FLOOD SECURITY STRATEGIES: A RISK- AND UNCERTAINTY-BASED APPROACH

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ABSTRACT (for oral paper presentation)

The current flood policy in the Netherlands is based on the principle that the coastal defence system should be strong enough to resist a certain critical water level. It is, however, recognised that it is better to look at the actual flooding probability, which depends on the weakest point in the defence line. A second development is the recognition that looking at exceeding frequency or flooding probability is a one-sided approach, since it lacks attention for the damage if flooding would occur. Risk of flooding can be divided in three categories, individual, societal and systemic risk (Jonkman et al. 2003; Hoekstra, 2005; OECD, 2003). By draining land and building extensive river and coastal protection systems/works the Dutch ensured a low probability of flooding, thereby still accepting extreme consequences in case of failure. This leads to a low overall risk; (R = P*C), but results in high systemic risks. Climate change poses a major future challenge and introduces large uncertainties, which are subject of controversial discussion among the scientific community. Enhanced by economic growth in coastal regions, the results of climate change increases the systemic risk. This calls for an integrated approach, which focuses on all steps in the safety chain.
The objective of this study is to develop, analyze, and assess innovative flood security strategies using risk and uncertainty as leading principles.
Innovative flood strategies are developed that decrease the potential damage and therewith increase the system resilience. These strategies account for factors such as elevation, land use, capacity of roads, population density and proximity to the sea. The first strategy uses flood shelters to facilitate the self preparedness on a local scale. The area is divided in risk zones where flood shelters are allocated. Risk and crisis communication is needed to raise awareness and increase the self preparedness. The second strategy, compartmentalization, protects critical functions in the area and decelerates the flooding process by dividing the area into compartments with the use of dikes, utilizing existing line elements in the landscape where possible. The third strategy, proposes a broad robust coastal defence line. This creates a more gradual transition from sea to land, which reduces the wave power and adds to the ecological development of the area.
Flood shelters reduce the number of casualties, but have little effect on the economic damage, flood probability, or spatial damage distribution. Compartmentalization leads to gradual, more or less guided flooding, which results in less economic damage and less casualties but causes an inhomogeneous spatial damage distribution. The location of the compartment dikes is critical for the success of this strategy. The third strategy decreases the flood probability by reducing the wave power and combines this with ecological development. A combination of these two strategies appears to be promising for areas close to the sea, which are most vulnerable. Flood shelters can reduce the amount of casualties and the evacuation is reinforced by compartmentalization as it slows down the progress of the flood and reduces the economical damage.

References

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