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Morphological evolution of an intertidal area following a set-back scheme: a case study from the Perkpolder Basin (Netherlands)

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In the present context of sea-level rise, the recreation of previously reclaimed intertidal areas represents an opportunity to build dynamic coastal defences, to decrease flooding under storm conditions by dissipation of wave and surge energy across the vegetated domain. In Europe this approach started in the late 1990s along the coast of eastern and southern England but it is now becoming common to many European countries around the North Sea margin. The process of salt-marsh recreation normally develops around the opening or removal of flood protection structures and gradual flooding of the hinterland. As the intertidal zone starts to build-up, vegetation colonizes the area and a proper saltmarsh develops. The process of saltmarsh colonization is normally natural, e.g. plants are not artificially inserted, therefore they can only establish themselves once the tidal flat reaches a certain elevation. Thus, there are still a number of unknown processes, such as changes in grain size and speed of deposition following the decrease in tidal inundation as the tidal flat builds up.

This paper reports on tidal flat formation and sediment dynamics in the Perkpolder basin, SW Netherlands (NL), following the conversion of a reclaimed area into a tidal flat, after opening of an inlet in the flood defence structures in June 2015. The main focus of this study consists in determining the evolution of the tidal flat since the opening and identify where and when the condition for salt marsh formation could occur. To reach this objective, numerous topographic surveys were undertaken, together with surface sampling. Sedimentation rates at fixed sampling stations were assessed as well suspended sediment concentration during the passage between neap and spring tides.

The morphological relative to the inlet formation proved that after 6 - 8 months after the opening the inlet reached equilibrium. The average accretion rate across the whole study area was about 6 - 7 cm per year. The average deposited sediment is about 200 g/m^2, while the suspended sediment ranges between 0.16 – 0.55 g/L. Considering the higher regions of the study area and assuming that the sedimentation will remain constant in time, the conditions for salt marsh formation will not be reached before a further 6 years. Similar values of accretion were found in the experimental stone-gabion and clay-filled terraces made in the tidal flats near Tollesbury (England) where the average accretion vary between 3.27 and 7.1 cm per year. Coastal managers will need to take this rate of growth into account before an efficient saltmarsh will be able to provide enhanced flood protection capabilities.