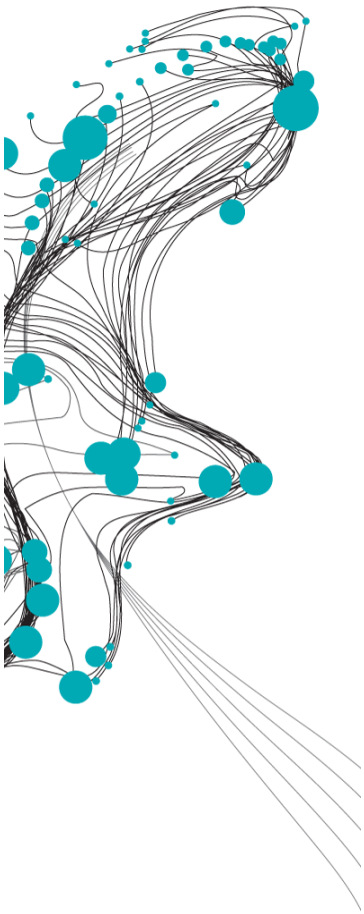
EVALUATING SPATIAL MEASURES WITH A D-HYDRO MODEL TO REDUCE FLOOD RISK BASED ON THE DUTCH FLOOD SAFETY STANDARDS



All over the world flooding is experienced, which can result in casualties and large monetary damages. The Netherlands is prone to flood risk from the larger rivers and the sea and has therefore adopted strict flood safety standards. In a recent policy shift a multi-layer safety approach was designed to minimize flood risk. However, flood reduction using spatial measures and crisis management is often overlooked.

The main research objective of this study is to; identify and evaluate spatial measures that can be implemented to reduce flood risk by evaluating the Dutch flood safety standards using D-HYDRO. First, the influence of model complexity on the derived safety standards is assessed, in order to make a comparison between effectiveness of calculated measures and model uncertainty. After that, the spatial measures from literature were ranked using semi-structured interviews with experts. Lastly, the most promising spatial measures were evaluated by comparing their investment costs with the added benefits of the measures.

Using a different flood simulation model has both an impact on the local individual risk (LIR) criterion and on the societal cost-benefit analysis (SCBA) criterion. For the LIR criterion the most important impact is the large differences in water depth, which mostly result from the different way breach flow is modelled. Line elements also play an important role, both for the magnitude and the spatial distribution of the mortality, because of the high ascent rates that they cause. For the monetary damages, most of the flood risk already occurs at a water depth of 1 m, therefore it is more important which parts inundate than the exact inundation depth. For most norm segments this resulted in a different safety standard classification, than calculated with Delft-FLS.

Two different spatial measures were evaluated, namely heightening a highway using a temporary flood defence and decompartmentation by removing a regional dike. The temporary flood defence measure showed to be effective to decrease the total amount of monetary damages and the total costs when including investment costs. However, north of the highway locally flood risk is increased because of the increased water depths. The decompartmentation measure is effective in reducing the local individual risk (LIR). However, it does increase monetary risk, as a result of the increased number of victims and monetary damage. Spatial measures were in this case not effective enough to result in a lower safety standard classification, therefore dike reinforcement remains necessary.

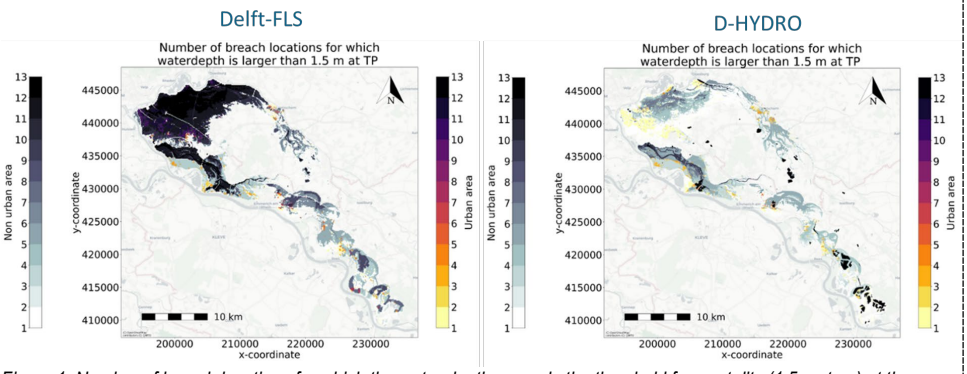


Figure 1: Number of breach locations for which the water depth exceeds the threshold for mortality (1.5 meters) at the normative discharge scenario, for both the Delft-FLS model and the D-HYDRO model

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