

Title of the project: Sensitivity analysis of the safety levels for the Dutch primary water defenses	
Assignment no.: 02.19	Internal/external: External
Head graduation committee: Martijn Booij	Daily advisor: Marcel van den Berg/ Ric Huting (Royal HaskoningDHV)
Name(s) of participating companies or institutes: Royal HaskoningDHV	Start of the project: A.s.a.p.
Required courses: Hydrology, Data analysis, basic knowledge of flood risks, inundation calculations, GIS, cost-benefit analysis, statistics	
<p>Introduction</p> <p>Since 2017 new safety levels for the Dutch primary flood defenses have been established in the Dutch Water Act. These safety levels have been determined based on the calculated flood risk levels in the different dike ring areas in the Netherlands. This approach is different from the old approach in which the safety levels were based on the probability of exceeding a certain water level.</p> <p>The safety levels are based on the highest safety level according to (amongst others):</p> <ol style="list-style-type: none"> 1. Probability of casualties as a result of a flood event (local individual risk or LIR). The maximum level for every location in the Netherlands has been determined at 1:100 000 (base safety level). To achieve this a certain safety level is necessary for the flood defenses. 2. A cost-benefit analysis (CBA). Stronger flood defenses cost more and will result in a lower flood risk (in terms of damage in euros to buildings, cars and people). The economically most optimal safety level can be determined for all the flood defenses. <p>In the Dutch Water Act the calculated safety levels for all Dutch primary defenses have been established. A method has been developed to determine these safety levels. This method is based on inundation calculations for different events (for different locations and different probabilities). The inundation calculations can be used to determine the number of casualties for a certain event depending on the evacuation level. The different events for the different locations are statistically combined to determine the LIR. The same method can be applied to determine the costs in case of flooding. The method is described in the report: "Achtergronden bij de normering van de primaire waterkeringen in Nederland, Ministerie I&M, 2016 (in Dutch only)".</p> <p>Objective</p> <p>The new safety levels and the method to determine these safety levels are based on a number of assumptions, inundation calculations, GIS analysis, statistical analysis. Most of these lead to a conservative safety level. This will result in relatively high costs for the defenses. To further complicate this, the safety levels for different parts of the defenses in the same dike ring area are dependent on each other, a higher level for a certain part will result in lower levels for other parts. There are a lot of opportunities to sharpen the safety levels of the flood defenses. Using a sensitivity analysis, we would like to gain insight in the parts of the method that are the most sensitive and ways to improve this method.</p>	

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