

10 years of experience with a new disposal strategy in the Westerschelde: a multi-criteria decision making ride, bumpy but moving forward

Bart De Maerschalcck¹, Yves Plancke¹, Frederik Roose², Jürgen Suffis²

¹Flanders Hydraulics Research, Berchemlei 115, Antwerp, Belgium

Phone: +32 (0)3 224 63 72

²Maritime Access, Department MOW, Thonetlaan 102, Antwerp, Belgium

E-mail:

bart.demaerschalcck@mow.vlaanderen.be

The Western Scheldt (Dutch part of the Scheldt Estuary) and the Lower Sea Scheldt (Belgian) together give access to the port of Antwerp. Over the period 2008-2010 the navigation channel in the Western and Lower Sea Scheldt was deepened and enlarged to guarantee tide-independent access for ships up to 13,1 m draft. For the enlargement of the channel in total 7,7 Mm³ in the Western Scheldt and 7 Mm³ in the Sea Scheldt of sediment was relocated. To maintain the minimum depth of the main channel, on average 9,5 Mm³ sand needs to be dredged in the Western Scheldt and another 4 Mm³ sediment, mainly muddy material, needs to be dredged in Lower Sea Scheldt and the Deurganckdock. In the Western Scheldt twelve sills require frequent maintenance dredging, in the Belgian Lower Sea Scheldt these are 6 sills and the tidal Deurganckdock.

As the estuary is integrally part of the Natura 2000 network, both EIA and AA were necessary both for the capital dredging and for the maintenance dredging. Apart from the ecological function the two other main functions of the estuary are safety and accessibility. In the Western Scheldt all dredged sediment is maintained within the system. Before 2010 the material was relocated mainly in the secondary channels. However, it was overserved that continuing this strategy could jeopardize the multi-channel system. With the enlargement the need for a new relocation strategy arose.

Within the new strategy sediments are disposed (1) near sand bars, (2) in the secondary channels and (3) in the deeper parts of the main channel. The main idea of the new strategy is to relocate the sediments to create morphological structures that influence the local flow patterns, creating low dynamic areas which are beneficial from an ecological point of view. This concept was applied at four locations near sandbars: two locations at the tip of a sandbar (Hooge Platen West and Plaat van Walsoorden), where a “megadune” has been realized, creating a shadow zone behind the dune; and two locations (Hooge Platen North and Rug van Baarland), where a “sandspit” along the sandbar has been realized, aiming at guiding the flow away from the sandbar.

The maintenance of the channel is a bilateral management between the Dutch and Flemish authorities. Therefore, an adaptive management protocol was designed. The protocol is based on planning – design – implementation – monitoring –

evaluation and adaption of the strategy. Within the context of the monitoring and evaluation strategy, a bilateral integrated monitoring and research plan has been implemented.

To evaluate the success of the disposal strategy, an extensive monitoring program was set up and several criteria were defined. The monitoring of the disposal sites consists of frequently topo-bathymetric surveys (multibeam) in combination with seasonal sedimentation-erosion measurements using both RTK (intertidal) and singlebeam (subtidal). These measurements are combined with ADCP and AquaDopps current measurements at different locations.

Parallel with the monitoring, a validated 2D-numerical hydrodynamic model was used to evaluate the effects of the disposal of sediments on the local currents. Every three months, a simulation is performed using the most recent topo-bathymetry. This allows an extra evaluation of the changes in flow velocities and flow patterns near the disposal areas.

Within the SMARTSEDIMENT EU Interreg project an additional tool was developed within the open source Q-GIS software to investigate the effects of the sediment management strategy on the delivery of ecosystem services [2].

Results (2021) show that the applied strategy has led to an increase of 125 ha of low dynamic habitat near the 3 disposal zones where sediments were relocated over the 11 year period. The ecological value of this newly created habitat was similar to existing habitats near the disposal zones [1]. Evaluation shows that a smart adaptational sediment strategy can be beneficial from ecological point of view. However, there are limitations. An enhanced elevation of the bank was considered as undesired. A continuous monitoring, evaluation, research and the bilateral consultation are key factors for an efficient sediment strategy.

References: [1] Plancke, Y.M.G.; Ides, S.J. (2016). Morphological management, a concept for an holistic management of estuaries. ECSA Local Meeting 2016. Estuarine Restoration: from theory to practice and back, University of Antwerp, Antwerp, Belgium, 5-9 July 2016.

[2] Boerema et al. (2019), 11th International SedNet Conference, Dubrovnik, Croatia, 2019