

Climate change and socio-economic impacts on the long term sediment balance in the Belgian Part of the North Sea

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Introduction:

This paper will present the preliminary results of two ongoing and collaborating scientific projects dealing with climate change, the sediment balance and the impact of natural evolution versus socio-economical activities in the Belgian Part of the North Sea (BPNS). The objective of CLIMAR (www.arcadisbelgium.be/climar) is the elaboration of an evaluation framework for adaptation scenarios/measures as a response to climate induced ecological, social and economical impacts, and this for the Belgian North Sea environment. Quest4D (<http://www.vliz.be/projects/quest4d>) focuses on a better definition of the sediment and sediment transport system of the Belgian part of the North Sea by comparing natural evolution with the impact of socio-economic activities.

Methods:

Within Climar, research and modeling will be carried out to differentiate the primary impacts of climate change from the natural evolution at the North Sea scale: sea level rise, increased storminess, possible increased rainfall, erosion, temperature changes, salinity, etc. Then secondary impacts of climate change both on the ecological system of the North Sea as well as on socio-economic activities will be assessed. Two extensive case-studies (coastal flooding, fisheries sector) have high extrapolation potential towards the global North Sea environment. Adaptive measures will be formulated both for the ecosystem as well as for the other marine activities. An evaluation tool will be developed to assess the impact of these measures according to the principles of sustainable development, considering as well socio-economic scenario's.

Considering Quest4D, the research strategy focuses on sedimentation/erosion processes on small and large geographical as well as short and long time scales. Extensive GIS analyses, state-of-the-art observations/sampling, experiments and advanced modeling are used within the space, depth and time domain (4D). Site-specific measurements were performed during several sea-going campaigns. A multi-sensor benthic lander was used for longer-term measurements to determine the variability in near-bed dynamics, including currents and suspended

particulate matter. At locations with a persistent erosion or sedimentation history, measurements on the erodibility of the sediments were performed; these are important as input to numerical modeling. New modeling initiatives include the development of integrated 2D sand/mud transport models extended with a flocculation model; wetting/drying schemes to include the shallow coastal strip; and the dynamic coupling of wave and flow models.

Results and Discussion:

Results on primary impacts (sea level rise, storminess, rainfall, ...) for the BPNS will be explained as part of the outcome of Climar, resulting in different climate change scenario's being used for further research. The link with research in surrounding countries will be touched upon. The impact on other activities (coastal defence, fisheries, tourism) will be illustrated.

The Quest4D presentation will focus on some case-studies with emphasis on the main disposal site of dredged material. Based on acoustic data, sedimentological and biological sampling and vibrocoreing, together with data from Electronic Monitoring Systems, sedimentation/erosion budgets have been quantified at this location. Meanwhile, a historic reference framework is being set-up, based on a sediment and macrobenthos dataset of 100 yrs ago (Gilson dataset). This will serve as a baseline for the evaluation of long-term changes in bathymetry, sediment grain-size, mud content and macrobenthos. Together with data related to dredging, marine aggregate extraction, beach replenishments and infrastructure works, the spatial extent and intensity of impacts are evaluated.

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