

## THE USE OF DIFFERENT FLOOD SCENARIO'S INCLUDING WORST CASES FOR EMERGENCY PLANNING AND FLOOD PREPAREDNESS

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Flood preparedness is based on the frequency and possible impact of a flood and possible mitigating measures. This paper focuses on emergency preparation. Preparation is defined as: to maximize the use of available means and infrastructure in a possible event (threat or flood). The reduction of the impact of these measures depends on the impact of a flood and the available time to implement measures. When ambitions, as the required level of safety, are defined for emergency preparation the frequency of possible flood scenario's can be used in a risk based approach to define the required level of safety and effectiveness of emergency management (and so preparation of authorities, citizens and businesses). Therefore a representative set of scenarios is required.

Multiple flood scenarios can be defined varying from small events up to worst (credible) cases. History shows that in case of a flood event often multiple breaches and failures occur. Water levels can, by far, exceed the height and strength of the prevention system. Dikes and levees can also fail because of other circumstances as wrong design and bad maintenance. For the design of safety levels for flood prevention a (probabilistic) cost benefit approach can be used to define optimal safety levels; investments can be related with the reduction of the risk. For land use planning and emergency management within a protected area this only becomes effective when a flood occurs, so if the system of prevention fails. Multiple scenarios of flooding can occur and also defined in advance.

This research defines an approach to define a set of representative flood scenarios based on all known possibilities for emergency management and land use planning. This approach is applied for a case study in The Netherlands.

A scenario for flooding for emergency management contains an element of 'impact' and 'time', based on this combination also the probability can be defined. The impact related to the size of the flood zone, the number of inhabitants, damage and casualties. The time is related to the available time before a flood (lead time) and the progress of the flood over time. Combinations of impact and time can be used to define the effectiveness of mitigating strategies. When uncertainty is taken into account different classes can be defined over time and impact. Different classes for time are: 1) red: unexpected flood (missed call) 2) green: enough time and 3) orange: a middle class of medium time. Different classes for the impact are: 1) expected flood in an area related to return period of safety level 2) small flood in an area: a probability of 10 times below the return period of the safety level 3) extreme flood in an area: a probability of 10 times more than the return period of the safety level and a combination of multiple breaches and 4) a worst case or worst credible flood (extreme flooding in multiple areas caused by the same event) that describes an upper limit that is considered to be realistic to take into account for planning.

