



PRE- AND POST-NOURISHMENT MORPHOLOGIC BEHAVIOUR ALONG THE DUTCH AND DANISH NORTH SEA COAST

In the shoreface of the Dutch and Danish coast nearshore sandbars are present. These sandbars play a vital role in the nearshore morphology; due to the decreased depth at the bar crest, waves break and dissipate a part of their energy before reaching the coast. The sandy North Sea coast of The Netherlands and Denmark are both prone to erosion, especially in case of storm events. Sandbars are important to reduce this coastal erosion.

Amongst other protection measures, shoreface nourishments are applied along both coasts aimed at counteracting erosion so that the coastline is maintained and the probability of flooding is decreased. In case of a shoreface nourishment, see Figure 1, sand is supplied to the coastal zone, commonly around -6m MSL (mean sea level). A shoreface nourishment influences also the migration and position of nearshore sandbars.

In this study, the large-scale and long-term influence of shoreface nourishments on nearshore morphologic behaviour, including sandbar migration, has been investigated by performing an eigenfunction analysis on multi-decadal data sets of densely spaced transects of cross-shore bed level measurements. 92 (transects 5-97) and 156 km (transects 3100-5880) of the Dutch and Danish west coast were analysed respectively over a period of more than 50 years.

Results of this study show that prior to the implementation of nourishments along the Holland coast, nearshore sandbars migrated offshore, with the most seaward bar decaying offshore while a new bar formed near the shoreline. This resulted in bar cycle return periods of 15 and 3-4 years, respectively north and south of the IJmuiden harbour moles. After the application of shoreface nourishments, this offshore migration reduced or stagnated for 1 to 13 years. No consistent relations between implementation characteristics (e.g. volume, grain size, placement depth) and the duration of affected bar migration has been found. The influence of (repeated) nourishments on the bar migration cycle is local, i.e. it is affecting the bar migration no further than 2-3km away from the nourished section. Generally, the alongshore influence of nourishments is very limited and bar switches occur directly at the borders of the nourished section.

Along the Danish Midtjylland coast (transects 5250-5880), generally offshore migrating shore-oblique sandbars are observed. The sandbars have lengths of approximately 6-10 km and are attached to the shore in the north and extend seawards in the south. The observed bar migration prior to the implementation of nourishments forms a noisier and more irregular pattern than observed along the Holland coast. Therefore, no consistent influence of a nourishment on the bar migration has been found for the Danish site.

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26 November 2018

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Figure 1: Application of shoreface nourishment near Callantsoog (Rijkswaterstaat, 2017)