Advancing Sentinel-1 use in Coastal Climate Impact Assessments and Adaptation – A Case Study from the Danish North Sea

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Publication date: 2017

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
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A novel approach
The municipality, the water and wastewater utility company, the Port, the national Coastal Authority, Central Region Denmark, private companies and consultants team up with universities to explore future outcomes – and to obtain data and gain common grounds.

Climate adaptation
Protected from sea floods today but flood prone in the future from storm surges, groundwater, precipitation and land subsidence (figs 2-3)

Planning and management
Working the sewers (Fig. 4), running Port business (Fig. 5), keeping citizens happy and coping, and caring for the environment.

Research
Utilizing data and integrating climate impacts factors into non-expert’s concepts. Applying and customizing satellite data for common use and relate to datum network (Fig.6). Investigating time & space dependencies in S-1 signals, and exploring processing algorithm optimization for local area studies.

Approaching target
Water-related climate impacts are modeled in MIKE by DHI (a hydrodynamic modeling tool) to reveal potential future floods from precipitation, sewer stow, high groundwater levels and storm surges. These results are being merged with regularly updated S-1 results, a 3-D geological model and infrastructure in an API or web-GIS (figs 7-8) solution to provide a common framework for adaptation and planning. In addition, real-time data of groundwater levels (10 locations) and sea levels (three locations) are being incorporated into an early warning system for water management.

Not quite there yet
The 2½ year S-1 time series together with concurrent measurements of groundwater and sea levels, the water modeling setup, and the detailed geological model provide ample opportunity to further explore the S-1 signal; and to e.g. relate groundwater and sea levels to variations over time in the detected vertical displacements rates. In addition, the one meter resolution of the geological model may detail our understanding of the local mechanisms of subsidence. The explicit aim for further research is to explain the subsidence encountered by use of S-1 data.