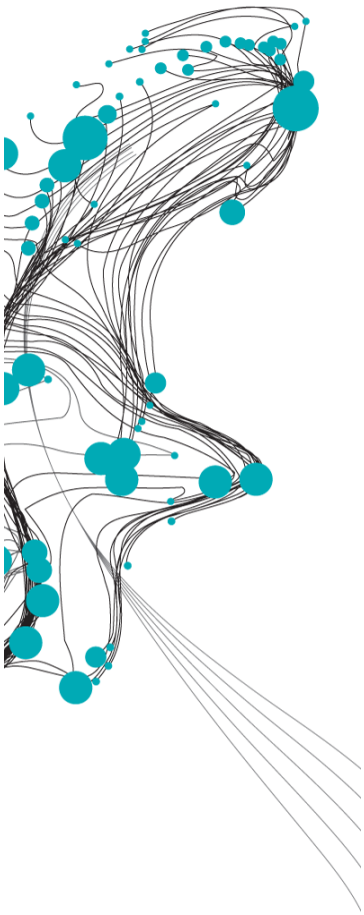

UNDERSTANDING THE HYDRODYNAMIC EFFECT OF GROYNES AT INTERTIDAL TIDAL FLATS IN ESTUARIES.

Land reclamations, dredging activities, dike reinforcements and sea level rise caused the habitats of birds and benthic species in the Western Scheldt to decrease in surface area with approximately 3200 ha. The ecological value is classified as an insufficient condition of conservation. To increase the ecological value of the Western Scheldt, 600 ha estuarine nature is planned to be created. One of the projects contributing to this goal is creating ecological valuable low-dynamic intertidal area by the construction of groynes at Baalhoek and Knuitershoek. The design of these groynes consists of two heightened groynes and one new groyne at Knuitershoek, and one heightened groyne and one new groyne at Baalhoek.

The main objective of this thesis is *to understand how the newly-constructed groynes at Baalhoek and Knuitershoek in the Western Scheldt affect the hydrodynamics and sediment-dynamics at the intertidal flats and nearby tidal channels.* First, data analysis is performed on the situation before the implementation of the groynes. This analysis showed that the flow velocities at both locations are too high for the areas to be classified as low-dynamic, and that the flow velocities on the flats are flood dominated by means of maximum flow velocities. Next, the data is used to set-up a depth averaged numerical model (Delft3D Flexible Mesh) to simulate the impact of the design and perform a scenario study to investigate the impact of changing the groyne height, the length of the high water resting areas as seen at Knuitershoek, and the number of groynes. Based on the initial hydrodynamic effects, the design created less low dynamic area compared to the demand of the Province of Zeeland.

It is recommended to reconsider the design at Baalhoek by using the results of the scenario study. This study showed that increasing the groyne heights or adding an extra groyne has increasing effects on the amount of low-dynamic area. The effect of high water resting areas is depending on the location and should not be implemented at Baalhoek.

For further research, validation of the KnuBa-model with measurements after the implementation of the groynes is advised. This model could also be extended with waves, sediment transport and bed level changes. Furthermore an extension of the definition of low-dynamic area with waves and the percentage of time that critical velocities are exceeded should be considered. At last, the design graphs for the amount of low-dynamic area as function of the groyne height and the high water resting area length should be further studied for a more general applicability.

Figure 1: The locations of the intertidal flats Knuitershoek and Baalhoek

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