

CASE STUDY

US EXPERIENCE TO DEFINE SAFETY STANDARDS FOR FLOOD RESPONSE PLANNING IN THE NETHERLANDS

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Samenvatting

Overstromingen zijn in Nederland een uitzonderlijke gebeurtenis. Hierdoor is er in Nederland nagenoeg geen ervaring met dergelijke situaties. In de Verenigde Staten komen (grote) overstromingen en andere water gerelateerde rampen vaker voor. Er is daar dus meer ervaring met de organisatorische voorbereiding op overstromingen. Voorbeelden van recente overstromingen en ervaringen met rampenplannen zijn de (dreigende) overstromingen als gevolg van de orkanen Katrina, Gustav en Irene, en de overstromingen van de Mississippi. Het Ministerie van Infrastructuur en Milieu heeft in 2009 het 'Netherlands US Water Crisis Research Network' (NUWCREN) opgericht. Het doel van dit netwerk is het delen van ervaringen en kennis uit Nederland en de Verenigde Staten rondom het thema van de voorbereiding op overstromingen. Dit artikel beschrijft de resultaten van de workshop op 26 mei 2011 waarin is gekeken naar het effect van maatregelen om de voorbereiding op overstromingen te verbeteren. Centraal stond hierbij de vraag "hoe veilig is veilig genoeg" en hoe je dat zou kunnen bepalen.

Abstract

Flooding is infrequent in the Netherlands, therefore experience with floods and related disasters response is limited. In the United States floods and flood response happen more often. Examples of such flooding events include: the flood events caused by hurricanes Katrina and Gustav, those caused by hurricane Irene in New York, and several floods along the Mississippi river. The Dutch Ministry of Infrastructure and the Environment therefore initiated the 'Netherlands US Water Crisis Research Network' (NUWCREN) in 2009. The objective of NUWCREN is to share experience and knowledge related to flood response planning and disaster response from both the US and the Netherlands. This paper presents the results of a workshop held on 26 May 2011 focused on emergency management activities with regard to flooding in answering the question: How safe is safe enough?

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■ What is NUWCRen?

NUWCRen is a network that was funded by the Netherlands from 2009-2012 in order to develop a sustainable network of US (Universities of Delaware, Boulder, George Washington and Virginia tech) and NL (Deltares, HKV, TNO, Wageningen University and COT) based partners that could exchange critical information related to water crises. Members of the network have been exchanging ideas for a number of years and have hosted a number of meetings and workshops in the Ne-

therlands and participated in the discussions. During the workshop experiences of the US were shared and discussed for use in the Netherlands. This discussion is related to the Dutch concept of “multiple layer safety”¹ in which flood risk management is spread over three separate layers: 1 prevention, 2 land use planning and 3 flood response planning. It also draws on lessons gathered from a meeting in November 2010 in the United States focused on Katrina, 9/11, and the Deepwater Horizon oil spill. This resulted in a first draft of

States

Historically, more attention has been placed on flood response activities in the United States then in the Netherlands. Even so, throughout time interest with risk management and mitigation measures (land use planning and prevention) has waxed and waned. What results is a system where engineered protection systems are built to standards much lower than in the Netherlands. On the other hand, since the middle ages the Netherlands has invested in flood prevention resulting in the

SINCE THE MIDDLE AGES THE NETHERLANDS HAS INVESTED IN FLOOD PREVENTION RESULTING IN THE HIGHEST SAFETY STANDARDS FOR FLOOD PROTECTION IN THE WORLD, BUT HAS PAID RELATIVELY LITTLE ATTENTION TO HOW TO RESPOND AND REACT IF THOSE PROTECTIONS WERE EVER TO BE SERIOUSLY OVERWHELMED

therlands. This paper was developed as part of one of those meetings. The purpose of the workshop, where these ideas were generated, was to consider how to define safety standards for flood preparedness and response.

The workshop of the 26th of May was organized by the NUWCRen member HKV, the University of Delaware and Deltares. Members of water boards, safety regions, Rijkswaterstaat, ministries, and the former Task Force Management Flooding were invited

a concept to define and to deal with requirements for flood response planning as the 3th layer of multiple layer safety.

Short introduction to Flood risk management and Multiple Layer Safety in the Netherlands and the United

¹ Ministry of Transport Public Works and Water Management. National Water Plan, The Hague, 22 december 2008

highest safety standards for flood protection in the world, but has paid relatively little attention to how to respond and react if those protections were ever to be seriously overwhelmed. However, this is also changing and over the last decade, the Netherlands has begun to focus more attention on how to deal with the consequences of a flood. Developing such systems is difficult however, given that public perception of

Photo 1. Large-scale shelter for evacuees in the United States



flood risk is very low². Modern changes reinforce the importance of greater response capability.

Safety standards for prevention in the Netherlands are based on cost benefit analyses with data of the 1960's. We see that economic and population growth have created a situation where a failure would likely produce catastrophic losses and that the recent safety

standards might not fit any more. In the coming years, decisions will take up the issue of new safety standards as defined in the program of the Delta Commissioner. Therefore risk analyses have been done that take the probability and the consequences into account. Also several pilots have been done to get experience with multiple layer safety.

In the case of flood response planning it is often stated that organizations and governments are prepared enough, in Dutch "op orde" (for examples see the working program of the Delta Com-

missioner 2011 and the advice of the second delta commission). Yet it is apparent that no meaningful conceptual or measurable criteria have been provided to guide such activities³, nor has a meaningful dialogue on what such preparedness requires been conducted.

Despite the absence of criteria for land use and flood response planning assumptions are made based on risk

2 T. Terpstra. Flood preparedness; Thoughts, feelings and intentions of the Dutch public, University of Twente, 2009.

3 B. Kolen, B. Maaskant and F. Hoss. Multiple layer safety: without safety standards no chance (in Dutch), Ruimtelijke Veiligheid 2010.

analyses and cost benefit analyses to determine the optimal level of prevention. These studies also result in a remaining individual and group risk for loss of life. In order to fully espouse a multi-layer safety approach these issues need to be discussed by practitioners, politicians, bureaucrats, and the public. By drawing insights from the US and the Netherlands we can see how important it is to move from a

ted that citizens as first responders are typically not taken into account for large-scale events. They also noted that people tend to take measures that are known to them and closely related to their day-to-day work despite the fact that in these types of events uncommon solutions are typically more effective. They also suggested that crisis commanders often have to deal with scarcity of equipment, personnel, mass

areas around flood control devices has led to a risk trade off where frequent smaller and larger events are being exchanged for large catastrophic but less frequent events sometime in the future. The existence of this residual threat is important particularly because the public expects the government to be prepared. US research shows how the public, experts and authorities deal with the concept of risk and safety and

DURING EMERGENCY PLANNING PEOPLE TEND TO UNDERESTIMATE THE CONSEQUENCES OF EVENTS

one-layer flood safety policy to a multiple layer policy to be able to define the adequate measure in each layer. Here we provide some insights that describe the role of flood response planning with regard to multiple layer safety.

The United States Experience and the need for preparedness

In November 2010, during a NUW-CReN meeting organized by George Washington University, crisis commanders from a number of major US disasters shared their experiences managing major catastrophes. Individuals that participated in the oil spill in the Gulf of Mexico (Deepwater Horizon), 9/11 for the Pentagon, and Katrina were present. These individuals provided a number of important insights. They suggested that during emergency planning people tend to underestimate the consequences of events. They no-

impact, and autonomous response of citizens. It should be noted that all of these insights were made in the US context where the formal and material level of response preparedness far exceeds that of the Netherlands. All these examples highlighted a complex environment that needs to be addressed by a more articulated and interconnected system in which all the components (policy makers, emergency managers, experts and the public) contribute to the achievement of the same goal that is that of maximize safety.

Community and Safety

The University of Delaware also described flood safety as a complex reality. They suggested that the risk for flooding will remain even if the probability of an event is further reduced by strengthening (delta) dikes, simply because of the existence of the threat. They also suggested that development in the

how their perceptions before and after a flood will often come into conflict during major events. While the public does not expect that the risk will be reduced to zero, they do expect that some response will be forthcoming. Despite the fact that time and equipment will be limited, the public and government will be better off when adequate measures are taken to prepare for a disaster. Exactly how much should be done is hard to say. While experts often focus on a risk-based approach and decision makers tend to use cost benefit analysis it must be noted that all safety standards are related to an acceptable level of risk and require stakeholders to discuss and determine what level of consequences can be accepted and what should be guarded against.

Given that all of these measures are based on the same funding (tax payers' money) attention is required to determine the relationship between the

measures taken by the authorities, their functional outcomes, public perception of risk reduction measures, and public desires or expectations for safety. In short, while costs and benefit tools can provide valuable insights in deciding what measures have to be taken with regard to the acceptable level of risk, without a connection to public deliberative discourse they alone are insufficient.

First concept of safety standards for flood response planning

- Early warning procedures (as part of the Netherlands Water Management Centre)
- Emergency planning (such as planning for extreme water levels, flooding and evacuation)
- Education and training programs
- Risk and crisis communication (such as risk mapping on the internet)
- Information management and systems such as the net-centric approach, FLIWAS and LCMS.

lands the use of worldwide experiences translated to the Dutch situation is necessary. In the US the effectiveness of preparation can be measured after events because these happen frequently. Improvements after Katrina were already tested a few years later during hurricane Gustav⁴. For the Netherlands it is estimated that critical water levels for the evaluation of emergency measures occur with a return period of 100 years⁵, and mass evacuation is foreseen with a return period of 200 year⁶.

For the Netherlands the requirements for flood response planning

THE PERCEPTION FOR FLOOD RISK IS VERY LOW IN THE NETHERLANDS AND IT MAY BE QUESTIONED IF PEOPLE ARE INTERESTED AT ALL

As a result of these insights, the workshop resulted in a conceptual vision of how to consider safety standards that includes three different activities:

1. Basic requirements
2. Proven effectiveness
3. Dialogue

Level 1: Basic requirements of flood response planning

This level describes the required elements and procedures for flood preparedness. These elements and procedures are based on the current working processes in water boards and safety regions. The need for these processes is often already described in laws or used by inspections. These elements and procedures are:

Level 2: Proven effectiveness for flood response planning

Because the threat cannot be eliminated completely, it is important to consider measures that can reduce the consequences of flooding and therefore the risk. These preparations could be selected from a set of possible interventions that would help prepare people for dealing with the consequences. For example, education, training, exercises, and the level of preparedness could be measured and related to annual requirements. The consequences of these measures in a reduction in damage and loss of life should be determined.

Given the lack of data in the Nether-

lands could be described in a systematic way that blends standardized and qualitative approaches. Such an approach would use literature, models (for water levels, flooding scenarios, forecasts and traffic) expert judgment, and community inputs to assess the relationship between basic activities, interven-

4 J. Cole. Hurricane Gustav - Testing the Lessons Learned from Katrina, Emergency Management, Editor, HSR Monitor, 2008.

5 Ministry of Transport Public Works and Water Management and Unie van Waterschappen. National plan for extreme water levels and flooding (in Dutch), Lelystad, RWS Waterdienst, 2010.

6 B. Kolen and B. Maaskant. Evacuation in cost benefit analyses (in Dutch), Delft, HKV lijn in water for Deltares, 2010.



Photo 2. Stopping seepage through a Dutch dike with sand bags

tions. All of these would be focused on determining the appropriate levels of preparedness. Such an approach could be adjusted as tests and experiences relevant to flood preparedness occur and as changes in organizations, society, climate, or infrastructure happen.

Some of the basics for such a model have already been defined and are used both in risk analyses (as VNK2) and for the cost benefits studies (cost benefit analyses as part of the Delta Programme) for the new safety levels. These studies assumed a certain number of people that is able to evacuate from an area, also the economical value for loss of life and the consequences of false alarms are taken into account. However much work is needed to advance such model and unlock the logic and expectations hidden in calculations which have not been made explicit.

Level 3: Dialogue

What safety standards for flood response planning look like and what risk level is acceptable, is a political choice⁷. A dialogue with involved stakeholders can be used to evaluate if the rational approach based on costs and benefits is reasonable and desirable or if other measures might be required. A dialogue with the public, however, will be a difficult task. The perception of flood risk is very low in the Netherlands and it may be questioned if people are interested at all. This makes the task even more im-

portant. If we are to consider citizens as partners in safety it is critical that governments engage openly with the public on such matters by making citizens more aware of the threat.

Concluding remarks and recommendations

A more integrated approach to safety can reduce disastrous consequences. The NUWCREN workshop concluded that safety standards or guidelines for flood response planning are required; therefore, a first outline is developed for safety standards for flood response planning based on three levels 1) basic requirements 2) proven effectiveness and 3) dialogue. A standardized approach to define these safety standards for flood response planning can be used to develop and test preparation over time. This standard can also be used to implement new knowledge and experiences.

The use of multiple layer safety strategy requires that the effectiveness of flood response measures is known and can be related to other layers. The basic requirements (level 1) already exist; the effectiveness has still to be determined (level 2). Shared safety or guidelines for flood response planning, as a result of a public discourse, are needed in support of a more traditional approach based on costs and benefits. The participants at the workshops recommend the Delta Commissioner to make these requirements for flood response planning explicit as part of overall safety standards for flood risk management.

⁷ R.B. Jongejan. How safe is safe enough? The government's response to industrial and flood risks, Delft University of Technology, 2008.