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Controlled floodbasins: driving land-level rise along estuaries

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Dikes are the conventional means of flood defence along rivers and estuaries. However, dikes gradually lead to the superelevation of waterbodies, and the common method of enforcing dikes is unsustainable as this is expensive, contends with limited space for urbanisation and may aggravate ecological deterioration. Therefore, future flood management requires new, sustainable strategies that not only minimise flood risk, but also steer land-level rise and improve ecology. An example is controlled floodbasins, where a part of land is temporarily opened to the tide to capture sediment and rise well above mean sea-level. This study explores how the sequence of opening controlled floodbasins affects sediment capture and large-scale estuary dynamics through 2D modelling in Delft3D. To this end, different floodbasin configurations and delays of opening floodbasins were tested along the Western Scheldt Estuary (NL). Findings show land-level rise in all configurations. However, opening more floodbasins results in a lag of muddy sediment capture in floodbasins opened later in a sequence, most likely due to a deficit of fines. Opening of the more landward located floodbasins generally leads to a stronger reduction in tidal range if opened alone or at the start of an opening sequence compared to more seaward located floodbasins. Also, the floodbasins seem to result in stronger erosion and deposition patterns in the estuary seaward of the floodbasin inlets, but it is still unclear whether and how this trend influences the channel migration rate. The results imply that a well-chosen location and timing of opening floodbasins, which may vary for different estuaries, can have a positive impact on reducing flood risk.