dynamical Systems
Department of Applied Mathematics and Computer Science
Department of Environmental Engineering

Description
Lecture in Armax and Greybox Modeling as part of course 12342
Activity: Other

Stochastic runoff forecasting and real time control of urban drainage systems
Period: 31 Jan 2013
Roland Löwe (Lecturer)

Department of Informatics and Mathematical Modeling
Mathematical Statistics
Department of Mathematics
Urban Water Engineering
Department of Environmental Engineering

Links:
http://www.forskningsplatformen-vand.dk/Documents/Annual%20meeting%202013/index.html

Related event

7th Annual Meeting of the Danish Water Research and Innovation Platform
**Concept for a secondary water supply in Nordhavn**

**Period:** 28 Jan 2013

**Martin Rygaard (Invited speaker)**

Department of Environmental Engineering

Urban Water Engineering

**Related event**

**Konference om Sekundavand: En storm i et glas vand eller kilden til innovation, vækst og eksport**

28/01/2013 → 28/01/2013
Odense, Denmark

Activity: Talks and presentations › Conference presentations

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**Reviewer of Grant applications under EU research framework programme call FP7-SME-2013 (External organisation)**

**Period:** 21 Jan 2013 → 24 Jan 2013

**Dimitar Borisov Karakashev (Participant)**

Department of Environmental Engineering

Residual Resource Engineering

Degree of recognition: International

**Related external organisation**

**Reviewer of Grant applications under EU research framework programme call FP7-SME-2013**

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

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**International Conference on Algal Biorefinery**

**Period:** 10 Jan 2013

**Susan Løvstad Holdt (Participant)**

Department of Environmental Engineering

**Description**

ICAB 2013
International Conference on Algal Biorefinery: A Potential Source of Food, Feed, Biochemicals, Biofuels and Biofertilizers

Links:
http://www.icab2012bt.iitkgp.ernet.in/icab/

**Related event**

**International Conference on Algal Biorefinery: A Potential Source of Food, Feed, Biochemicals, Biofuels and Biofertilizers**

10/01/2013 → 12/01/2013
Kharagpur, India

Activity: Attending an event › Participating in or organising a conference

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**Reviewer for Grant Proposals at the Italian Ministry for Education University and Research (MIUR) (External organisation)**

**Period:** 2012 → 2015

**Dimitar Borisov Karakashev (Participant)**

Department of Environmental Engineering

Residual Resource Engineering

Degree of recognition: International

**Related external organisation**

**Reviewer for Grant Proposals at the Italian Ministry for Education University and Research (MIUR)**

Activity: Membership › Membership in review committee
Nanotechnology and human health
Period: 10 Dec 2012
Steffen Foss Hansen (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry

Description
Exposure pathways

Related event
Nanotechnology and human health: Scientific evidence and risk governance
10/12/2012 → 11/12/2012
Bonn, Germany
Activity: Talks and presentations › Conference presentations

Temamøde: Virker EU’s regulering af nanomaterialer i arbejdsmiljøet?
Period: 28 Nov 2012
Steffen Foss Hansen (Invited speaker)
Department of Environmental Engineering
Environmental Chemistry

Description
Er medarbejdere og forbrugere tilstrækkeligt sikret?

Links:

Related event
Temamøde: Virker EU’s regulering af nanomaterialer i arbejdsmiljøet?
28/11/2012 → 28/11/2012
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Nanosafe 2012
Period: 14 Nov 2012
Steffen Foss Hansen (Speaker)
Department of Environmental Engineering
Environmental Chemistry

Description
In order to understand how companies identify and handle emerging risks related to nanomaterials, we completed more than 15 in-depth interviews with occupational health and safety (OHS) representatives in various Danish organisations. Companies varied not only greatly in regard to number of employees, overall R & D capacity and health and safety personnel, but also in regard to level of which, they already use/produce products that contain nanomaterials. Surprisingly, very little research has been done on how companies become alert to emerging issues although this initial identification of emerging risks is a prerequisite for any subsequent risk management. Key unanswered questions evolve around how companies: 1) Initially identify potentially emerging risks; 2) Collect and analyze data on these risks; 3) how they communication results of their analysis internally and externally; 4) how they complete their analysis of management options and subsequently implementation of these management options and finally, 5) what the implications of action taken are or has been. Through our interviews we found that the level of awareness about the potential occupational risk associated with nanomaterials varied greatly and range from “having just heard about potential risks and planning to look into it” to “having initiated an internal full risk assessment currently under external peer-review”. Employees noting “that something might not be right” as well as media rumors turned out to be the two main sources of identification of emerging risks, whereas ad hoc personal and non-formal networks and meetings with academics and health care officials also played a role in larger organisations. Various sources were used to obtain more factual information including: Google; Newsletters from the National Research Centre for the Working Environment in Denmark; chemistry databases and scientific articles, but the information gathering process itself was somewhat unsystematic and seems to be completed ad
hoc over time. Internal data analysis was performed by occupational health personal within the companies in constant consideration of resources available, priorities, possible management options, etc. unless individual OHS representative “felt like it” putting far more effort into it. Very often independent external experts were consulted in order to learn more and get outside confirmation of key internal findings and interpretations of the available literature. The selection of management options often involved a pro et con analysis of various options considering various technical and operational barriers whereas implementations often followed a process of: 1) Double-checking that company is in compliance with existing legislation and guidelines - often non-NM specific; 2) Initial mapping of NM R & D within the company; 3) Initiation of a capacity building process; 4) Mapping of NM exposure (sometimes very extensive); 5) Mapping of health effects among employees (again sometimes very extensive) and 6) Mapping and implementation of possible management options. Overall, very few options had been implemented about mostly “easy”, “low-hanging fruit” - PE-options and administrative controls. Limited or no implementation of more thorough process-related options or engineering controls was identified primarily explained by the continued uncertainty related to health effects of nanomaterials as well as uncertainty about legislation and best practices. Results were mostly communicated internally via intranets or internal workshops with health representatives. Externally communications included publication of scientific papers, posting of information on company websites, but surprisingly involved no or very limited dialogue with authorities. This was considered irrelevant at best and potentially a source of additional confusion and bureaucracy. Overall, implications of action taken within the companies have had little impacts, but in general company representatives noted that they had gotten an improved knowledge about NM risks; that there was a general alertness regarding risks related to airborne NPs and – in some companies - that there was an increased dialogue between workers and leadership.

Horizon-scanning and Identification of Emerging Risk among Nanotech-companies

Documents:
NanoSafe 2012 Book of Abstracts

Related event

Nanosafe 2012: International Conference on Safe production and use of nanomaterials
13/11/2012 → 15/11/2012
Grenoble, France
Activity: Talks and presentations › Conference presentations

EU-US Environmental Biotechnology Working Group Workshop
Period: 6 Nov 2012
Barth F. Smets (Invited speaker)
Department of Environmental Engineering

Description
Spatially structured autotrophic nitrogen removing communities: Competition and cooperation
Documents:
PDF

Related event

EU-US Environmental Biotechnology Working Group Workshop
04/11/2012 → 07/11/2012
St. Louis, United States
Activity: Talks and presentations › Conference presentations

Training on Human Health and Environmental aspects of Nanomaterials
Period: 5 Nov 2012 → 7 Nov 2012
Steffen Foss Hansen (Organizer)
Department of Environmental Engineering
Environmental Chemistry

Description
Organizer, course lecturer, coordinator

Related event

Training on Human Health and Environmental aspects of Nanomaterials
New Uses and Possibilities for Seaweed
Period: 26 Sep 2012 → 27 Sep 2012
Susan Løvstad Holdt (Invited speaker)
National Institute of Aquatic Resources
Department of Environmental Engineering
National Food Institute
Residual Resource Engineering

Related event
Value Added Seafood Conference
26/09/2012 → 27/09/2012
London, United Kingdom
Activity: Talks and presentations › Conference presentations

7th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials
Period: 10 Sep 2012
Denisa Cupi (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Third Author
Documents:
DOCX
PDF

Related event
7th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials
10/09/2012 → 12/09/2012
Alberta, Canada
Activity: Attending an event › Participating in or organising a conference

7th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials
Period: 10 Sep 2012
Sara Nørgaard Sørensen (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Co-author of poster
Documents:
Toxicity of silver nanoparticles to green algae - towards a biotic ligand understanding

Related event
7th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials
10/09/2012 → 12/09/2012
Alberta, Canada
Activity: Attending an event › Participating in or organising a conference
**14th International Symposium on Microbial Ecology**  
*Period: 20 Aug 2012 → 21 Aug 2012*  
Ana Faria Tomás (Participant)  
Department of Environmental Engineering  
Residual Resource Engineering  

**Description**  
Participated with a poster entitled "Use of a newly isolated extreme thermophile for the production of 2nd generation bio-ethanol"  

**Links:**  
http://www.isme-microbes.org/isme14 (Conference website)

**Related event**

**14th International Symposium on Microbial Ecology: The Power of the Small**  
*19/08/2012 → 24/08/2012*  
Copenhagen, Denmark  
Activity: Attending an event › Participating in or organising a conference

**Euroscience Open Forum 2012**  
*Period: 11 Jul 2012 → 15 Jul 2012*  
Denisa Cupi (Participant)  
Department of Environmental Engineering  
Environmental Chemistry  

**Related event**

**Euroscience Open Forum 2012**  
*11/07/2012 → 15/07/2012*  
Dublin, Ireland  
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**SRA Europe 2012**  
*Period: 18 Jun 2012 → 20 Jun 2012*  
Steffen Foss Hansen (Organizer)  
Department of Environmental Engineering  
Environmental Chemistry  

**Description**  
Chairman  
Degree of recognition: International  

**Links:**  

**Related event**

**SRA Europe 2012: 21th Annual conference**  
*18/06/2012 → 20/06/2012*  
Zurich, Switzerland  
Activity: Attending an event › Participating in or organising a conference

**SRA-Europe 21st Annual Conference**  
*Period: 18 Jun 2012*  
Steffen Foss Hansen (Chairman)  
Department of Environmental Engineering  
Environmental Chemistry
Description
New approaches in risk assessment
Documents:
SRA Europe 2012 Book of abstracts
Links:
http://www.sraeurope.org/filehandler.ashx?file=10312

Related event
SRA-Europe 21st Annual Conference
18/06/2012 → 20/06/2012
Zurich, Switzerland
Activity: Attending an event › Participating in or organising a conference

2nd International Workshop of Microbial Life under Extreme Energy Limitations
Anne Graham Uldahl (Participant)
Department of Environmental Engineering

Description
Microenergy 2012 workshop

Related event
2nd International Workshop of Microbial Life under Extreme Energy Limitations
06/05/2012 → 09/05/2012
Aarhus, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

6th SETAC World Congress 2012
Period: 23 May 2012
Sara Nørgaard Sørensen (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Participating in conference

Related event
6th SETAC World Congress 2012: SETAC Europe 22nd Annual Meeting
20/05/2012 → 24/05/2012
Berlin, Germany
Activity: Attending an event › Participating in or organising a conference

6th SETAC World Congress 2012
Period: 23 May 2012
Denisa Cupi (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Attended lectures and poster presentations

Related event
6th SETAC World Congress 2012: SETAC Europe 22nd Annual Meeting
20/05/2012 → 24/05/2012
Berlin, Germany
Activity: Attending an event › Participating in or organising a conference
1st International Workshop on Swimming Pool Research
Period: 3 May 2012 → 4 May 2012
Kamilla Marie Speht Kaarsholm (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event
1st International Workshop on Swimming Pool Research
03/05/2012 → 04/05/2012
Delft, Netherlands
Activity: Talks and presentations › Conference presentations

SOT Annual Meeting and ToxExpo
Denisa Cupi (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
First Author
Poster Presentation
Documents:
PDF

Related event
SOT Annual Meeting and ToxExpo
11/03/2012 → 15/03/2012
San Francisco, United States
Activity: Attending an event › Participating in or organising a conference

Course: Advanced Urban Wastewater Treatment: Lecture: Xenobiotics in wastewater and sludge
Period: 2011 → 2016
Eva Eriksson (Lecturer)
Department of Environmental Engineering
Environmental Chemistry

Description
Annual 3-day course
Lund University, Technical University of Denmark together with Svenskt Vatten

Related event
Advanced Urban Wastewater Treatment
01/01/2011 → 31/12/2016
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

3rd Nanosafety Autumn School 2011
Denisa Cupi (Participant)
Department of Environmental Engineering
Environmental Chemistry

Related event
3rd Nanosafety Autumn School 2011: Understanding Human Health Effects and Environmental Impacts of Engineered Nanomaterials
Venice, Italy
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

EcoDesign MBR Centre
Period: 10 Nov 2011 → 11 Nov 2011
Marlene Mark Jensen (Speaker)
Department of Environmental Engineering

Related external organisation
EcoDesign MBR Centre
Aalborg, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

2011 Symposium The Danish Microbiological Society
Period: 7 Nov 2011
Ana Faria Tomás (Speaker)
Department of Environmental Engineering
Residual Resource Engineering

Description
Presentation with the title "Use of extreme thermophilic bacteria for second generation bio-ethanol production"
Invited speaker

Related event
2011 Symposium The Danish Microbiological Society
07/11/2011 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

PhD Nano 2011 - Nano Connect Scandinavia
Denisa Cupi (Participant)
Department of Environmental Engineering
Environmental Chemistry

Related event
PhD Nano 2011 - Nano Connect Scandinavia
20/10/2011 → 21/10/2011
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Nordic Environmental Nucleotide Network 2011 (NENUN)
Period: 7 Sep 2011 → 10 Sep 2011
Barth F. Smets (Participant)
Department of Environmental Engineering

Related event
Nordic Environmental Nucleotide Network 2011 (NENUN): Molecular investigation and quantification of microbes in Rapid Sand Filters
07/09/2011 → 10/09/2011
Reykjavik, Iceland.
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Nordic Environmental Nucleotide Network 2011 (NENUN)
Period: 7 Sep 2011 → 10 Sep 2011
Sanin Musovic (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event
Nordic Environmental Nucleotide Network 2011 (NENUN): Molecular investigation and quantification of microbes in Rapid Sand Filters
07/09/2011 → 10/09/2011
Reykjavik, Iceland.
Activity: Talks and presentations › Conference presentations

Nitrogen loss in the intertidal permeable sediment: ph.d. defence
Period: 1 Jun 2011
Marlene Mark Jensen (External examiner)
Environmental Chemistry
Department of Environmental Engineering
Activity: Examinations and supervision › External examination

Dansk Svømmebadsteknisk Forening - Årsmøde 2011
Period: 13 Apr 2011 → 14 Apr 2011
Kamilla Marie Speht Kaarsholm (Speaker)
Department of Environmental Engineering
Documents:
referat svømmebadet nr 24.pdf

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Society of Toxicology Annual Spring Meeting/North Carolina Chapter
Period: 17 Feb 2011
Denisa Cupi (Participant)
Department of Environmental Engineering
Environmental Chemistry

Related event
Society of Toxicology Annual Spring Meeting/North Carolina Chapter
17/02/2011 → …
Research Triangle Park, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

12th World Congress on Anaerobic Digestion
Period: 31 Oct 2010 → 4 Nov 2010
Ana Faria Tomás (Speaker)
Department of Environmental Engineering
Residual Resource Engineering

Description
Oral presentation with the title "Effect of xylose and nutrient concentration in ethanol production by a newly isolated extreme thermophile"

Related event

12th World Congress on Anaerobic Digestion
31/10/2010 → 04/11/2010
Guadalajara, Mexico
Activity: Talks and presentations › Conference presentations

Advanced Water Treatment
Period: 23 Jun 2010
Martin Rygaard (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event

DANVA Årsmøde
23/06/2010 → 23/06/2010
Kolding, Denmark
Activity: Talks and presentations › Conference presentations

EnviroSymp 2010 "Nanoparticles in the Environment"
Period: 10 Jun 2010 → 11 Jun 2010
Denisa Cupi (Organizer)
Department of Environmental Engineering
Environmental Chemistry

Related event

EnviroSymp 2010 "Nanoparticles in the Environment"
10/06/2010 → 11/06/2010
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Invertebrate animals in Danish drinking water distribution networks
Period: 7 Jun 2010 → 9 Jun 2010
Sarah Christine Boesgaard Christensen (Speaker)
Department of Environmental Engineering
Urban Water Engineering

Related event

7th Nordic Drinking Water Conference
07/06/2010 → 09/06/2010
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Efterpolering af spildevand for mikroforureningsstoffer: IdaMiljø møde 4.maj 2010 om "Fremtidens Spildevandsbehandling"
Period: 4 May 2010
Henrik Rasmus Andersen (Speaker)
Department of Environmental Engineering
Urban Water Engineering
Links:
splidevand/vand: hospitalssplidevand rejser helt særlige problemer, som skal håndteres allerede i projektering
Period: 24 Feb 2010
Henrik Rasmus Andersen (Lecturer)
Department of Environmental Engineering
Urban Water Engineering
Links:
http://s-kbh.dk/sidste-nyt/%E2%80%9Db%C3%A6redygtige-hospitaler%E2%80%9D-%E2%80%93-skal-der-nu-vindm%C3%B8ller-p%C3%A5-tagene-616 (Link to program.)

Related event
bæredygtige hospitaler: skal der nu vindmøller på tagene?
24/02/2010 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

review of proposals for qatar national research fund (qnrf) (external organisation)
Period: Mar 2009 → …
Henrik Rasmus Andersen (Member)
Urban Water Engineering
Department of Environmental Engineering
Description
Review of individual proposals in 1-2 yearly application rounds.
Degree of recognition: International

Related event
review of proposals for qatar national research fund (qnrf)
Activity: Membership › Membership in review committee

small animals in water distribution networks
Period: 29 Jan 2009
Sarah Christine Boesgaard Christensen (Invited speaker)
Department of Environmental Engineering
Urban Water Engineering

related event
3rd annual meeting of the danish water research platform dwp - forskningsplatformen vand
29/01/2009 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

invertebrate animals in danish drinking water distribution networks
Period: 7 Sep 2008
Sarah Christine Boesgaard Christensen (Speaker)
Department of Environmental Engineering
Urban Water Engineering
Related event

6th IWA World Water Congress and Exhibition
07/09/2008 → 12/09/2008
Vienna, Austria
Activity: Talks and presentations › Conference presentations

Hydrograv - Improving Hydrological Models with Ground-Based and Space-Borne Time-lapse Gravity Surveys
Period: 1 Jan 2007 → …
Peter Bauer-Gottwein (Speaker)
Department of Environmental Engineering

Description
Place: ESA Hydrospace conference, Geneva, Switzerland

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Local to Regional Hydrological Model Calibration for the Okavango River Basin From In-Situ and Spaceborne Gravity Data
Period: 1 Jan 2007 → …
Peter Bauer-Gottwein (Speaker)
Department of Environmental Engineering

Description
Place: ESA Hydrospace conference, Geneva, Switzerland

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Merging GRACE gravimetry, satellite altimetry and in-situ data for Terrestrial water storage and flood monitoring; EGU2007 G3-1WE2O-001
Period: 1 Jan 2007 → …
Peter Bauer-Gottwein (Speaker)
Department of Environmental Engineering

Description
Place: Vienna, Austria

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Terrestrial Water Storage Monitoring from GRACE and Satellite Altimetry in Bangladesh and the Okawango Delta (Botswana)
Period: 1 Jan 2007 → …
Peter Bauer-Gottwein (Speaker)
Department of Environmental Engineering

Description
Place: ESA Hydrospace conference, Geneva, Switzerland

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations
Environmental Effects of Nanoparticles and Nanomaterials
Period: 18 Sep 2006 → 19 Sep 2006
Sara Nørgaard Sørensen (Participant)
Department of Environmental Engineering
Environmental Chemistry

Description
Participant, co-author of presented study

Related event
Environmental Effects of Nanoparticles and Nanomaterials
London, United Kingdom
Activity: Attending an event › Participating in or organising a conference

Prizes:

2nd prize winner in Green Challenge at the Technical University of Denmark: Project 817: Reducing overflow to River Aarhus by using MPC - Master thesis, idea category
Nadia Schou Vorndran Lund (Recipient)
Department of Environmental Engineering, Urban Water Systems

Description
Student conference at the Technical University of Denmark

Details
Awarded date: 24 Jun 2016
Prize: Prizes, scholarships, distinctions

3rd prize "Best Student Presentation" at ARTEK Event 2016, International Conference - Sanitation in Cold Climate Regions
Camilla Tang (Recipient)
Department of Environmental Engineering, Urban Water Systems

Details
Awarded date: 14 Apr 2016
Prize: Prizes, scholarships, distinctions

Best Master Thesis - Idea Category
Mathilde Jørgensen Hedegaard (Recipient)
Department of Environmental Engineering, Urban Water Systems

Description
Grøn Dyst 2014 - second prize

Details
Awarded date: 2014
event: Green Challenge (Grøn Dyst) 2014
Prize: Prizes, scholarships, distinctions

Best Presentation Award at 7th International Conference Swimming Pool & Spa
Waqas Akram Cheema (Recipient)
Department of Environmental Engineering, Water Technologies

Description
At the 7th International Swimming Pool & Spa Conference (Kos Island, Greece), Waqas A. Cheema (WCHE) received the award for the best presentation out of 48 presentations. The title of the presentation was “Destruction of DBPs and their precursors in swimming pool water by combined UV treatment and ozonation”.

**Best Student Project winner at the VandTek fair 2016**
Camilla Tang (Recipient)
Department of Environmental Engineering, Urban Water Systems

**Chemicals in the Environment - Best course of the year 2012/2013 chosen by the students**
Steffen Foss Hansen (Recipient)
Department of Environmental Engineering, Environmental Chemistry

**DTU's Sustain Conference Poster Award**
Sarah Brudler (Recipient)
Department of Environmental Engineering, Urban Water Engineering

**EliteForsk-rejstependierne 2017**
Aikaterini Spiliotopoulou (Recipient)
Department of Environmental Engineering, Water Technologies

**Environmental Management and Ethics - Best course of the year 2004/2005 chosen by the students**
Steffen Foss Hansen (Recipient)
Department of Environmental Engineering, Environmental Chemistry
Nanoscale zero-valent iron impregnation of covalent organic polymer grafted activated carbon for water treatment: 11th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials (ICEENN 2016)
Paul D. Mines (Recipient)
Department of Environmental Engineering, Water Technologies, Department of Micro- and Nanotechnology, Surface Engineering

Description
Best Poster Prize

Details
Awarded date: 18 Aug 2016
Granting Organisations: Royal Society of Chemistry
Prize: Prizes, scholarships, distinctions

The Director Gorm-Petersen memorial grant to young scientist in promising development
Steffen Foss Hansen (Recipient)
Department of Environmental Engineering, Environmental Chemistry

Details
Awarded date: 2009
Degree of recognition: National
Granting Organisations: Direktør P. Gorm-Petersens og Hustrus Legat
event: PhD graduation ceremony
Prize: Prizes, scholarships, distinctions

The NIRAS award
Mathilde Jørgensen Hedegaard (Recipient)
Department of Environmental Engineering, Urban Water Systems

Description
The NIRAS Award of 10.000 DKK is given to a young researcher or student, who through her/his studies or research has contributed with new and ground-breaking research

Details
Awarded date: 30 Jan 2018
Granting Organisations: NIRAS A/S
event: 12th annual meeting of DWF
Prize: Prizes, scholarships, distinctions

Trophees Performance Veolia Environment
Aikaterini Spiliotopoulou (Recipient)
Department of Environmental Engineering, Water Technologies

Details
Awarded date: 2013
Granting Organisations: VEOLIA
Prize: Prizes, scholarships, distinctions

Press clippings:

Hvor meget metan udleder danske biogasanlæg
Anders Michael Fredenslund & Charlotte Scheutz
11/06/2018
Department of Environmental Engineering, Air, Land & Water Resources

Media contribution (1)

Hvor meget metan udleder danske biogasanlæg?
11/06/2018
Forskning i (National), Denmark, Print
Anders Fredenslund & Charlotte Scheutz
2 pages
http://www.biopress.dk/PDF/hvor-meget-metan-udleder-danske-biogasanlaeg
source treatment of pharmaceuticals in hospital wastewater
Henrik Rasmus Andersen
15/05/2018 → 16/05/2018
Department of Environmental Engineering, Water Technologies

Media contributions (3)

Radioavisen
16/05/2018
DR P1 (National), Denmark, Radio
https://www.dr.dk/radio/p1/p1-radioavisen/radioavisen-2018-05-16-08-00#!00:00:00
Interview. DTU budskab er at det er billigst at rense for lægemidler på de eksisterende renseanlæg.
Henrik Rasmus Andersen
Department of Environmental Engineering, Water Technologies

Eksperter er enige: Fejlinvestering at bygge rensningsanlæg på sygehuse
15/05/2018
JP (National), Denmark, Print
https://jyllands-posten.dk/indland/ECE10604917/eksperter-er-enige-fejlinvestering-at-bygge-rensningsanlaeg-aa-sygehus
Nordjyderne vil snart kunne blive behandlet på et splinternyt og flot supersygehus i Aalborg. 4,7 mia. kr. vil det have kostet at opføre, når det står klart i 2021. Men nogle af pengene kunne måske være anvendt lidt klogere.
I hvert fald sætter en række eksperter spørgsmålstegn ved, om millioninvesteringer i små, decentrale rensningsanlæg på sygehus som det nye i Aalborg er den miljømæssigt bedste måde at rense vandet for medicinrester. Blot 4 pct. af medicinforureningen kommer fra sygehusene, mens resten kommer fra private husstande, plejehjem og lignende. Derfor vil det ifølge kritikerne være langt bedre at investere i ny teknologi på de store, centrale rensningsanlæg, der vil kunne fjerne langt flere medicinrester – og gøre det for færre penge.
Henrik Rasmus Andersen
Department of Environmental Engineering, Water Technologies

Professorer: Sygehuse er i gang med gigantisk fejlinvestering for milliarder
15/05/2018
JP (National), Denmark, Print
https://jyllands-posten.dk/indland/ECE10604933/professorer-sygehuse-er-i-gang-med-gigantisk-fejlinvestering-for-milliarder/
Ifølge vandselskaber og eksperter er regionerne i gang med en milliardinvestering, der kan være unødsvendig spild af penge.
Henrik Rasmus Andersen
Press / Media

Forurening af flod ved Carlsbergs bryggeri i Nepal
Henrik Rasmus Andersen
08/03/2018 → 08/03/2018
Department of Environmental Engineering, Water Technologies

Media contributions (3)

Massiv forurening ved Carlsberg-bryggeri i Nepal
08/03/2018
Danwatch (National), Denmark, Web
Emilie Ekeberg
https://danwatch.dk/undersoegelse/carlsberg-bryggeri-forurener-i-nepal/
Vandprøver viser udledning af giftigt spildevand ved Carlsbergs bryggeri i Nepal.
Henrik Rasmus Andersen
Department of Environmental Engineering, Water Technologies

Carlsberg anklages for at forurene en af Nepals største floder
08/03/2018
Danwatch (National), Denmark, Web
Vandprøver indikerer, at der udledes giftigt spildevand fra Carlsbergs bryggeri i Nepal. Lokale indbyggere har i årevis klaget over forureningen, imens Carlsberg hævder, at de har løst problemerne.
Henrik Rasmus Andersen
Department of Environmental Engineering, Water Technologies

**Knutse flasker og forurening belaster Carlsbergs bryggeri i Nepal**
08/03/2018
Denmark, Web
https://www.dr.dk/nyheder/penge/knutse-flasker-og-forurening-belaster-carlsbergs-bryggeri-i-nepal
Flere vandprøver viser kraftig forurening, der belaster både fisk og truede dyrearter, lige uden for Carlsbergs bryggeri.
Henrik Rasmus Andersen
Press / Media

**Ny lovgivning om regnvand er nødvendig**
Katrine Nielsen
17/10/2017
Department of Environmental Engineering, Urban Water Systems

**Bornholm: Flere bassiner har problemer med vandkvalitet**
Henrik Rasmus Andersen
24/07/2017
Department of Environmental Engineering, Water Technologies

**Fire sandheder om vandet i poolen: Nej, det er hverken kloren der lugter eller svier i øjnene**
Henrik Rasmus Andersen
19/07/2017

**Description**

**Subject**
swimming pool; chlorine
Department of Environmental Engineering, Water Technologies

**Fire sandheder om vandet i poolen: Nej, det er hverken kloren der lugter eller svier i øjnene**
19/07/2017
TV2 (National), Denmark, Web
Marie Kjempff

Det er højsæson for plasken og sjasken i swimmingpools og badebassiner. Men hvad er det egentlig, der foregår under vandoverfladen? Er det for eksempel farligt at sluge poolvandet? Og hvad er det egentlig, der svier sådan i øjnene?
Henrik Rasmus Andersen
Press / Media
Water may prevent holes in teeth.
Erik Arvin
01/06/2017

Description
Interview with journalist Sidsel Boye from the news magazine "Danish communes" on Erik Arvin's research on the significance of water quality on caries among school children. In particular the significance of calcium and fluoride in drinking water and family income.
The article is published in the magazine "Danske Kommner" No. 17 from 2017. The article is based on the interview with Erik Arvin.
Department of Environmental Engineering

Media contribution (1)

Vand kan forebygge huller
01/06/2017
Danske Kommuner (National), Denmark, Print
Sidsel Boye
4 pages
Reports on Erik Arvin's research on how caries is affected by drinking water hardness, fluoride content and family income
Erik Arvin
Press / Media

OECD nanomaterials programme 'of little value' for risk assessment
Steffen Foss Hansen
02/03/2017

Description
Criticism from Ecos, Ciel and Oeko-Institute aimed at industry and EU policy makers
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

OECD nanomaterials programme 'of little value' for risk assessment
02/03/2017
Chemical Watch (International), Web
Andrew Turley
Criticism from Ecos, Ciel and Oeko-Institute aimed at industry and EU policy makers
Steffen Foss Hansen
Press / Media

Five Questions for Steffen Foss Hansen
Steffen Foss Hansen
23/02/2017

Description
A Danish scholar talks about his online database of 'nano-enhanced' products — many made with materials that could be hazardous.
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Five Questions for Steffen Foss Hansen
23/02/2017
UNDARK (International), Web
Fabio Turone
https://undark.org/article/five-questions-steffen-foss-hansen/
A Danish scholar talks about his online database of 'nano-enhanced' products — many made with materials that could be hazardous.
Steffen Foss Hansen
Press / Media
Blødt vand i hovedstaden skal spare husstande for millioner
Camilla Tang
14/02/2017
Department of Environmental Engineering, Urban Water Systems

Media contribution (1)

Blødt vand i hovedstaden skal spare husstande for millioner
14/02/2017
Politiken (National), Denmark, Web
Anna Belling-Ladegaard
http://politiken.dk/indland/art5833405/Bl%C3%B8dt-vand-i-hovedstaden-skal-spare-husstande-for-millioner
Camilla Tang
Press / Media

No small deal: Evaluating nanomaterials with alternatives assessment, with Rune Hjorth
Rune Hjorth
27/01/2017
Department of Environmental Engineering

Media contribution (1)

No small deal: Evaluating nanomaterials with alternatives assessment, with Rune Hjorth
27/01/2017
IEAM Podcast, Web
Rune Hjorth
Department of Environmental Engineering

Relations
Research outputs:
The applicability of chemical alternatives assessment for engineered nanomaterials
Press / Media

OECD conclusions about nanomaterials and test guidelines disputed
Steffen Foss Hansen
05/01/2017

Description
Danish, US researchers say further research needed to substantiate suitability claim
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

OECD conclusions about nanomaterials and test guidelines disputed
05/01/2017
Chemical Watch (International), Web
Andrew Turley
Danish, US researchers say further research needed to substantiate suitability claim
Steffen Foss Hansen

Relations
Activities:
A Critical and in-depth analysis of the environmental aspect of the OECD SP dossiers
Press / Media

Hård kritik af Total og kommune
Steffen Foss Hansen
01/12/2016
HØRING: Prøveboring efter skifergas har slidt på kommune og borgere.

Subject
Shale gas extration and environment
Department of Environmental Engineering, Environmental Chemistry

Media coverage (1)
Hård kritik af Total og kommune
01/12/2016
https://apps-infomedia-dk.proxy.findit.dtu.dk/mediearkiv/link?articles=e601d8de (Regional), Denmark, Print
Esben Agerlin Olsen
HØRING: Prøveboring efter skifergas har slidt på kommune og borgere.
Steffen Foss Hansen

Relations
Projects:
Shale gas in a Danish context
Press / Media

Netbutikker har markant flere antibakterielle sølvprodukter på hylderne
Steffen Foss Hansen
13/10/2016

Description
Antallet af hverdagsprodukter med bakteriebekæmpende sølv i nanopartikelform er vokset med 80 procent på bare fire år, viser tal fra DTU Miljø. Men sølv kan skabe antibiotikaresistente bakterier og skade miljøet.
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)
Netbutikker har markant flere antibakterielle sølvprodukter på hylderne
13/10/2016
DR (National), Denmark, Web
Thomas Lemke, Helle Slejborg, Simon Risum Pedersen
https://www.dr.dk/nyheder/penge/kontant/netbutikker-har-markant-flere-antibakterielle-soelvprodukter-paa-hylderne
Antallet af hverdagsprodukter med bakteriebekæmpende sølv i nanopartikelform er vokset med 80 procent på bare fire år, viser tal fra DTU Miljø. Men sølv kan skabe antibiotikaresistente bakterier og skade miljøet.
Steffen Foss Hansen
Press / Media

Stort fokus på branchens vækstpotentiale ved VandTek
Hans-Jørgen Albrechtsen
10/10/2016
Department of Environmental Engineering, Urban Water Systems

Media contribution (1)
Stort fokus på branchens vækstpotentiale ved VandTek
10/10/2016
DanskVAND, Print
Hans-Jørgen Albrechtsen
Department of Environmental Engineering, Urban Water Systems
Press / Media

Ph.d.-forsvar om at vurdere risikoen for udsættelse for nanomaterialer i arbejdsmiljøet ved hjælp af control-banding værktøjer
Steffen Foss Hansen
27/09/2016
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)
Ph.d.-forsvar om at vurdere risikoen for udsættelse for nanomaterialer i arbejdsmiljøet ved hjælp af control-banding værktøjer
27/09/2016
Arbejdsmiljoforskning.dk (National), Denmark, Web
Kirsten Rydahl
http://www.arbejdsmiljoforskning.dk/da/nyheder/arkiv/2016/ph-d--forsvar-om-risikovurdering-af-nano-i-arbejdsmiljoet-vha-control-banding-vaerktoejer
Steffen Foss Hansen
Press / Media

Stort fokus på branchens vækstpotentiale ved Vandtek
20/09/2016

Description
Mention of Camilla Tang winning "Best Student Project" at Vandtek
Department of Environmental Engineering, Urban Water Systems

Media contribution (1)

Commission seeks input to third nanomaterials regulatory review
Steffen Foss Hansen
23/06/2016

Description
Interplay between REACH and CLP key, says NGO
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Debat: Nej, skifergas er da alt andet end forsvarligt
Steffen Foss Hansen
23/02/2016

Description
SKIFERGAS Politikerne må enten forbyde skifergas eller indrømme, at de gambler med miljø og sundhed.
Department of Environmental Engineering, Environmental Chemistry

Media coverage (1)

Projects:
Shale gas in a Danish context
Press / Media

**Naturstyrelsen kortlægger erfaringer 36 farer ved skifergas i Danmark**
Steffen Foss Hansen
19/02/2016

**Description**
Naturstyrelsen advarer om, at udvinding af skifergas kan føre til forurening af grundvandet, og at der er brug for mere viden om de kemikalier, der bruges til at udvinding.
Department of Environmental Engineering, Environmental Chemistry

**Media contribution (1)**

**Naturstyrelsen kortlægger erfaringer 36 farer ved skifergas i Danmark**
19/02/2016
Arbejderen (National), Denmark, Web
http://arbejderen.dk/indland/36-farer-ved-skifergas-i-danmark
Naturstyrelsen advarer om, at udvinding af skifergas kan føre til forurening af grundvandet, og at der er brug for mere viden om de kemikalier, der bruges til at udvinding.
Steffen Foss Hansen
Press / Media

**Forskere står med mange ubesvarede skifergasspørgsmål: Der er stadig mange ubesvarede spørgsmål om skifergasboringernes konsekvenser for miljøet og grundvandet.**
Steffen Foss Hansen
10/02/2016
Department of Environmental Engineering, Environmental Chemistry

**Media contribution (1)**

**Forskere står med mange ubesvarede skifergasspørgsmål: Der er stadig mange ubesvarede spørgsmål om skifergasboringernes konsekvenser for miljøet og grundvandet.**
10/02/2016
Energisten, Web
Morten Kammersgaard
http://energisten.mediajungle.dk/2016/02/10/forskere-staar-med-mange-ubesvarede-skifergasspoergsmaal/
Steffen Foss Hansen
Department of Environmental Engineering, Environmental Chemistry

**Relations**
Projects:
Shale gas in a Danish context
Press / Media

**36 risici ved at bore efter skifergas**
Steffen Foss Hansen
03/02/2016

**Description**
Regeringsrapport peger på, at der er 36 risici ved at bore efter skifergas. Ifølge lektor ved DTU Steen Foss Hansen er der dog behov for yderligere undersøgelser.
Department of Environmental Engineering, Environmental Chemistry

**Media coverage (1)**

**36 risici ved at bore efter skifergas**
03/02/2016
Danskfjernvarme.dk, Denmark, Print
Dansk Fjernvarme
162 words
Steffen Foss Hansen

**Relations**
Rapport: Sådan gør vi skifergas miljøvenlig
Steffen Foss Hansen
02/02/2016

Description
Der er en række miljømæssige risici ved at bore efter skifergas, men en ny rapport fra Naturstyrelsen bringer mulige løsninger for dagen.
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Sådan gør vi skifergas miljøvenlig: Der er en række miljømæssige risici ved at bore efter skifergas, men en ny rapport fra Naturstyrelsen bringer mulige løsninger for dagen
Steffen Foss Hansen
02/02/2016
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Bacteria Monitoring in 3D
Hans-Jørgen Albrechtsen
01/01/2016

Description
Article on new 3D monitor that DTU Environment (Hans-Jørgen Albrechtsen) is collaborating on with Grundfos and HOFOR A/S. Published in Water online August 10, 2016
Department of Environmental Engineering, Urban Water Systems

Media contribution (1)
Nanoteknologien buldrer frem på arbejdspladserne
Steffen Foss Hansen
11/11/2015

Subject
Nr. 11 - 2015
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Nanoteknologien buldrer frem på arbejdspladserne
11/11/2015
Arbejdsmiljø, Print
Birgit Bruun Christensen
Steffen Foss Hansen
Department of Environmental Engineering, Environmental Chemistry

Description
Man kan ikke se en nanopartikel med det blotte øje. Nogle er sundhedsskadelige, mens andre er helt ufarlige. En af de store udfordringer for arbejdspladserne er at få overblik over, om der er nano i arbejdsmiljøet – og derefter at tage de rigtige forholdsregler.

Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Interview
02/11/2015
Magasinet Arbejdsmiljø (National), Denmark, Print
Birgit Bruun Christensen
Magasinet Arbejdsmiljø Nr. 11 2015 side 20-24
https://mitarbejdsmiljo.dk/search/node/steffen%20foss%20hansen
Steffen Foss Hansen

Kulstofnanorør kan blive vor tids asbest
Steffen Foss Hansen
21/09/2015

Description
Kulstofnanorørerne er så mikroskopiske, at de kan udrette betydelig skade på lungerne, hvis de bliver indåndet. Den første maling med kulstofnanorør er netop kommet på makredet til professionelle.

Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)
For fire år siden blev malingen Tesla Nanocoating kåret som en af de 100 bedste opfindelser af R & D Magazine. Nu er malingen kommet på det danske marked for professionelle malere - og nu vækker malingen bekymring hos flere ekspert.
Årsagen er malingens indhold af kulstofnanorør. Det skriver dagbladet Ingeniøren.
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Første maling i Danmark med kulstofnanorør vækker bekymring
21/09/2015
Byggecentrum.dk (National), Denmark, Web
Byggecentrum.dk
https://molio.dk/bygnet/nyhed/article/foerste-maling-i-danmark-med-kulstofnanoroer-vaekker-bekymring/
Kulstofnanorørerne er så mikroskopiske, at de kan udrette betydelig skade på lungerne, hvis de bliver indåndet. Den første maling med kulstofnanorør er netop kommet på makredet til professionelle. For fire år siden blev malingen Tesla Nanocoating kåret som en af de 100 bedste opfindelser af R & D Magazine. Nu er malingen kommet på det danske marked for professionelle malere - og nu vækker malingen bekymring hos flere eksperter. Årsagen er malingens indhold af kulstofnanorør. Det skriver dagbladet Ingeniøren.
Steffen Foss Hansen
Press / Media

Kulstofnanorør kan angribe lungerne
Steffen Foss Hansen
21/09/2015

Description
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Kulstofnanorør kan angribe lungerne
21/09/2015
Ingeniøren, Print
Bjørn Godske
Steffen Foss Hansen
Department of Environmental Engineering, Environmental Chemistry
Press / Media

Denmark: Early adopter of water and climate solutions
Sara Maria Lerer
01/09/2015
Department of Environmental Engineering, Urban Water Engineering

Media contribution (1)

Denmark: Early adopter of water and climate solutions
01/09/2015
Asian Water, Print
PERCETAKAN OSACAR SDN BHD
http://www.asianwater.com.my/?startpage=22&iid=121939
Sara Maria Lerer
Department of Environmental Engineering, Urban Water Engineering
Press / Media

Spildevand er ikke spildevand
Ravi Kumar Chhetri
01/08/2015

Description
Our field work on wastewater treatment in Kangerlussuaq, Greenland was published in this newspaper.
Spildevand er ikke spildevand
01/08/2015
Sermitsiaq, Print
Ravi Kumar Chhetri
Department of Environmental Engineering, Urban Water Engineering
Press / Media

Storkøbenhavn får mindre kalk i drikkevandet: Når Hovedstadsområdets Forsyningsselskab frem mod 2024 reducerer kalken i drikkevandet, vil københavnernes vaskemaskiner og opvaskemaskiner holde lige så længe som de midt- og vestjyske. Samtidig vil de spare energi og bruge mindre sæbe.
Martin Rygaard
16/07/2015
Department of Environmental Engineering, Urban Water Engineering

Storkøbenhavn får mindre kalk i drikkevandet: Når Hovedstadsområdets Forsyningsselskab frem mod 2024 reducerer kalken i drikkevandet, vil københavnernes vaskemaskiner og opvaskemaskiner holde lige så længe som de midt- og vestjyske. Samtidig vil de spare energi og bruge mindre sæbe.
16/07/2015
Bolius, Print
Thomas Lemke
Martin Rygaard
Department of Environmental Engineering, Urban Water Engineering

Fordelene ved bioforgasning af organisk affald
Morten Bang Jensen
17/03/2015

Dansk Fjernvarme
Morten Bang Jensen
10/03/2015
Forskere sår tvivl om madaffald som energikilde
Morten Bang Jensen
02/03/2015
Department of Environmental Engineering, Residual Resource Engineering

Media contribution (1)

Forskere sår tvivl om madaffald som energikilde
02/03/2015
Jydske Vestkysten, Print
Morten Bang Jensen
Department of Environmental Engineering, Residual Resource Engineering

Media contribution (1)

Madaffald er en god forretning i Billund
Morten Bang Jensen
02/03/2015
Department of Environmental Engineering, Residual Resource Engineering

Media contribution (1)

Madaffald er en god forretning i Billund
02/03/2015
Jydske Vestkysten, Print
Morten Bang Jensen
Department of Environmental Engineering, Residual Resource Engineering

Media contribution (1)

Udskældt fracking skal rense danske giftgrunde: En variant af den frackingmetode, der bruges til udvinding af skifergas, kan blive fremtidens metode til rensning af forurenet jord. Danmark er først til at forsøge.
Mette Martina Broholm
21/11/2014
Department of Environmental Engineering, Water Resources Engineering

Media contribution (1)

Udskældt fracking skal rense danske giftgrunde: En variant af den frackingmetode, der bruges til udvinding af skifergas, kan blive fremtidens metode til rensning af forurenet jord. Danmark er først til at forsøge.
21/11/2014
Ingeniøren, Print
Bjørn Godske
Mette Martina Broholm
Department of Environmental Engineering, Water Resources Engineering

Media contribution (1)
Professor: Ingen kan give pris på Engsøen: Billund : Kommunens datagrundlag for forureningen af Engsøen er for spinkelt, siger DTU-professor.
Poul Legstrup Bjerg
20/11/2014
Department of Environmental Engineering, Water Resources Engineering

Media contribution (1)

Professor: Ingen kan give pris på Engsøen: Billund : Kommunens datagrundlag for forureningen af Engsøen er for spinkelt, siger DTU-professor.
20/11/2014
JyskeVestkysten, Print
Lars Fahrendorff
Poul Legstrup Bjerg
Department of Environmental Engineering, Water Resources Engineering

Spis rolig grønt fra byens have
Stefan Trapp
25/08/2014
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Spis rolig grønt fra byens haver
25/08/2014
Politikken, Print
Stefan Trapp
Department of Environmental Engineering, Environmental Chemistry

Experts call for focus on hazards of emerging technologies
Steffen Foss Hansen
21/08/2014

Description
Danish experts are calling for increased environmental, health and safety (EHS) funding to improve prediction of potential hazards from emerging technologies, while also maximising commercial lifespan.
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Experts call for focus on hazards of emerging technologies
21/08/2014
Chemical Watch (International), Web
Chemical Watch
https://chemicalwatch.com/20953/experts-call-for-focus-on-hazards-of-emerging-technologies
Danish experts are calling for increased environmental, health and safety (EHS) funding to improve prediction of potential hazards from emerging technologies, while also maximising commercial lifespan.
Steffen Foss Hansen
Press / Media

Experts call for focus on hazards of emerging technologies
Steffen Foss Hansen
21/08/2014
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Experts call for focus on hazards of emerging technologies
21/08/2014
Chemical Watch, Print
Steffen Foss Hansen
Nu skal nanoprodukter registreres
Steffen Foss Hansen
17/06/2014
Department of Environmental Engineering, Environmental Chemistry

Nu skal nanoprodukter registreres
17/06/2014
Lemvig Folkebladet (Regional), Denmark, Web
Marianne Fajstrup
644 words
Steffen Foss Hansen
Press / Media

Årsmøde 2014 - De tekniske oplæg: Den kemiske strategi for et godt badevand
Kamilla Marie Speht Kaarsholm
01/06/2014
Department of Environmental Engineering, Urban Water Engineering

Årsmøde 2014 - De tekniske oplæg: Den kemiske strategi for et godt badevand
01/06/2014
Svømmebadet, Print
Klau Rask Petersen
Kamilla Marie Speht Kaarsholm
Department of Environmental Engineering, Urban Water Engineering
Press / Media

Losseplader truer danskernes rene drikkevand i 50 år
Poul Løgstrup Bjerg
27/05/2014
Department of Environmental Engineering, Water Resources Engineering

Losseplader truer danskernes rene drikkevand i 50 år
27/05/2014
Ingeniøren, Print
Christian Østergaard
http://ing.dk/artikel/losseplader-truer-danskernes-rene-drikkevand-i-50-aar-168630
Poul Legstrup Bjerg
Department of Environmental Engineering, Water Resources Engineering
Press / Media

De tre millimeter mellem os og Solen
Marlene Mark Jensen
15/05/2014

Subject
Gasser, Ozonlaget, Lattergas
Department of Environmental Engineering, Urban Water Engineering

De tre millimeter mellem os og Solen
15/05/2014
Weekendavisen, Print
Christoffer Muusmann
Marlene Mark Jensen
Blødt vand sparer os for millioner: Vandværkerne i hovedstaden vil halvere mængden af kalk i vandet.
Martin Rygaard
10/05/2014

Ny forskning: Ingen gevinst ved at genanvende madaffald
Morten Bang Jensen
09/03/2014

Interview on consequences of drinking water softening in Brøndby
Martin Rygaard
15/02/2014

Nu skal miljøbombe afmonteres
Poul Løgstrup Bjerg
01/01/2014
Job hænger på træerne for miljøstuderende: Vandnørdernes legeplads
Florian Benedikt Wagner
18/12/2013
Department of Environmental Engineering, Urban Water Engineering, Technical University of Denmark

Media contribution (1)

Job hænger på træerne for miljøstuderende: Vandnørdernes legeplads
Mathilde Jørgensen Hedegaard
18/12/2013
Department of Environmental Engineering, Urban Water Engineering

Media contribution (1)

Hvad kan vi danskere: Gode forhold tiltrækker ph.d-studerende
Florian Benedikt Wagner
18/12/2013
Department of Environmental Engineering, Urban Water Engineering, Technical University of Denmark

Media contribution (1)

Den dag Europa kom til Kalunborg
Susan Løvstad Holdt
01/12/2013
Description
Grand opening of the Bioreactor Greenhouse facility in the Kalundborg wastewater treatment plant.
Department of Environmental Engineering, Residual Resource Engineering, National Food Institute, National Institute of Aquatic Resources

Media contribution (1)
Nano-produkter
Anders Baun
13/11/2013
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Nano-produkter
13/11/2013
DR2 Morgen, Web
Niels Krause-Kjær og Anja Bo
http://www.dr.dk/tv/se/dr2-morgen/dr2-morgen-med-niels-krause-kjaer-og-anja-bo-118#!/53:45
Anders Baun
Department of Environmental Engineering, Environmental Chemistry

Regeringen vil bruge 24 millioner på et nano-register
Steffen Foss Hansen
12/11/2013
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Regeringen vil bruge 24 millioner på et nano-register
12/11/2013
DR, Web
Christine Hyldal og Peter Skaustrup
http://www.dr.dk/nyheder/politik/11233723.htm
Steffen Foss Hansen
Department of Environmental Engineering, Environmental Chemistry

Lessons nanotechnology can learn from past mistakes
Steffen Foss Hansen
16/09/2013

Description
Falling in love with a new technology and wanting to apply it everywhere is not a good idea
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)

Lessons nanotechnology can learn from past mistakes
16/09/2013
The Guardian, Web
Michele Catanzaro
http://www.theguardian.com/science/small-world/2013/sep/16/nanotechnology-lessons-safety
Steffen Foss Hansen
Department of Environmental Engineering, Environmental Chemistry

Press / Media

Danish engineer supports water scarcity problems in China
Claus Davidsen
02/09/2013

Description
Background article concerning our research in China.
Department of Environmental Engineering, Water Resources Engineering

Media contribution (1)
Danish engineer supports water scarcity problems in China
02/09/2013
Ingeniøren, Print
Sigrid Møller
Claus Davidsen
Department of Environmental Engineering, Water Resources Engineering
Press / Media

Kina giver mulighed for store armbevægelser
Claus Davidsen
02/05/2013
Description
Special edition of the paper Information (Videnskapløb Forår 2013) with focus on experiences gained by Danish Ph.D.-students during research stays abroad.
Department of Environmental Engineering, Water Resources Engineering

Media contribution (1)
Kina giver mulighed for store armbevægelser
02/05/2013
Information, Print
Martin Gøttske
Claus Davidsen
Department of Environmental Engineering, Water Resources Engineering
Press / Media

Skejby-hospital satser på rationel spildevandsrensning
Henrik Rasmus Andersen
23/03/2013
Department of Environmental Engineering, Urban Water Engineering

Media contribution (1)
Skejby-hospital satser på rationel spildevandsrensning
23/03/2013
Ingeniøren, Print
http://ing.dk/artikel/skejby-hospital-satser-paa-rationel-spildevandsrensning-157270
Henrik Rasmus Andersen
Department of Environmental Engineering, Urban Water Engineering
Press / Media

The tiniest particles that may be a threat as bad as asbestos
Steffen Foss Hansen
27/01/2013
Description
Nanomaterials are everywhere, but their use is totally unregulated.
Department of Environmental Engineering, Environmental Chemistry

Media contribution (1)
The tiniest particles that may be a threat as bad as asbestos
27/01/2013
The Independent, Web
Emily Dugan
Steffen Foss Hansen
Department of Environmental Engineering, Environmental Chemistry
Press / Media

Forfra med Jeppesen (1)
Sarah Christine Boesgaard Christensen
25/01/2013
Department of Environmental Engineering, Urban Water Engineering

Media contribution (1)

Forfra med Jeppesen (1)
25/01/2013
Radio 24syv, Radio
55:27
http://arkiv.radio24syv.dk/video/7649950/forfra-med-jeppesen-uge-4-2013
Sarah Christine Boesgaard Christensen
Department of Environmental Engineering, Urban Water Engineering
Press / Media

Millioner til tang
Susan Løvstad Holdt
29/11/2012
Department of Environmental Engineering

Media contribution (1)

Millioner til tang
29/11/2012
Sydkystens avis, Print
Susan Løvstad Holdt
Department of Environmental Engineering
Press / Media

Alge-biorafinaderi
Susan Løvstad Holdt
28/11/2012
Department of Environmental Engineering

Media contribution (1)

Alge-biorafinaderi
28/11/2012
Danskernes Akademi/DR2, Television
http://www.dtu.dk/forskning/danskernes_akademi/susan%20%C3%B8vstad%20holdt.aspx
Link
Susan Løvstad Holdt
Department of Environmental Engineering
Press / Media

Tang til sushi og salat: Tang er havets grøntsag og en ny afgrøde i Danmark
Susan Løvstad Holdt
20/11/2012
Department of Environmental Engineering

Media contribution (1)

Tang til sushi og salat: Tang er havets grøntsag og en ny afgrøde i Danmark
20/11/2012
Foodculture.dk, Web
Anne Mette Ehlers
http://www.foodculture.dk/Produktion/Gartneri_og_Akvakultur/2012/Tang_til_sushi_og_salat.aspx#.UOb61KxW1Bk
Link
Susan Løvstad Holdt
Department of Environmental Engineering
Press / Media

Havets grønbruene guld
Susan Løvstad Holdt
16/11/2012
Department of Environmental Engineering

**Media contribution (1)**

**Havets grønbrune guld**
16/11/2012
Rasio/Natursyn/P1, Radio
Dorte Dalggaard
41 min
http://www.dr.dk/P1/Natursyn/Udsendelser/2012/11/15122202.htm
Susan Løvstad Holdt
Department of Environmental Engineering
Press / Media

**Asellus aquaticus and other invertebrates in drinking water distribution systems - occurrence and influence on microbial water quality**
Sarah Christine Boesgaard Christensen
30/10/2012

**Description**
Portrait of Sarah Christine Christensen
Department of Environmental Engineering, Urban Water Engineering

**Media contribution (1)**

**Asellus aquaticus and other invertebrates in drinking water distribution systems - occurrence and influence on microbial water quality**
30/10/2012
Web
DTU broadcast
4:06
http://www.youtube.com/watch?v=FdFROp-gzoI
Link to video
Sarah Christine Boesgaard Christensen
Department of Environmental Engineering, Urban Water Engineering
Press / Media

**Jyllandsposten: Blodtud til rygeradvokat**
Stefan Trapp
13/10/2011
Department of Environmental Engineering, Environmental Chemistry

**Media contribution (1)**

**Jyllandsposten: Blodtud til rygeradvokat**
13/10/2011
København, Print
Stefan Trapp
Department of Environmental Engineering, Environmental Chemistry
Press / Media

**En overset guldgrube**
Susan Løvstad Holdt
01/05/2011
Department of Environmental Engineering

**Media contribution (1)**

**En overset guldgrube**
01/05/2011
Print
Susan Løvstad Holdt
Department of Environmental Engineering
Søsalat og fedtemøg baner vej for fremtidige havlandmænd
Susan Løvstad Holdt
01/01/2011
Department of Environmental Engineering

Media contribution (1)

Tang kan både dyrkes og fanges
Susan Løvstad Holdt
01/01/2011
Department of Environmental Engineering

Media contribution (1)

Små dyr lever i vandrørene
Sarah Christine Boesgaard Christensen
01/02/2010
Department of Environmental Engineering, Urban Water Engineering

Media contribution (1)

Smådyr lever i vandrør overalt i Danmark
Sarah Christine Boesgaard Christensen
01/02/2010
Department of Environmental Engineering, Urban Water Engineering

Media contribution (1)

50+ appearances in news media regarding "Animals are living in the drinking water"
Sarah Christine Boesgaard Christensen
29/01/2010
Department of Environmental Engineering, Urban Water Engineering
Media contribution (1)

50+ appearances in news media regarding "Animals are living in the drinking water"
29/01/2010
Infomedia, Print
Sarah Christine Boesgaard Christensen
Department of Environmental Engineering, Urban Water Engineering
Press / Media