

An integrated technical research of beach nourishment design for the Flemish East Coast

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Along the Flemish East Coast persistent regression of the coastline forms an acute threat. The natural shore profile is gradually weakening and intervention is needed to ensure a sufficient safety level of shore protection. Long-term field records clearly identify that, due to the complex interaction of wave-induced on- and offshore transport, longshore tidal drift and the impact of the breakwater obstruction by the harbour extension of Zeebrugge, a structural erosion problem occurs. Several beach replenishments were already executed in the last 25 years. In order to identify the drastic instability and the morphological impact on the area, an extended research program is set up to explore a basic understanding of the local beach morphology.

As an initial link in the actually popular integrated 'coastal zone management'-chain, an integrated hydromorphological study is explored. By using physical model tests (in collaboration with the Flanders Hydraulics Laboratory) together with computer simulations (SBEACH-software) and in-situ registration, a complete synergy between all components leads to a fully integrated description.

The initial physical scale model tests in a 1D-wave flume generate an overall qualification of the beach nourishment stability as a cross shore unit. Simultaneous numerical simulations reveal some interesting agreements and operational (sensitive) features. The extended 2D-physical model generates a realistic sediment transport development under the complex hydrodynamics, as a combination of perpendicular random waves, longshore ebb-flood currents and vertical tidal variation, confirming the local structural erosion problem.

As a result, an optimum beach protection for the studied coastal area should surpass the traditional sand suppletion if one is looking for a long-term stable beach policy. A perched beach with gravel foot protection at the foreshore can be an alternative solution to the actual, regular maintenance suppletion in this case.