

Comparison of sedimentation in controlled reduced tidal and simple culvert tidal restored sites along the Scheldt-estuary

Lotte Oosterlee¹, Tom Cox², Tom Maris¹, Stijn Temmerman¹ and Patrick Meire¹

¹ University of Antwerp, Department of Biology, Universiteitsplein 1 C0.30, 2610 Wilrijk, Belgium
E-mail: lotte.oosterlee@uantwerpen.be

² Royal Netherlands Institute for Sea Research NIOZ

Along the Scheldt estuary tidal marshes and mudflats are being restored on formerly embanked land. For this purpose several techniques can be used, among them two different forms of regulated tidal exchange: controlled reduced tide (CRT) and simple culvert system (SCS).

In a CRT high inlet culverts and low outlet valves in the dike allow a limited amount of water to enter and leave the low elevated polder area. The created tidal regime in the CRT has almost the same characteristics as the tidal regime on higher-elevated natural marshes in the estuary. In contrast, the SCS consists of a low single passage through the dike so that the full estuarine tidal range (on average 5.35 m) enters and leaves the low lying area without change of the tidal curve. It may be expected that in CRT-marshes or SCS-marshes the interaction between elevation change and consequent changes in tidal characteristics and soil properties deviate from each other and from natural tidal marshes. In this study we compare results on these variables between the systems and discuss possible underlying causes of the observed differences.

The low CRT sites are initially characterized by a strong increase in surface elevation (max. 0.1 m year⁻¹) gradually decreasing over nine years, which coincided with a reduction of flooding frequencies. At high sites elevation change rates and flooding frequencies started to increase after several years.

In the SCS-area, extremely high sedimentation rates (3.8 m year⁻¹ at low sites, 0.7 m year⁻¹ at high sites) were observed within the first months. Very quickly, liquid mud covered the whole SCS-area. Due to an unexpected event, the area was cut off from tidal influence for 1.5 years, in which the area drained. Soon after re-opening the culverts, the evolved creek system maintained and a well-drained, ecologically well-functioning mudflat system formed.