IMPROVING BYPASS AND INCREASING NAVIGATION DEPTH: A VISION FOR HVIDE SANDE HARBOUR, DENMARK

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Abstract

A harbour on a coast blocks the littoral drift causing accretion and erosion at the up- and downdrift side, respectively. Eventually a significant part of the littoral drift may bypass the harbour. In this case it is important to minimize the deposition of the passing sediment in the harbour basin and the harbour mouth. Traditionally navigation channels are maintained, updrift sediment reservoirs are dredged and sand is bypassed mechanically or by repeated dredging and disposal. The sedimentation and depth in front of the harbour depends not only on the littoral drift but also on the layout of the protective breakwaters. The full paper presents an optimisation of breakwater layout in promoting bypass.

Hvide Sande harbour in Denmark is protected by shore-perpendicular breakwaters (see Figure) and experiences considerable sedimentation in its access channel. Facing the need to accommodate larger fishing vessels, the harbour wishes to increase the navigation depth in front of the harbour entrance while at the same time reducing the sedimentation in the access channel. An new scheme is proposed (see Figure) consisting of a combination of new protective breakwaters and an updrift capital dredging of the coastline: while the streamlined breakwaters will increase the bypass of sediment past the harbour mouth by increasing the flow velocity due to contraction, the retreat of the coastal profile will help maintain the required additional water depth needed. The present morphological study shows that the proposed scheme results in an increased equilibrium depth of the bypass bar in front of the harbour without increasing the downdrift erosion, and an improved natural bypass of the littoral drift.