

Morphological Study of the downstream tidal Durme - Field Measurements and Numerical Modelling



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Location: Tidal reach of Durme River basin of Scheldt

Partners: IMDC – Grontmij Belgroma
Actualisation SIGMA plan



Sedimentation in the tidal Durme reach

Assignment:

In the framework of the river restoration plan of the Durme (actualisation of SIGMA-plan), the potential impact of a gradually increased upstream flow on the actual (severe) sedimentation in the tidal reach is studied with a 1D-numerical morphological model of the tidal reach of the river Durme.

Scope of Services:

- Morphological field records
- River bed characterisation
- Set-up, calibration and validation of the actual state
- Morphological river process modelling MIKE 11
- River restoration plan

Technical Description:

In the framework of the river restoration plan of the Durme, the potential impact of a gradually increased upstream flow on the actual (severe) sedimentation in the tidal reach is studied.

Therefore, a 1D-numerical morphological model of the tidal reach of the river Durme, based on the calibrated HD model in its actual shape (year 2000), is developed. The model simulation of the actual status of the river is calibrated based on the 20 year morphological evolution records, showing the natural sedimentation processes in the tidal branch. The available river bed topography (year 1977) is used as a starting point for the modelling. In order to establish the initial river bed conditions 20 years ago the 1977 cross-sections are digitally processed into MIKE 11-formats.

The morphological modelling was based on the MIKE 11 model for cohesive sediment transport, in which the riverbed profile will automatically be updated (under the running hydrodynamic impact) during simulations to account for impacts of morphological changes. The model is calibrated based on both the discrete field measurements and a general match of the 20 years of morphological river bed changes.



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Morphological field recording

An intensive field measuring campaign was set up in the (downstream) tidal part of the river Durme. Measurements of suspended sediments reveal a tidal variation in concentration and also a variation with upstream discharge. Long-term continuous turbidity measurements conducted in Tielrode approximately 800 m upstream of the confluence with the Scheldt River, reveal suspended sediment concentrations varying between 100 to 500 mg/l.



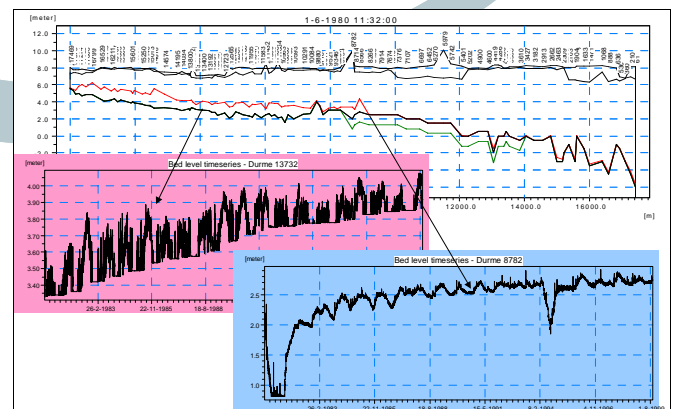
Tidal Durme in Tielrode (near river mouth)

Grain size analysis of bottom grab samples reveals a clear layered river bottom: a fine mud layer on top covers a more consolidated mud/silt mixture above the fine sand river bed material.



Tidal Durme in Lokeren (upstream end)

Secondly, a thorough analysis of the recorded river bed changes reveals some interesting natural processes in the tidal Durme reach. The longitudinal bed profiles from 1977 and 2000 respectively show a systematic and significant increase in bed level. Although the difference in the individual profiles is not significant the large volumes of dredged sediments in the intermediate period indicate substantial sedimentation. Based on limited and fragmented data on dredging activities along the Durme river reach, an assessment of dredged volumes and dredging locations has been made in order to generate a proper estimation of the dredging rate in the numerical morphological modelling.



Numerical modelling results - river bed evolution