

Restoring estuarine functions in combination with safety management: ten years of data from the first CRT

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When considering marsh (re)creation or restoration on embanked sites, managed realignment is not always an option, due to site characteristics or safety considerations. For this purpose flood control areas combined with a Controlled Reduced Tide (CRT) (a form of regulated tidal exchange) can offer an alternative.

CRT allows the implementation of a restricted tidal regime by the use of high inlet culverts and low outlet valves, as well as storm flood protection. Although the tidal amplitude is strongly reduced, the newly created marsh is subjected to flooding characteristics similar to the natural marshes in macrotidal estuaries. It allows the introduction of a wide range of flooding frequencies in a polder with an elevation far below the estuarine mean high water level. At the same time spring- neap tide variation is maintained, but the the hydroperiod is extended compared to natural marshes.

Results of intensive monitoring on the CRT pilot site Lippenbroek demonstrate the potentials of this approach. Here we present these data on tidal variation, nutrient processing, species colonization and habitat development in the CRT pilot.

Mass balance studies show that the CRT acts as a sink for e.g. nitrogen. The site evolved from a source to a sink for phosphorus. Rapid colonisation by typical estuarine and wetland species was observed for plants, benthic invertebrates, fish and birds. Vegetation patterns and sedimentation rates are highly linked to site elevation and related flooding characteristics. Yet, long term predictions are difficult since a CRT has no feedback mechanism that decreases flooding frequencies with increasing elevation of the marsh. This is because of the tidal volume entering the CRT being independent of site elevation, but being dependent on culvert dimensions, which can be fully adjusted. In this way, tidal regime, sediment dynamics and ecological evolution can be modified according to the restoration goals.