Assessment of wave run-up reduction by salt marshes

The purpose of this thesis is to analyze the salt marshes in the eastern Wadden Sea which are located in front of the dike and assess how these areas influence the waves. Additionally, this thesis looks into the uses of flotsam lines. These lines are made up of pieces of floating debris (or: flotsam) which are transported by waves and left on the slope of a dike, marking the maximum wave run-up for a dike section (Figure 1). The reason for this research is that in evaluations of the required height and strength of a dike, the salt marshes are not taken into account. This means that the design of these dikes is oversized and costly. By determining the impact of the salt marshes on wave conditions under design conditions, it is possible to reduce the uncertainties and take the effects of the salt marshes into account in future dike safety evaluations. Dikes could be deemed 'safe' for additional decades, saving up to several million euro per kilometer of shoreline. The flotsam lines are a low-cost source of information and by showing the possible use of this method, valuable data can be gathered after a storm passes in locations where no wave measurements are available.
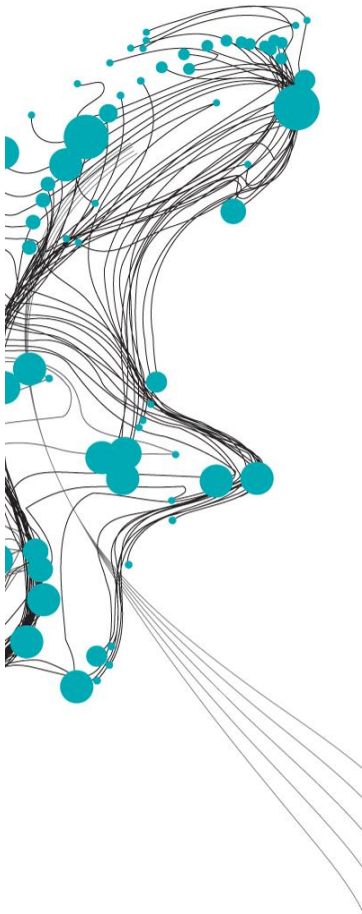

Figure 1: Photo of the salt marsh with the flotsam line on the slope of the dike

What was concluded in this research is that the salt marshes have a significant impact on the wave height during design conditions, reducing wave run-up by up to 41%. The analysis inof the flotsam lines, compared to the foreshore characteristics showed that the flotsam lines are a good indicator for local wave conditions. Additionally, the shape of the flotsam lines is replicated with results from the 2D model. However, it was not possible to replicate the exact values of the flotsam lines for all measured points. This is caused by a combination of uncertainties related to both the model and the measurements.

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