Comparison of pollutant emission control strategies for cadmium and mercury in urban water systems using substance flow analysis

The European Union (EU) Water Framework Directive (WFD) requires Member States to protect inland surface and groundwater bodies but does not directly stipulate how the associated environmental quality standards should be achieved. This paper develops and assesses the performance of a series of urban emission control strategies (ECS) with an emphasis on the scientific and technological benefits which can be achieved. Data from the literature, in combination with expert judgement, have been used to develop two different semi-hypothetical case cities (SHCC), which represent virtual platforms for the evaluation of ECS using substance flow analysis (SFA). The results indicate that the full implementation of existing EU legislation is capable of reducing the total emissions of cadmium (Cd) and mercury (Hg) by between 11% and 20%. The ability to apply voluntary reduction practices is shown to be particularly effective for Cd with the potential to further lower the overall emissions by between 16% and 27%. The most efficient protection of the receiving surface water environment is strongly influenced by the city characteristics with the introduction of stormwater treatment practices being particularly effective for one city (59% reduction of Hg; 39% reduction of Cd) and the other city being most influenced by the presence of efficient advanced wastewater treatment processes (63% reduction of Hg; 43% reduction of Cd). These reductions in receiving water loads are necessarily accompanied by either increases in stormwater sediment loadings (2.6–14.9 kg/year or 0.6–2.4 kg/year for Hg) or wastewater sludge loadings (45.8–57.2 kg/year or 42.0–57.4 kg/year for Cd).

General information
Publication status: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Middlesex University
Contributors: Revitt, D. M., Lundy, L., Eriksson, E., Viavattene, C.
Pages: 172-180
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Environmental Management
Volume: 116
ISSN (Print): 0301-4797
Ratings:
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 3.84 SJR 1.203 SNIP 1.988
Web of Science (2013): Impact factor 3.188
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Original language: English
Keywords: Priority pollutants, Semi-hypothetical case cities, Substance flow analysis, Cadmium, Mercury
DOIs:
10.1016/j.jenvman.2012.12.007
Source: dtu
Source-ID: u::3579
Research output: Contribution to journal › Journal article – Annual report year: 2012 › Research › peer-review