

University of Delaware
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STRENGTHENING FLOOD MANAGEMENT
THROUGH US-DUTCH COOPERATION:
LEARNING FROM A LARGE SCALE
FLOOD EXERCISE IN THE NETHERLANDS
PART II: PROCESS REPORT

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Strengthening flood management through US – Dutch cooperation

Learning from a Large Scale Flood Exercise in the Netherlands

Part II: Process report

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1 Introduction

In response to a request from the Directorate General of the Ministry of Public Works, Transport and Water Management in the Netherlands to COT a network of institutions with expertise in emergency management, risk and disasters was initiated in September 2008. Representatives from two US institutions, Disaster Research Center (DRC) at University of Delaware and the Institute for Crisis, Disaster and Risk Management at George Washington University, provided a US perspective. The objective of the collaboration was to develop background knowledge for, participate as observers in, and derive lessons learned from the Dutch flood-exercise week “Waterproef”, organized by the Flood Management Taskforce (TMO, Taskforce Management Overstromingen) in November 2008. COT served as the coordinating institution.

Prior to the exercise four working papers were developed. These papers served to review experiences and literature relevant to the exercise. The titles of the papers are as follows:

- Best Practices in Incident Management, John R. Harrald, Ph.D. and Dilek Ozceylan, George Washington University, Institute for Crisis, Disaster, and Risk Management
- Best Practices in Using Information Technology in Disaster Management, by Dilek Ozceylan and John R. Harrald, Ph.D, Institute for Crisis, Disaster, and Risk Management, The George Washington University
- A Brief Summary of Search and Rescue Literature, Joseph Trainor, Disaster Research Center, University of Delaware
- A Brief Summary of Social Science Warning and Response Literature, Joseph Trainor, Disaster Research Center, University of Delaware

In addition COT developed a working paper “The Netherlands: Crisis Management and Water Management” that served as a resource for the US team and provided background material.

Background

Dutch and American disaster researchers recognize that, although differences exist, we share many of the same concerns when it comes to the provision of safety before and care after disasters. As a result, COT, DRC, and GW with support from the Ministry of Public Works, Transport and Water Management agreed to engage in an exploratory project designed to both provide a platform for Dutch American exchange and substantive input into the waterproof exercise.

Within the context of the project *Learning from a large scale flood exercise in the Netherlands* the primary researchers from the Institute for Crisis, Disaster and Risk Management and the Disaster Research Center came to the Netherlands to observe the large scale flood exercise (Waterproef) organized by the Flood Management Taskforce (TMO). The primary objectives were to attain a better

understanding of flood preparedness and flood prevention in the Netherlands and to reflect on these issues from an outside ('US') and scientific perspective. Additionally, the week in the Netherlands allowed for a number of reflection and networking moments, particularly with Dutch researchers and professionals. We feel the week was a success and will allow for a solid final report to come about.

Objectives

The objectives of this project are to:

- Exchange information regarding key processes, best practices, and complexities of flood disaster management identified from the literature and US experience that are validated (or refuted) during the exercise with emergency management. Such information is particularly valuable for emergency planning and future exercises.
- Identify areas throughout which additional research is necessary, particularly those areas in which results of the literature study were not validated by the case-study.

A secondary objective of this research is to initiate the collaborative research that will serve as a foundation for the proposed Dutch-US research network focused on water management.

Process

The project is a three phase efforts.

Phase 1. Literature Review and Preparation

A preliminary meeting was held in Den Haag in September 2008. The agenda is included as Appendix A. The meeting included a briefing on *Waterproof* by former Lieutenant-General Ruurd Reitsma, currently program manager Flood Management Taskforce (Taskforce Management Overstromingen, TMO) and a visit to the Maeslant Barrier. In addition to provide an opportunity for the US participants to begin to understand flood and water management in the Netherlands the meeting identified the topics for the working papers and background materials needed for the US participants to be able to understand the scale and context of *Waterproof*.

Phase 2 – Observation of the exercise

The team observed the flood-exercise and then participated in several reflection sessions and documentation of observations. The schedule and participants are listed in Appendix B.

COT also interviewed key participants of the exercise. The interview questions and interviewees are listed in Appendix C. These interviews allowed for additional and

more detailed findings.
interviews was developed.

A discussion-paper based on the

Phase 3 – Lessons Learned

An additional expert meeting with key participants to discuss the results/ propositions was held in January 2009. The schedule and participants are listed in Appendix D.

The working papers developed as part of Phase 1 are included in Appendix E.

Report Outline

This report is part II of a larger report.

Part I of the reports focuses on the outcome of the project. In part I the observations are presented based on papers, interviews, reflection meetings and the expert meeting.

Part II gives a brief overview of the various activities in this project. This includes a description of the activities during the Waterproef week (November 3-7) in addition to a number of observations that were discussed throughout different 'reflection' meetings. It must be noted here that the issues raised are not part of an evaluation. The issues raised are a number of observations that were discussed; the issues raised are first impressions. This second part of the report also includes the papers that were written during this project. Furthermore, we need to express that this report is confidential and should be treated as such.

2 “Waterproof” site visits

The US team was able to observe just a small part of the “Waterproof”. Our understanding of events, activities and decisions was also somewhat limited by language, although every effort was made to provide concurrent translation of discussions and presentations, and documents in English. Table 1 summarizes the specific events and activities the US team observed. The time frame refers to the time relative to the specific flooding event.

Table 1. Waterproof events observed

Day	Observation Location	Event/ Activity	Time Frame
Monday, November 3, 2008	Rotterdam	Coastal Flooding	Event -4 days
Tuesday, November 4, 2008	Leerdam	River Flooding	Event
Wednesday, November 5, 2008	Lelystad to Nieuw Millingen	Lake Flooding	Event
	Driebergen	National Coordination	Discussion
	Delft Waterboard	Coastal Flooding	Discussion
Thursday, November 6, 2008	Den Haag	Expert Discussion	Discussion
Friday, November 7, 2008	Nijkerk	Search and Rescue	Event

On November 3, 4 and 5 the US delegation of researchers observed, together with COT, the large scale flood exercise (TMO) to get a better understanding of flood preparedness and flood prevention in the Netherlands. In order for the different aspects of the exercise to be taken into consideration, the observation team travelled to various locations to reflect and experience different elements of the Dutch crisis management structures in case of a (possible) flood.

Monday (coastal flooding threat): Rotterdam

On Monday the observation team went to Rotterdam to explore the flood preparedness of metropolitan areas in the Netherlands. First the Harbour Master elaborated on the port’s preparedness and the role of the port, and himself, throughout the exercise, i.e. in case of a possible flood. Then the team observed the regional strategic team. At that point in time the central government had decided on a mandatory evacuation of special needs groups. Aside from observing

the team spoke to the crisis coordinator of the city of Rotterdam as well as to the Mayor of Rotterdam.

Tuesday (riverine flooding threat): Leerdam

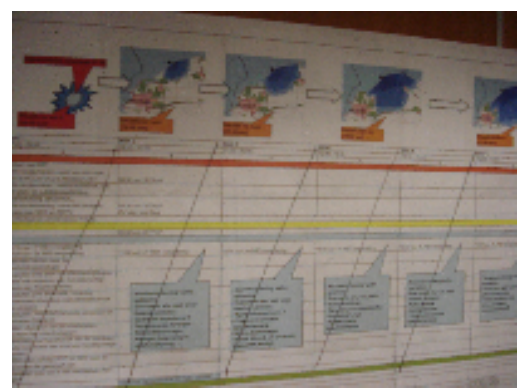
On Tuesday the observation team travelled to Leerdam, the city known for their glass works. As a result of a supposed riverine flood threat the city evacuated 200 individuals, a nursing home and wrapped up a dike.

The team observed the wrapping of a dike and the evacuation of the nursing home.



Wednesday (lake flood): Lelystad and Driebergen

On Wednesday part of the team travelled to Lelystad. As Lelystad was about to



flood, the strategic team
fall back location in Nieuw Millingen.

needed to evacuate and travel to their

At the fall back location operations had to be set up again. Two researchers, namely Marco Zannoni and Jack Harrauld, travelled with the strategic team to experience this operation. The rest of the team went to Driebergen to the National Operational Center (LOCC). At the LOCC the National Operational Staff, the National Operational Center and the National Evacuation Staff were operational. The researchers were able to observe the different operational staffs and were able to discuss matters with principal actors, such as Don Berghuis (head of safety region Rotterdam-Rijnmond and chair of National Operational Staff).

Thursday: Expert Input and Reflection

As 'Waterproef' took the observation team from one location to the next to observe a variety of elements of the Dutch disaster management organization and structures, the team was confronted with a great number of impressions and a lot of (new) information. To prevent an 'information overload' and take the time to reflect on observations, we chose to organize reflection meetings on Thursday. Throughout this report we present a number of discussion points that were raised throughout these meetings.

Friday (search and rescue): Nijkerk

The large scale flood exercise ended with search and rescue demonstrations in Nijkerk. The entire team travelled to Nijkerk to witness these demonstrations. It was interesting to view how TMO decided to end the flood exercise and how these demonstrations were presented. The search and rescue demonstrations were experienced as a great show.

3 Internal 'reflection'

meeting, November 6, 2008

During the internal meeting the various attained observations of the past three days were reflected on, with a particular focus on the findings and experiences of the US delegation. These are first impressions; reflections and should not be considered an evaluation of the exercise week. These reflections should be considered mere observations. These observations are confidential and will be discussed more in depth in the final report.

Observations

Exercise vs. Experiment

The US researchers pointed to the inconsistent depiction of 'Waterproof' by participating actors. Some of the involved actors defined it as an exercise, while others referred to it as an experiment. The term 'experiment' suggests something is tested with the purpose of improving it, while 'exercise' tends to imply an approved and already in place system is being practiced. The importance of defining one's endeavor adequately, particularly in terms of ends to be attained, was underlined. It must be noted, however, that the communication to the public might be different, as it would not be possible to communicate that the government is experimenting. By publicly defining the exercise as an experiment, the public might get the idea that the Dutch government is not prepared and has no tested structures in place. Even so, it is important to note that even among responders it was not clear which this was and or which portions should be thought of as each.

Learning and the bureaucratization of human factors

Firstly it is important to note that most participants to the exercise have actively been learning from New Orleans. Many Katrina lessons have been directly transferred to Dutch emergency management systems. The great emphasis of Dutch emergency services on learning from New Orleans and Katrina might, however, have led to the bureaucratization of human factors. The fact that a certain percentage of New Orleanians starts evacuating spontaneously, does not mean that that same percentage of Rotterdam will start evacuating spontaneously. Instead of translating lessons to the Dutch context, when exercising many participants envisioned numbers and percentage rather than the factual (human) reality around them—the exercise was characterized by the bureaucratization of human factors. It needs to be underlined that in times of catastrophes, crisis management organizations become social service organizations.

Examples: there was hardly any communication to the public, there was no interaction with grass root organizations/ civil society, no sense of what special needs groups are (those injured at a soccer match, for example, might also require special assistance) and require, no attention to relief, etc.,

The human factor of institutional Interaction

The organizational design and structure of crisis management is clearly defined and well positioned. However, the design seems to lack mechanisms that enable relationships through which people can connect with other people and institutions.

Leadership

Principal individuals had multiple roles. For instance, Mr. Berghuis has two roles throughout a (possible) flood, namely as chair of a safety region and as chair of the National Operational Staff.

Logistics

It was difficult to uncover to what extent regional and local levels dealt with logistics, particularly means and capacity. It was also noticeable how available means and capacity were not taken into consideration throughout strategic decision making processes. A decision concerning evacuation should include logistical aspects. One might decide to evacuate horizontally, but if there's insufficient capacity it might be best to evacuate vertically and initiate a major rescue operation when the storm settles. Whatever one decides, means and capacity, makes something possible, thus should be part of any decision making process.

Safety paradox

Dutch safety standards are rather high. Subsequently, large scale incidents are often prevented. This does, however, mean that when safety mechanisms are breached the consequences of a rather large and complex incident could be catastrophic, particularly because the Netherlands has limited experience with such events. The breaching of a coastal dike, for example, would be catastrophic. While the Dutch emergency services might have experience with small scale incidents, they have absolutely no experience with incidents that approximate catastrophic dimensions. The Dutch situation could be compared with a high-school team playing their first soccer game at the world cup.

The question subsequently is: "is it possible to equip and enable an organization to deal with catastrophic events if the organization never experiences incidents characterized by catastrophic dimensions?"

Situational awareness regarding a 1 in the 100 000 year storm

During the exercise it appeared very difficult for participants to attain an adequate situational awareness, particularly with respect to a 1 in the 100 000 year storm. There was no real understanding of the consequences, particularly physical effects, of such a storm and decision making individuals were subsequently hardly concerned with important questions that will arise as a result of such a great storm.

The scalability in time and space of a crisis is a challenge in the Netherlands.

4 Expert Session,

November 6, 2008

Observations

Worst-case Scenario Exercises

A number of experts are in favor of Worst-case scenario exercises. They feel it is important to make the scale of the exercise great to ensure people become increasingly aware of the great dimensions a (possible) flood would entail. It must be noted, however, that the risk of worst case scenarios is that people, due to such great dimensions, might feel frustrated and helpless thus give up. People might conclude that the consequences of a flood are so devastating that the Netherlands, and their region, most likely won't even exist anymore. Why prepare for a situation in which you don't exist anymore?

Connecting the worst-case scenario with means

Throughout the exercise, the worst case scenario did not enable participants to connect the great dimensions with necessary capacity and means. A storm that might occur once every 100 000 years will be great and will require great numbers of people and a significant amount of resources. Numbers can be modeled, and such models should be used. Human factors, however, cannot and must be taken into account by the policy making level and the operational level.

Special needs

Human factors, such as special needs, were insufficiently taken into account throughout the exercise. There seemed to have been very little awareness of the actual nature of special needs groups, thus also little awareness of the people that would be considered special needs and the "special needs" such people need. In this discussion the US delegation identifies, amongst others, additional groups with special needs, namely non-Dutch speaking people, Muslim societies, minorities, and tourists that were, for example, not taken into account throughout the exercise. It is important to take these groups into account. These groups will be confronted with language barriers and a lack of historical knowledge, such as geography and knowledge regarding historical floods, which will limit their self reliance throughout a (possible) flood.

Mayor's Perspective

A mayor needs to know and understand the social, economic, cultural and demographic aspects of the municipality or the region he or she is responsible for. Furthermore, the trust a mayor puts in his or her operational staff is crucial. Both at a strategic level as an operational level people need to speak the same language, know and trust each other and have previously build social networks.

It should not be forgotten that any skills or competences of a person will be greatly influenced by his or her background.

Coordination between various levels of government

Coordination between governmental levels, regarding various issues but particularly communication, seemed insufficient.

Questions:

At the end of the discussion the experts came up with the following questions and discussion points, which we might address in the future:

- What will happen to evacuees six months after the crisis? Who will provide long term shelter and relief to evacuees?
- What is the role of civil society organizations, NGOs, aid organizations?
- How will the international dimensions of a possible flood look like? What can different countries provide?
- How can be determined what kind of crises a system can absorb?
- What should the role of the media be? The media can be a central source for information to different levels of the population, but can also affect which areas get aid and which areas do not.
- To what extent are societal partners included in crisis management?

5 Observations From US Experts

This section of the report is intended to provide the American contingent's substantive observations regarding the exercise. All of the following observations should be interpreted as tentative and should be seen as points of interest or as opportunities for a critical dialogue rather than definitive statements or proscriptions for change. As outside observers for a limited amount of time and of only a small portion of an exercise undertaken in Dutch and in the context of a complex system, our perspective was seriously limited. It is our hope however that over time and given the opportunity to engage in more significant and sustained interaction that we will be able to provide more definitive exchanges and also have the benefit of Dutch insights into the US system as well.

The observations are presented in terms of strengths and challenges. Finally, next steps are presented.

Observations

Although we noted a number of difficulties it should be acknowledged that there were many positive features in the Dutch system of emergency, crisis, and disaster management.

Strengths

Here we highlight a few of the features we see as strengths of the Dutch system.

1. Regional Focus

The Dutch emergency management system has a regional and local focus. This level of local awareness is something that we are attempting to achieve in the United States. Research has long held that local input and regional knowledge are vital to successful disaster operations and decision-making.

2. Workable Structure

The Dutch government has put in place a workable system based on both the documentation we received and the observations that we made throughout our time in Holland. The regional focus seems to be quite appropriate as do the developing efforts to better integrate national level actors into the disaster process when necessary. Balancing the integration of national capacity with local knowledge is an admirable goal.

3. Capabilities in Place

Many types of capabilities exist in the Dutch civil and military systems that would be of great use during a crisis or emergency. We observed evacuation, water rescue, information systems, and communications systems, partnerships with Ham radio operators and a number of other activities that were all appropriate for preparing for or responding to disaster activities.

4. Seriousness of Purpose

This exercise was developed based on the recognition that there is a real potential for a catastrophic event in the Netherlands. Particularly in a society that has historically placed so much attention on mitigation and the provision of safety, the willingness of high level decision-makers to engage in the process of defining an event and orchestrating a meaningful exercise is an admirable goal. It is often extremely challenging to convince people of the need for catastrophic planning. Having engaged in this process has likely made the Netherlands a safer place. The Dutch should be commended for taking on this serious and important task.

5. Dedicated Workforce and Passionate Representatives

There was little doubt that there is a dedicated workforce committed to the safety of citizens. We saw a number of passionate exchanges where political and bureaucratic officials advocated fiercely for their constituents. This level of dedication and commitment is important for disaster responders.

6. Recognition of the Importance of Educating the Media

Media plays an important role in communicating information about disasters and chronicling the event. The media was present at several events and simulated media broadcasts and press releases were included as part of the exercise. It is vital at every phase of disaster response for responders to engage the media as a partner.

Challenges

As is often the inclination of external observers, we had a tendency to focus our attention on issues that were most related to our interpretive frames and the current issues being discussed in the US. While some of these interpretations may be shortsighted they do provide at a minimum interesting point for discussion and/or clarification.

1. Estimating Needed Capacity

While we observed in many areas that the Dutch responders had the capability to engage in technical procedures, there were very serious reasons to believe that responders grossly underestimated the scale and scope of the events being envisioned. They often made the assumption that resources such as man-power and equipment would simply be in ready supply. There are a number of complex logistics issues that were not addressed sufficiently to suggest that the capability existed to engage in such a large scale operation for a sustained period of time. Some examples include nursing home evacuation, water rescue, and dyke wrapping procedures. For the most part we saw limited focus on the long term and little attention on the complexities of support functions. Overall there was little attention to spatial and temporal connections. Furthermore, these capacities were not part of the strategic decision-making process. It is our perspective that strategic level decisions should be made with a level of awareness of the capability of organizations to successfully complete operations. This level of information allows for more informed decision-making and in the end better results.

2. Decision Making

Process

It is important that Dutch officials be aware that in the kinds of events being envisioned there often will not be a single solution that will be sufficient to address any need. It is important that thought patterns be diversified and that multi-dimensional thinking be made part of these processes. For example, Evacuation needs to be seen as a multi modal operation it is not simply evacuation by roads. It is doubtful that the Dutch Road system could handle the demands of a large scale evacuation alone. It will be vital to also include strategies that involved buses, trains, and vertical shelters. Multi modal solutions are the only kinds of approaches that will work. Another example came from our visit to the water board where there was a conflict over whether to attend to prevention and response preparation. This tension was palpable for the people we talked with and it is important that multiple approaches at least be explored.

3. Coordination/Communications

As is almost always the case in operations that span political and bureaucratic boundaries we observed a number of difficulties in the coordination of activities and decision-making. The most striking of these was the gap between national and regional situational awareness only six hours into the exercise. It was apparent to us that these two levels of government were operating with different data and different interpretations of information. Reconciling these types of issues and developing a common operating picture is a vital task that should be given top priority. It is not sufficient for higher level decision-makers to simply disregard less influential or powerful actors. In order for these structures to operate trust and mutual understanding need to be established. We observed many tensions in these interactions at a number of levels including "Super Mayor" to other mayors, safety region to national, safety region to safety region, safety region to waterboard, and policy head to operational heads. While the structure of the system is sound, it appears that the mechanisms for integrating these units are underdeveloped.

4. Identifying and Responding to Vulnerable Populations

The rhetoric of "special needs populations" has become so dominant in emergency management that it has become a must attend to issue. It is important for responders to remember however that the label special needs is simply meant to provide a column that sensitizes us to those groups of people that will need more help than the "normal person" there seemed to be little awareness of what precisely special need meant, the complexities of these populations, and what might be done to provide additional assistance. Although the social disparity is not of the same scale as in the USA it is important to remember that the Netherlands does have some level of cultural, educational, and experiential diversity that must be taken into account when planning social services during disasters.

5. Awareness of Human Behavioral Factors

Although the extent to which US based findings on human behavioral response to disasters can be generalized to the Dutch context is unclear, the level of

confirmatory findings from other European countries suggests that many of the assumptions regarding human behavioral reactions to crisis and disasters we observed were unfounded. There have been extensive studies on issues such as: role abandonment, factors that affect evacuation, “panic,” and looting that should be used to inform decision-making or at a minimum should be tested in the Dutch context.

6. Public Communication

Although we did not observe any direct public communication strategies of the responders we observed, the issue of public communication was conspicuous in its absence. We never heard any serious discussion about public awareness about communication or the like. This is potentially a very dangerous situation. These types of situations often generate a great deal of uncertainty in the public and it will be of great importance that public officials engage in open and honest communication with the public. The absence of information often leads to rumor transmission that can become very difficult to control. Furthermore, open communication will also facilitate trust that can be vital when attempting to get public compliance with governmental requests.

7. Exercise design

Our final observation is related to the design of the exercise itself. It was in our opinion both too complex and too simplistic. The overall scenario in many ways seemed to be interpreted as implausible by many responders. Even those that bought into the scenario had a difficult time getting themselves to think about all of the complexities of a 1 in 100,000 year event, nor did we have anything other than anecdotal evidence of the impacts other than flooding of a 1 in 100,000 storm (for example, wind and wave damage). It would have probably been more productive to do a smaller scale event and exercise the system than to have the first national exercise also be of enormous proportions. It is likely that a smaller event would have manifested many of the same issues, but would not have been so overwhelming as to allow responders to disregard the scenario. As another observation we also questioned the choice to run simultaneous scenarios over several days. We believe it would have been more beneficial to have run one scenario through the course of several days. While everyone would not have been in an impact zone it is likely that there could have been important lessons learned about campaign operations and about how to better organize those areas operating in a supporting role.

Conclusions

It is the consensus of all involved parties that this effort has been a great success. In addition to providing the American contingent a concrete way to learn the structure of the Dutch response system the exercise also allowed the Americans to observe many response activities and learn a great deal about how the Dutch go-about-the-business of emergency management. Further it provided significant opportunity for the American contingent and several members of the Dutch contingent get to know each other. We believe that this effort marked the beginning of what will develop into a strong collaborative relationship.

Next Steps

As stated previously, it is the perspective of the American contingent that this effort provided useful insights into the Dutch system. We are also in agreement that there are numerous opportunities for exchange and mutual growth. The preliminary observations in this document along with the “Reflection Sessions” can serve as foundations for this project’s final report and as blue prints for future work. In terms of concrete next steps, we believe it is important that we refine the observations made here and continue to identify areas where the US Dutch long term collaborative partnership can focus.

6 Findings from

Additional Interviews

Introduction

In the context of the research project *Learning from a large scale flood exercise in the Netherlands* in-depth interviews were held with a number of participants of 'Waterproof' and decision-makers and practitioners in the field of flood management. The interviews were directed at identifying issues that Dutch stakeholders consider important and might require further investigation. Also we intended to complement the substantive observations of the four representatives from the Disaster Research Center (DRC) at University of Delaware and the Instituted for Crisis, Disaster and Risk Management (ICDRM) at George Washington University with Dutch observations. While during the interviews various issues were discussed, we also asked the interviewees to disclose research areas they regard as requiring more attention.

This section will give an overview of some of the issues that were identified by interviewees, particularly those issues that several interviewees shared. Furthermore it will give a good presentation of the research areas that interviewees deem important and that according to them require more attention. Lastly, the discussion paper will present the interviewees and scope of the interviews, particularly the questions.

The interviews were conducted in December 2008. The interviewees are listed in Appendix C.

Issues identified

Large-scale exercises: risk awareness and stakeholder appreciation

The interviewees appreciated the large-scale flood exercise. Particularly the preparation phase of the large scale exercise they valued. The large scale exercise allowed learning, increased risk awareness as well as increasing stakeholder appreciation.

Risk awareness

Thankfully, the Netherlands is not often faced with floods. This reality does, however, lead to a decreased risk awareness and very little substantial knowledge regarding the threat they do continue to face. Due to lack of real-life experience with floods, knowledge and experience throughout the Netherlands is primarily generated through educational processes and exercises. Especially the preparative phase of the exercise gave participants the opportunity to learn more about the specific risk of floods throughout their regions and the response it requires.

Stakeholder appreciation

Another aspect of the large-scale exercise the interviewees appreciated was the stakeholder appreciation it enabled. One of the primary objectives of the Flood Management Taskforce was to enhance stakeholder appreciation throughout various sectors that have an interest when it comes to flooding. As a result, the exercise created a platform in which participants could meet partners they would

normally not encounter
valuable in case of a flood.

but whom would be relevant and

Furthermore the exercise established a possibility to assess the cooperation between partners. As a result lessons that could enhance cooperative interaction, thus effective crisis management, could be derived from the exercise. Here some interviewees did underline that for an exercise to be truly valuable and learning to be facilitated, transparency and the possibility to err during the exercise is important.

Another issue that was disclosed by the interviewees was the importance of balancing planning and networking.

Interviewees recognize the importance of planning in the light of a (possible) flood as making plans often facilitates the generation of knowledge and awareness regarding risks as well as stakeholder appreciation. However, after acknowledging the importance of planning most interviewees emphasized the equally important endeavor of active networking. Planning, especially with respect to floods, was considered by some interviewees as theorizing about a particular risk. To them over-theorizing is undesirable as it often reduces flexibility and improvisation throughout the response. They therefore emphasized the importance of complementing planning with adequate, extended and active networks of stakeholders and experts in which relevant partners are continuously recognized, approached, acquainted and appreciated.

Networking

Though all interviewees recognize the importance of planning they appreciated equally if not more the networking possibilities that planning and such a large-scale exercise allow.

The interviews highlighted certain qualities of the act of networking that increase effectiveness of crisis management. They underlined that networking should be seen as a tool to enable the transference of knowledge and information and to cut through levels and fields of expertise and enable cooperation and communication. Interviewees perceive that investing in crisis management should also include investing in practitioners' networks. According to various interviewees there exist too few practitioners' networks.

While interviewees view networking as important, they do not underestimate the realization of attaining successful networking endeavors. Networking highly depends on 1) getting to know relevant partners well, 2) continuous engagement through, direct or fluid, 'living' networks 3) active involvement of stakeholders throughout daily/ normal activities and 4) broadly defined networks. Broadly defined networks refers to the continual interaction of various networks pertaining to different stakeholders such as citizens, private sector, water boards, governmental departments, universities, emergency services, etc. The exercise included various new relevant partners, but excluded various as well. Particularly the citizenry, civil society organizations and the private sector appear to have been insufficiently involved. The relevance of these partners was therefore underestimated and an effective alliance with these partners hindered.

Furthermore interviewees revealed that daily interaction is important for effective crisis management. They underlined that as a practitioner one should know one's partners, including their capabilities, tasks and responsibilities: personal contacts form the basis of effective cooperation. As a result, the interviewees recommend regularly seeking and maintaining contact, if possible on a daily basis not just with external partners but definitely also with one's team. With respect to internal networking they advised the transfer of knowledge between team members so that substitution is made possible.

...And add capacity building

According to the interviewees, plans are often left in cupboards when in actuality they should be utilized to support the crisis management efforts. Due to this fact, the interviewees recommend complementing planning with capacity building of teams and networks and enhance effectiveness when plans are not available or not used. Through capacity building resilience of organizations can be enhanced. According to interviewees regular capacity building activities enable the essence of crisis management to be embedded in organizations, structures, organizations and cultures.

The political agenda

The question that most interviewees ask themselves is whether or not after the exercise the issue of flood management will continue prominently on the stakeholders' agendas. Will there be a substantive follow-up?

Differentiation

Regional and local

Despite the Netherlands being a relatively small country, it accommodates a large number of local and regional areas characterized by distinctive geographical qualities, cultural features and risks. The interviewees stressed that acknowledging these differences is important. Awareness and knowledge of differences between regional and local areas are important, especially the particularities of regional differences of the flood threat. It was greatly emphasized that throughout the exercise it became apparent that the reality of a flood is defined by a specific area's specificities, and is therefore different everywhere.

Organizational and cultural

Flood management requires the involvement of relevant parties from different governmental levels, disciplines and geographical locations. As a result, the crisis management structure is characterized by organizational and cultural differences. According to various interviewees, parties seem unaware of these differences. Through the large scale exercise the interviewees got reaffirmed that acquainting relevant partners allows for these differences to be acknowledged and subsequently the effectiveness of cooperation to be increased.

Uniformity and harmonization

Due to the large amount of parties involved in flood management a great diversity, especially with respect to structures, procedures, methods and cultures, exists.

The interviewees put forward that actors often organize themselves independently and limit national harmonization of the crisis management structure despite the fact that floods require approaches that transgress borders. According to various interviewees the great diversity of the current crisis management structure and of organizations generates a complexity that makes cooperation and communication throughout different levels and throughout various geographical areas difficult. Unfamiliarity with, for example, neighboring operating procedures often impedes cooperation and communication, thus effective and efficient crisis management. They stress that a more uniform system and structure could enhance crisis management by decreasing the complexity of the system and augment harmonization thus increase the effectiveness of crisis management.

Regionalization

Interviewees throughout the country revealed that regionalization, particularly in areas in which horizontal power structures between municipalities exist it will be a difficult task because there is not particular actor with the extra capacity and authority to regionally take charge. Municipalities throughout such horizontal structures are equal partners with individual needs that are difficult to reconcile with those of other municipalities. These municipalities want to maintain their autonomy and will not hand over their responsibilities and competences to individuals who are not legally responsible for their territory. Interviewees perceive increasing regionalization difficult and see that weakness of the orange (municipality) column as a persistent issue.

The interviews furthermore revealed that handing over responsibilities to levels of government without local knowledge and local experience remains another issue for concern.

A few interviewees put forward a perspective of increasing centralization and simplification of the crisis management structures. They prefer a system characterized by fewer teams and possibly a department of homeland security (with a crisis management focus).

Insufficient knowledge at a national level regarding regional realities and needs in case of a (possible) flood.

Interviewees, particularly throughout the regions, emphasized that national involvement in crisis management requires increasing regional knowledge at the central level. The interviewees revealed that regional decision makers and practitioners feel that the national level has insufficient knowledge regarding regional risk profiles, realities, and regional demands in times of a (possible flood) to be able to intervene effectively. Various interviewees underlined for example that throughout the exercise the national level was insufficiently aware of the decisions that regions needed to effectively respond to their local reality and the timeframe they were forced to work with.

Real and Experienced Distance between the National, Regional and Local level

Throughout the interviews it became apparent that the distance between the central government, regions and local communities is generally intensified by an experienced distance based on previous interactions and perceived relationships.

Whether real or experienced, such an amplified distance is rarely beneficial to crisis management. Especially in case of disasters such as floods, adequate cooperation between national, regional and local levels is required. Distance entails decreased trust, i.e. undesirable relationships, thus a hampering of effective cooperation.

Command structures

Interviewees highlighted the importance of fixed and clear command structures supported by effective and efficient means of communication when responding to floods. The interviewees emphasized the importance of clear and fix roles and responsibilities throughout flood management structures in addition to the importance of swift and effective information exchange in case of a flood. Particularly for taking the right decisions at the right time interviewees have stressed the importance of these elements with respect to the issue of command structures.

ICT

As mentioned above, interviews underlined the importance of swift and effective information exchange. Interviewees agree that ICT systems could support swift and effective information exchange. According to interviewees ICT could be used to facilitate communication between relevant stakeholders as well as facilitate decision making processes. Throughout the exercise, however, participants realized that the current use of ICT merely increases the complexity of communication and information systems and subsequently impedes effective flood management. Different regions use different ICT systems and the interviewees feel that a more uniform ICT system could facilitate their response more adequately. Furthermore, interviewees learned that for ICT systems to be effective facilitating structures it is important for all relevant partners, at different levels and throughout all fields, to be acquainted with and connected to the system.

Apart from ICT systems being able to support communication and information exchange efforts, some interviewees emphasized that people should be aware that the actual realities in which people function is not included in ICT developed situation awareness schemes. One of the major hindrances is for example that a view on the emotional situation is excluded.

International and national learning

When interviewing participants from different regions it became apparent that the Netherlands, specifically the different regions, various bodies of knowledge are available throughout different regions. Subsequently, one of the issues that arose was the importance of not reinventing the wheel and preventing deficiencies of flood management systems by going beyond one's local, regional and national borders and learning from others' experiences and approaches.

Therefore, aside from international learning, which many interviewees consider to be very important, interviewees also emphasized that local knowledge, experience and expertise should be increasingly recognized. Regions characterized by different realities allows for great bodies of knowledge regarding various issues, such as risk communication. A nation should increasingly tap into these available bodies of knowledge and also nationally exchange knowledge. The available

bodies of knowledge on local and national levels can be found throughout various levels of society, such as local governments but also civilian organizations.

International cooperation

The interviews underlined the importance of international cooperation. Various regions do so, particularly with neighboring countries, and they experience such cooperation as very valuable particularly because one can learn from their systems and ways of operating, and enhance one's own systems such as early warning systems and crisis management systems.

Risk awareness and self-reliance

Interviewees revealed that experience has demonstrated that increasing risk awareness and self-reliance can be attained when such issues are integrated into educational routines.

Situational Awareness

Most interviewees put emphasis on the importance of situational awareness. They also recognize, however, how difficult it is to attain adequate situational awareness when a response requires the involvement of a great amount of parties. The difficulty arises when the consistent situational awareness should also embrace the unique characteristics of the different geographical areas, i.e. should respect national diversity.

Civilian leader vs. operational leader

According to some interviewees the Netherlands should separate the role of a civilian leader from the role of an operational leader more often.

Communication and exchange of information

Throughout the exercise participants experienced that the exchange of information and communication between the different hierarchical levels continues to be limited, particularly within regions, with the citizenry, and between regions and national government. Subsequently, attaining a consistent and toning situational awareness demonstrated to be difficult.

A primary question that arose regarding communication to the citizenry is:

- When should one communicate what to the citizenry regarding a threat?
- Who should communicate to the citizenry?

Communication and decision-making structures between hierarchical levels work insufficiently

Another issue which most interviewees considered problematic is communication across the national, and particularly administrative hierarchical, structure. Issues vary from communication to the citizenry and communication from the national to regional/ local levels and vice versa. One of the primary difficulties that inhibit communication, but often also decision-making, is the vaguely defined roles and command structures, particularly with respect to the role of the national

government. To many it continues uncertain what the role, legal mandate, capacities and responsibilities of the national government in case of a great disaster is. A primary question regarding this issue is whether in case of national disasters the national levels should take over regional/local operations or if they should they facilitate and assist regional/local efforts and operations?

Also more acquaintance between local/ regional and national actors might be desirable as 'knowing each other' is through such measures stimulated.

Evacuation

Most interviewees concur that the issue of evacuation, particularly the practical implication, was insufficiently integrated into the exercise. Additionally, many feel that with respect to this issue it would be very valuable to learn more from evacuations abroad. They recognize that several countries have effectively dealt with large scale evacuations and are subsequently more experienced. Instead of reinventing the wheel they feel the Netherlands should increasingly invest in learning from those countries and ascertaining and translating lessons that might be valuable in the Netherlands.

The after math of a (possible) flood requires more attention.

Interviewees felt that the aftermath of a flood was insufficiently taken into account throughout the exercise. Due to the complex and long term nature of a flood's after math the Netherlands should, however, according to the interviewees, increasingly explore preparative measures. Subsequently, despite the complexity, this phase requires more attention.

Research Areas/ Questions

The interviews produced a number of common themes for research issues and research questions. These are summarized in Table 2.

Table 2. Research Areas and Questions

Area	Questions
Self-reliance	<i>How self-reliant is the Dutch citizen?</i> <i>Effect of technical interventions in risk-perception and awareness</i> <i>Are citizens self-reliant?</i>
Risk awareness and perception	<i>What is the current risk perception the Dutch citizenry has?</i>
Evacuation	<i>What does evacuation imply on a decision-making and capacity level?</i> <i>How can a municipality prepare evacuations?</i> <i>How should evacuation be organized and what are the consequences of large scale evacuations?</i>
Exercises	<i>How can one best practice/ exercise flood crisis management, to not just increase awareness of the structures but also enhance the quality of the system?</i> <i>What type of crisis scenarios should be practiced?</i>
Centralization vs. Regionalization	
Is a Ministry of Safety/ Homeland security, desirable and achievable?	
The future of crisis management	<i>How should crisis management evolve over the coming decades?</i>
How can new forms of media be embedded in crisis management structures and organizations?	
National, regional and local cooperation	
Europe	<i>Explore the risk of floods on a European level. When the Netherlands is being threatened other European countries are being threatened as well. Exchange knowledge and research regarding the approaches of these countries to these threats.</i> <i>What should the role of the European Union be in case of a (possible) flood that threatens Europe?</i> <i>What is the impact of a Dutch scenario on other European countries?</i> <i>How should the after phase be organized when different European countries are threatened and possible even confronted with the same disaster?</i>
International Structures	<i>How can international structures as the EU, the NATO, the UN, etc. contribute in case of a (possible) flood?</i>
Partners	<i>Connect different spheres: connect scientists and</i>

practitioners.

*How can civil society and the private sector be employed
more effectively in crisis/flood management?*

After math	<i>Increase more attention to such an extent, that the after phase can be prepared.</i>
Connecting initiatives and knowledge	<i>How can increasingly synergy be created between the different initiatives around floods and crisis management? How can different initiatives be connected and lessons and knowledge come together?</i>
Critical infrastructure	<i>How do other countries approach the issue of critical infrastructure during a flood?</i>

7 Reflections from the

Expert Meeting January 2009

Location

AON, the Netherlands, headquarters in Rotterdam. Admiraliteitskade 62, 3063 ED Rotterdam, the Netherlands

Discussed

Discussion/ reflection of presentation US research observations and reflections/ outcome additionally held interviews

After the presentation held by Jack Harrauld on the observations and reflections on 'Waterproef' by the US researchers and the presentation held by Karen Engel about the outcome of the additionally held interviews, the content of these presentations were discussed. Several points were mentioned in this discussion:

- A nationwide disaster is absolutely different than a local incident. Therefore, a nation wide disaster cannot be seen as an up scaled local incident and needs other procedures than when a local incident appears. Referring to the large scale flood exercise, several regions make their own decisions, ignoring the national level, despite the national level is needed, for instance to generate additional capacity (assistance). The relation between the national level and the regions/local level needs further attention in the future.
- Three important C's in crisis management:
 - Capacity
 - Capability
 - Competences
- It is important to stimulate the interaction between the operational level and the decision making level, as during a crisis the decision making level needs to take operational effective decisions.

First steps towards a relevant future research and networking agenda

Several participants mentioned before the break topics and challenges were they would like to know more about in the near future. These subjects and topics have been discussed briefly in the meeting

1) **How to handle spontaneous civilian initiatives**

When a crisis appears groups will emerge that did not exist before. How do you integrate these groups within a formal response? The formal responders have to take into account that some people emerge that have nothing to do with the crisis. Spontaneous activation is nice, though you do not want people in toxic areas while you do not know about it. It is important that the emergent groups are coordinated and for instance are provided with the correct material so they can provide correct help. Though, it is possible to coordinate and direct other volunteers, it is impossible to keep in control of all the processes during a crisis.

The degree of spontaneous reactions on a crisis depends on how the warning message is sent to the public and depends on the content of a warning message. Emergent groups appear as they come together and make sense of a warning message. The media plays, in the process of the appearance of emerging groups, a major role. In the US you have for instance, '211 systems', which is an organization that provides social services.

2) The evacuation of family members of the first responders of a crisis

People have to know of their family is safe, before they can completely focus on their work as a first responder to a crisis (operational, decision makers and so on.). The evacuation of family from first responders does not have to be done before other people are evacuated, it is more important that the first responders can do their work, as i.e. emergency workers, while they know their families are assisted by evacuating and are safe.

3) Shared information on different levels

The solution to this challenge is not to share all the information with everybody involved, though, to share the used information with the correct person. It is important that you know beforehand who your partners are and what their competences are. Under stress during a crisis you need to trust your partners and need to trust the information you share with each other, if you never met before and you do not know who your partner is you cannot trust each other. Therefore, it is important to meet each other before a crisis appears, so you do not have to exchange business cards in times of a crisis.

4) Recovery/ aftermath phase

This topic raises several questions: How do you anticipate on the effects of a crisis? How do you know what to do to mitigate the effects? A city which is affected by a crisis does never become the same anymore as before. Moreover, in the aftermath you have to focus on the area that is affected, as well on the area that is taking care of all the evacuated civilians. Furthermore, the aftermath phase is not only about providing houses and food, but this phase comprises also social effects that have to be taken into account.

5) Real life situations/ scenario's

The challenge with exercising a large crisis is if all the involved parties do learn from it. It is necessary with such a large exercise that you need real engagement of people. The city of Rotterdam for instance, exercised for five days, which they experienced as very efficient. This, unless people for instance got tired, because in a real situations you have to operate as well for longer than one day.

6) The role of large industries/ the role of the private sector

7) Risk communication

The meeting was concluded by Mr. Rosenthal, who mentioned several catchwords referring to the discussions held during this afternoons meeting:

- The added value of a large scale exercise has two sides:
 - A national disaster is totally different from an up scaled local incident. Moreover, due to the size of the Netherlands: if one of the major cities is confronted with a disaster, the whole country is affected.
 - Communication to the public > the Netherlands is a paternalistic country and decision makers have their own characteristics, which makes public communication a challenge.

Referring to these two points mentioned, it useful to exercise on a large scale.

- The human factor: It appears that in the Netherlands human factors are 'bureaucratized', which means that human factors, i.e. people behave different in unnatural , are in the Netherlands different to internalize in decisions.
- Special needs category/ emergent groups
- Crisis management in the Netherlands deals with several different layers of government, the operational level, the private sector, civilians and so on. Therefore, the information sharing is one of the most difficult tasks with as a main goal: to get on common ground.

Participants

- | | |
|-----------------------------|--|
| 1. Balfort H. | Ministry of Public Works, Transport and Water Management, Senior policy advisor DG water |
| 2. Berghuijs, D | Safety Region Rotterdam-Rijnmond, Director General. |
| 3. Blok H. ms. | Knowledge Centre Zeeland |
| 4. Bousché H. | TNO |
| 5. Dijk, C.J van | Project leader flood coordination plan for Flevoland, Safety region Flevoland |
| 6. Dijk, W van | Waterboard Zuiderzeeland |
| 7. Ebbinkhuijsen S. | COT |
| 8. Engel K. | COT |
| 9. Geveke, H | Ministry of the Interior and Kingdom Relations, Director of the Directory of Crisis Management. |
| 10. Goemans, C. | Ministry of the Interior and Kingdom Relations, Senior Policy Advisor, National Security, Risk Assessment and Capability Planning. |
| 11. Harrauld, Prof. J Ph.D. | Director of the George Washington University Institute of Crisis, Disaster, and |

Risk Management, and Professor of the Department of Engineering Management and Systems Engineering at George Washington University, Washington, D.C

12. Klijnsma, B.P. Safety Region ZHZ, Chief project leader TMO/ Waterproef.
13. Korpel M. Water Board Delfland
14. Laanen, G. Ministry of Public Works, Transport and Water Management, Head of the bureau of crisis management.
15. McNeil Prof. S. PhD Director Disaster Research Center and Professor Civil and Environmental Engineering Transportation and Urban Planning and Public Policy at the University of Delaware
16. Mersie, P.J. Province of Zeeland, Coordinator public safety and security.
17. Okazumi, T. DG Water, Japan
18. Prins J. Safety Faculty Hogeschool Zeeland, University of Applied Sciences
19. Reitsma, R. TMO Program Manager.
20. Rosenthal Prof. dr. U. Director of the COT Institute for Crisis and Safety Management
21. Ruiten K. van Deltares
22. Scholten, S City of Rotterdam, Advisor Directory Security and Safety.
23. Smaak R. Project leader Water Safety
24. Shaw, Dr. G.D. Sc. Co-Director of the George Washington University Institute of Crisis, Disaster, and Risk Management, Associate Professor at the George Washington University
25. Trainor J. PhD Staff Researcher for the Disaster Research Center at the University of Delaware
26. Wijk, Prof. dr. Rob Professor of Strategic Studies at Leiden University. He is director of the Centre for Strategic Studies in The Hague. He is also professor of International Relations at the Royal Military Academy (KMA) in Breda.
27. Woudenberg, van R.A. Water Board Delftland, Senior policy advisor.
28. Zannoni M. COT

8 Issues and research road map

Based on the papers and observations during Waterproof, the project team discussed the preliminary results with TNO, Wageningen University and Deltares. This discussion took place during a reflection meeting (January 7, 2009) on the broader project for US-NL cooperation on network building and information sharing concerning flood management.¹ This discussion led to the identification of relevant issues and a possible road map for research.

The following issues were identified:

1. Capacity and capabilities
 - 1.1. Uniqueness of a catastrophic event
 - 1.2. Capacity building
2. Exercises
 - 2.1. Utility
 - 2.2. Learning
 - 2.3. Networking
 - 2.4. Capacity building
 - 2.5. Involving the public (incl. children)
3. Scalability of response
4. Collaborative decision-making under stress
 - 4.1. Singular solutions
 - 4.2. Structure and coordination (processes to make linkages work, including communication)
5. Coordination and communication (internal)
 - 5.1. Interorganizational and intergovernmental response issues
 - 5.2. Multi-actor coordination and collaboration (incl. civil military/ NGOs)
6. Social vulnerability
 - 6.1. Special needs groups
 - 6.2. Framework for provision of social services to different groups
 - 6.3. Patterns of differentiated vulnerability
7. Evacuation and shelter
8. Recovery
9. Human behavior during disasters
 - 9.1. Social networks
10. Societal resilience
 - 10.1. Disaster sub-cultures
11. Community preparedness
 - 11.1. Community awareness
 - 11.2. Community as asset during disasters
 - 11.3. Educating children
 - 11.4. Local knowledge
 - 11.5. Local awareness
12. Public communication
 - 12.1. Risk communication

¹ The project title is NL-US Water Crisis Research Network (NUWCREN)

- 12.2. Crisis communication
- 12.3. Issues of communication incl.. cross cultural communication with regard to ethnic, religious and linguistic minorities.
- 13. Situational awareness
 - 13.1. Information management
 - 13.2. Perception management
 - 13.3. Forecasting
- 14. Pre-event planning
 - 14.1. Process of planning
 - 14.2. Plan as product
 - 14.3. Harmonization vs. diversity
 - 14.4. Utility
 - 14.5. Fantasy planning
- 15. Network building
- 16. Public warnings and warning systems
- 17. Sensoring
 - 17.1. Community based/ citizen sensor
 - 17.2. Sensor network
 - 17.3. Sense making
- 18. Continuity of operations issues for the public and private sector
- 19. Leadership
- 20. Basic requirements crisis management
- 21. Up scaling/ downscaling
- 22. Operational alarming/ activation systems
- 23. Information management
- 24. Risk perception
- 25. *'Where should the government invest?'*

While the brainstorm session was very fruitful and resulted in 25 different interesting topics, the great number of topics would not facilitate a workable context for the network. As there are six semesters and six partners, the group decided to group the above mentioned topics into six clusters. The following clusters were the result of this endeavor.

1 Planning, preparing, exercising, learning

- 1.1. Planning
 - 1.1.1. Plan as a process vs. plan as a product
- 1.2. Exercises
 - 1.2.1. Utility
 - 1.2.2. Learning
 - 1.2.3. Networking
 - 1.2.4. Capacity building
 - 1.2.5. Involving the public (incl. children)
- 1.3. Creating a learning organization
- 1.4. Basic requirements crisis management
- 1.5. Process
- 1.6. Learning

- 2 Managing the catastrophic events**
 - 2.1. Decision-making under stress/ disaster management
 - 2.2. Leadership and competence
 - 2.3. Collaboration
 - 2.4. Singular solutions
 - 2.5. Sensing, sense making, situational awareness
 - 2.6. Interorganizational and intergovernmental response issues
 - 2.7. Multi-actor coordination and collaboration (incl. civil military/ NGOs/ civil society)
 - 2.8. Measures
 - 2.9. Structure (expected patterns of relationships) and coordinating mechanisms (processes to make linkages work, including communication) for large scale events (scalability)
 - 2.9.1. Information and provision
 - 2.10. Creativity, innovation
 - 2.11. Managing improvisation; controlled improvisation
 - 2.12. ICT
 - 2.13. International aspects
- 3 Human behavioral response to disasters and catastrophic events**
 - 3.1. Social networks
 - 3.2. Individual/ collective
 - 3.3. Risk perception
 - 3.4. Risk communication
- 4 Community vulnerability and resilience**
 - 4.1. Recovery/ After care
 - 4.2. Continuity of operations issues for the public and private sector
 - 4.3. Community preparedness
 - 4.3.1. Community awareness
 - 4.3.2. Community as asset during disasters
 - 4.3.3. Educating children
 - 4.3.4. Local knowledge
 - 4.3.5. Local awareness
 - 4.4. Social vulnerability
 - 4.4.1. Special needs groups
 - 4.4.2. Framework for provision of social services to different groups
 - 4.4.3. Patterns of differentiated vulnerability
 - 4.5. Societal resilience
 - 4.5.1. Disaster sub-cultures
 - 4.6. Evacuation and shelter
 - 4.7. Gender
 - 4.8. Metropolitan areas/ rural areas
 - 4.9. International cooperation
- 5 Response capacity and capability**

- 5.1. Uniqueness of a catastrophic event
- 5.2. Capacity building
- 5.3. Estimating capacity requirements
- 5.4. Metropolitan areas/ rural areas
- 5.5. Network building
- 5.6. Creating response systems
- 5.7. International system

6 Public communication/ information

- 6.1. Risk communication
 - 6.2. Crisis communication
 - 6.3. Issues of communication incl.. cross cultural communication with regard to ethnic, religious and linguistic minorities.
 - 6.4. Public warnings and warning systems
- ICT, new media

Appendix A: Initial

Meeting Structure

Program for September 11, 2008: location COT (Koninginnegracht 26, Den Haag)

09.30 – 10.00	Coffee/ Tea (at COT)
10.00 – 11.00	Up-date United States - Current situation regarding floods and crisis management? - Katrina - Gustav - Latest developments - Q&A
11.30 – 12.30	Up-date the Netherlands - Current situation regarding floods and crisis management - Latest developments - Q&A
12.30 – 13.30	Lunch
13.30 – 14.30	Waterproef - Presentation by former Lieutenant-General Ruurd Reitsma, currently program manager Flood Management Taskforce (Taskforce Management Overstromingen, TMO) - Q&A
15.00 – 17.00	Preliminary findings – methodology ‘research’ waterproef - Who? What? When? Where? How? - Deliverables
18.30 – 21.00	Informal dinner (The Hague)

Program for September 12, 2008: location Maeslant Barrier

09.30 – 10.00	Coffee/ Tea
10.00 – 12.30	Meeting of US and Dutch Experts: Expert meeting regarding key processes, best practices, complexities of flood disaster management
12.30 – 13.30	Lunch
13.30 – 15.00	Wrap-up

Appendix B: Participation November 2008

Meeting Schedule and

Internal 'reflection' meeting, November 6, 2008: 10:30-12:00

Attendees:

John (Jack) Harrauld (Institute for Crisis, Disaster, and Risk Management; the George Washington University), Gregory Shaw (Institute for Crisis, Disaster, and Risk Management; the George Washington University), Sue McNeil (the Disaster Research Center; University of Delaware), Joseph Trainor (the Disaster Research Center; University of Delaware), Uri Rosenthal (COT), Marco Zannoni (COT), Karen Engel (COT), Sanne Ebbinkhuijsen (COT).

Expert Session, November 6, 2008: 13:00-15.30

Attendees:

John (Jack) Harrauld (Institute for Crisis, Disaster, and Risk Management; the George Washington University), Gregory Shaw (Institute for Crisis, Disaster, and Risk Management; the George Washington University), Sue McNeil (the Disaster Research Center; University of Delaware), Joseph Trainor (the Disaster Research Center; University of Delaware), Hans Balfoort (The Directorate General Water of the Ministry of Public Works, Transport, and Water Management, the Netherlands), Kees van Ruiten (Deltares), Peter Werkhoven (TNO), Ben Ale (Delft University), Georg Frerks (Wageningen University), Uri Rosenthal (COT), Marco Zannoni (COT), Karen Engel (COT), Sanne Ebbinkhuijsen (COT).

Appendix C: Interviewees

Interviews – Questions and

Interviews were conducted by COT in December 2008.

Interviewees included:

- Nico Roobol, LOCC (National Operations Coordination Center)
- K. Peijs, Province of Zeeland, Commissioner of the Queen
- M. Horselenberg, City of Lelystad, Mayor
- Gerard Laanen, Ministry of Public Works, Transport and Water Management, Head of the bureau of crisis management.
- Sander Scholten, City of Rotterdam, Advisor Directory Security and Safety
- Jeroen van Opstal, Fire Department of Flevoland (safety region).
- Don Berghuijs, Safety Region Rotterdam-Rijnmond, Director General.
- Hubert Jan Albert, Ministry of the Interior and Kingdom Relations, Secretary of the National Review Team; Program manager Public Safety and Administration, physical safety
- Gregory Zautsen, Regional Fire Department Northern Limburg, Chief Preparation, Response and After Care.
- Nils Ligthart, Min BZK, Ministry of the Interior and Kingdom Relations, Senior Policy Advisor National Security, Risk Assessment and Capability Planning.
- Noortje Janssen, City of Maastricht, Advisor Directory Security and Safety.
- Ron Hamelinck, Regional Fire Department Northern Limburg, Chief Training and Exercising; Project Leader large scale exercise Rainbow Limburg.

The in depth interviews were semi-open interviews and were conducted along the following guidelines:

- Individual reflection; observations, of the exercise.
 - Were objectives of the exercise obtained? If so, which objectives?
 - Was the exercise useful? If so, which aspects made it useful?
 - Were all aspects of flood management taken into account and exercised? If not, why not? Which elements were missing?
 - To what extent did participants learn from the exercise? In case participants learned, what did they learn? What were the primary lessons?
 - Were the lessons of a more practical or substantial nature?
 - How will adequate follow-up of the exercise be ensured?
 - What were the main challenges throughout the exercise?
- With respect to flood management, what will be the main challenges; necessary improvements? Which of these challenges would require additional attention throughout the sphere of international academic research?
- Would you consider increasing international cooperation and international exchange of knowledge useful? Regarding which topics?

- Are there topics in the field of flood management which you feel could require a US perspective?
- What might be interesting research questions or useful research projects to deal with in the future.
- How should adequate and useful international cooperation look like? What kind of activities would you find useful? How would you like to be involved in the future?
- In case of interdisciplinary activities, which parties should be brought together?

Appendix D: Participation January 2009

Meeting Schedule and

Tuesday January 6, 2009 – Internal Meeting Learning from a Large Scale Flood Exercise in the Netherlands

Location:

COT Institute for Safety, Security and Crisis Management, Koninginnegracht 26, 2514 AB, The Hague

Participants: John (Jack) Harrald, Gregory Shaw, Sue McNeil, Joseph Trainor, Marco Zannoni, Sanne Ebbinkhuijsen, Karen Engel

Agenda

16:00 – 17:00 – Discuss results research Learning from a Large Scale Flood Exercise in the Netherlands and results Dutch interviews

17:00– 17:30 – Break/ dinner

17:30 – 18.30 – Discuss final report research Learning from a Large Scale Flood Exercise in the Netherlands

- Shape and structure
- Presentation

18.30 – 20.00 – Discuss practical matters concerning the final phase of the project Learning from a Large Scale Flood Exercise in the Netherlands

Wednesday, January 7, 2009 – DAIC-WEM meeting with all the partners

Location: COT Institute for Safety, Security and Crisis Management, Koninginnegracht 26, 2514 AB, The Hague

Participants: John (Jack) Harrald, Gregory Shaw, Sue McNeil, Joseph Trainor, Harold Bousché (TNO), Kees van Ruiten (Deltares), Georg Frerks (WUR), Marco Zannoni, Sanne Ebbinkhuijsen, Karen Engel

Agenda

10.00 – 12.00 – Basic structure of the future three year project

- Determine issues to be discussed;
- Determine decisions that need to be made;
- Discussion regarding issues and decisions.

12.00 – 12.30 – Lunch

12.30 – 15.00 – Draw outline final basic structure for future cooperation

- Take relevant decisions;
- Draw up 'draft' final structure for future cooperation;
- Discuss time-line and future action list;
- Go through 'draft' final structure for future cooperation, time-line and action list;
- Finalize meeting

16.00 – Conference call, Boulder

Thursday, January 8, 2009 – Reflection Expert Meeting US/NL

'January meeting'

On January 8, 2009, the last phase of the research project *Learning from a large scale flood exercise in the Netherlands* will be initiated with a reflection meeting. Throughout the reflection meeting the observations and reflections of the project will be presented and discussed with policy makers, practitioners and researcher. Furthermore, the (possible) future research program, particularly research topics, will be established.

Location: AON, the Netherlands, headquarters in Rotterdam, Admiraliteitskade 62, 3063 ED Rotterdam, the Netherlands

Agenda

- 10.00 – 12.00 – Guided tour Rotterdam Port (including lunch)
- 13.00 – 13.10 – Opening Robert Smaak, DG Water, Director Water Safety
- 13.10 – 13.20 – Opening COT by Prof. Dr. Uri Rosenthal
- 13.20 – 14.00 – Presentation US research observations and reflections / Outcome additionally held interviews
- 14.00 – 14.30 – Discussion/ reflection of presentation US research observations and reflections/ outcome additionally held interviews
- 14.30 – 15.00 – Break
- 15.00 – 15.30 – Presentation: A Japanese perspective on learning for Flood Management by Mr. Okazumi, Director for international water coordination, of the River bureau of the Japanese Ministry of land, infrastructure, transport and tourism
- 15.30 – 17.30 – First steps towards a relevant future research and networking agenda
- 17.30 – 18.00 – Closing by Prof. Dr. Uri Rosenthal
- 18.00 - drinks

Appendix E:

Working Papers

Best Practices in Incident Management

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Introduction

The U.S. approach to the management of preparation for, response to, and recovery from extreme events has evolved dramatically since the attacks of September 11, 2001 and significant changes have been made since the failed response to Hurricane Katrina.

The objective of this paper is to describe best practices that will lead to effective and efficient management of the response to extreme events and problems encountered in the United States achieving these best practices. Best practices developed in the United States of potential interest to the Netherlands in the following four areas are identified and discussed:

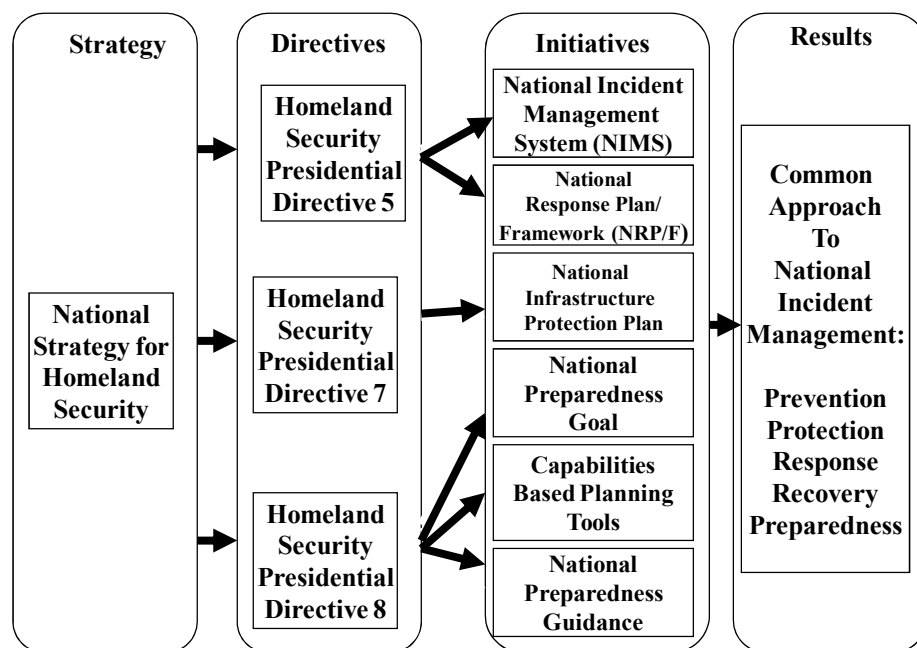
1. Development of Doctrine and Structure
2. Obtaining and Maintaining Situational Awareness
3. Determining response requirements
4. Mobilizing response resources

Issue 1: The development of clear doctrine and structure for incident management, minimizing problems of control and coordination.

Best Practice 1--Response Structure and Doctrine

Three Presidential directives have led to the development of a common structure and doctrine applicable to all hazards as shown in Figure 1.

Homeland Security Presidential Directive Five (HSPD5) declared that: "To prevent, prepare for, respond to, and recover from terrorist attacks, major disasters, and other emergencies, the United States Government shall establish a single, comprehensive approach to domestic incident management". The Directive designates the Secretary of the new Department of Homeland Security as the Principle Federal Official for domestic incident management and directed the DHS Secretary to develop a National Incident Management System (NIMS) and National Response Plan (NRP). The National Response Plan was revised and renamed as the National Response Framework (NRF) following Hurricane Katrina.



Source: Interim National Preparedness Goal

Figure 1
U.S. Incident Management Framework

The National Incident Management System is based on the Incident Command System, developed in the United States for wildfire response, and adopted by many fire services and federal and state emergency management organizations.

The NIMS ensures that consistent command and control structure and systematic procedures are used during the response to all incidents, minimizing organizational confusion and enhancing the ability to develop training programs and mobilization protocols. Additional information on the National Incident Management System may be found at www.FEMA.gov/emergency/nims.

The National Response Framework establishes national policy and doctrine for preparedness, response and recovery and assigns responsibilities to federal agencies and non government organizations. The NRF consists of a basic document and three extensive annexes. The Emergency Support Function Annex defines responsibilities for 15 functional areas, The Support Annex defines responsibilities for 9 general support areas, and the Incident Annex describes the response requirements particular to specific incident types. The NRF is intended to ensure that the government approaches all hazards and threats in a consistent manner and to provide the basis for developing the capability and capacity to do so. Additional information on the National Response Framework can be found at www.FEMA.gov/emergency/nrf.

Incident management problems

The national system established by the NRP and NIMS received its first major test when Hurricane Katrina struck the Gulf Coast in August, 2005. The federal government and state government response was a failure. Significant effort has been directed to correct three serious deficiencies

Poor leadership—the Post Katrina Reform Act requires that the Director of FEMA be an experienced Emergency Manager. The Federal and State governments have significantly increased the competence level of their senior emergency management leadership

Inadequate capacity—FEMA is funding a national catastrophic event preparedness effort designed to increase state capacity and capability. FEMA has created deployable response teams in key functional areas (search and rescue, medical, communications, etc). The US DOD Northern Command has increased the preparedness of the military to assist in disaster response.

Lack of agility and creativity As predicted by many observers, the development of doctrine and structure designed to enhance command, rather than to ensure collaboration and coordination, made the federal response more bureaucratic and less agile (see Harrald, 2006; Harrald, 2007, Buck, Trainer and Aguirre 2006). During the response to an extreme event, managers must deal with the unexpected and must have the ability to improvise and adapt. FEMA is attempting to deal with this issue by decentralizing its response operations and developing training and exercises focusing on catastrophic events. It is not clear whether or not these efforts will achieve their desired objective.

Issue 2: Obtaining and maintaining an accurate, shared awareness of the situation.

The term “situational awareness” was originally an aviation term, used to describe a pilot’s awareness during a tactical situation and is now broadly used in military and civilian operational contexts to describe congruence between the operational perception of a situation and reality. Situational awareness has an information

component, a perception component, and a meaning component. For a more detailed description of situational awareness see Endsley (1988) or Harrauld and Jefferson (2007)

Best Practice 2: Obtaining information for Situational Awareness

The Department of Homeland Security and FEMA have invested heavily in the first component of situational awareness—the collection, filtering, analysis, and distribution of information. Thousands of lives may have been saved by effectively using accurate situational information during the preparation and initial response to Hurricanes Gustav and Ike in the summer of 2008. Situational awareness allowed decision makers in states, Federal regions, and at FEMA and DHS headquarters in Washington, D.C. to manage the allocation of people needing public shelter to shelters opened in 9 states and 3 federal regions as shown in Figure 2

General Population Shelters

National Shelter System (NSS)					
04 SEPT 08 02:00 am EDT					
State	Total Shelters	Total Population	Evacuation capacity	Used % Capacity	
1 Alabama (R4)	52	10,932	22,571	48.43%	
2 Arkansas (R6)	27	1,063	5,925	17.94%	
3 Florida (R4)	3	70	1,300	5.38%	
4 Georgia (R4)	6	671	2,108	31.83%	
5 Indiana (R5)	1	0	350	0.00%	
6 Kentucky (R4)	1	1,432	3,000	47.73%	
7 Tennessee (R4)	37	5,655	13,205	42.82%	
8 Oklahoma (R6)	3	1,636	13,055	12.53%	
9 Mississippi (R4)	62	6,517	21,536	30.26%	
10 Texas (R6)	31	1,639	9,259	17.70%	
11 Louisiana (R6)	49	13,356	28,222	47.32%	
11 CURRENT DAY	272	42,971	120,531	35.65%	

Figure 2: Shelter Populations in National Shelter System Shelters
two days
After Hurricane Gustav landfall

Situational Awareness problems.

The problem of shared perception. Providing accurate, relevant, and consistent information to decision makers in the multiple operations centers in multiple locations that are required to manage the response to an extreme event is technologically and organizationally complex. Even if these operations centers receive approximately the same information, however, their perception of reality may differ significantly due to differences in experience, organizational culture, or organizational objectives. Unless collaboration mechanisms exist to share perceptions as well as information, shared situational awareness will not be

achieved. Shared
produce a shared perception of reality.

information does not necessarily

The problem of shared meaning. Meaning requires an understanding of the implications of information, both for the present and for the future. The imputation of meaning to information is a function of one's experience, knowledge, and culture. Simply put, information means different things to different people. In military organizations, uniform training and extensive shared experiences minimize differences in perception and understanding of meaning of information. In a response to a catastrophic event, however, responders and responder organizations are extremely diverse. Organizations range from military and professional first responders (fire, police) to organizations of spontaneous volunteers. At present, our ability to network and to share information exceeds our ability to promote shared perception and shared meaning.

Issue 3: Determining required response requirements.

As shown in Figure 3, the response and recovery capability and capacity required are determined by the needs of the affected population and region. These needs are a function of the physical impact caused by the event, and the social and physical vulnerability of the affected population

Best Practice 3: Estimating needs of vulnerable populations.

Drawing on current research DHS has developed methods of estimating physical and social vulnerability and development of models that will identify areas where high vulnerability coincide with areas of high impact. As shown in Figure 3, estimating disaster caused needs requires not only the estimation of economic and biophysical vulnerabilities but also the evaluation of social vulnerability. To understand who the most socially vulnerable people are within a population and where those less resilient reside is needed before response decisions can be made. (Cutter and Emrich, 2006).

Since vulnerability manifests itself geographically in the form of hazardous places (floodplains, remnant waste sites); spatial solutions are required, especially when comparing the relative levels of vulnerability between places or between different groups of people who live or work in those places (Cutter, 2003).

From Scenario to Operational Requirements

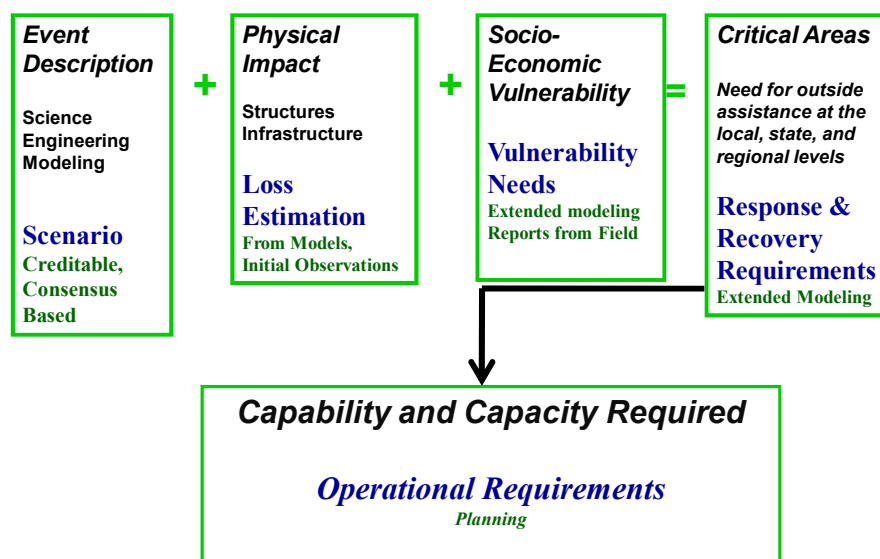


Figure 3

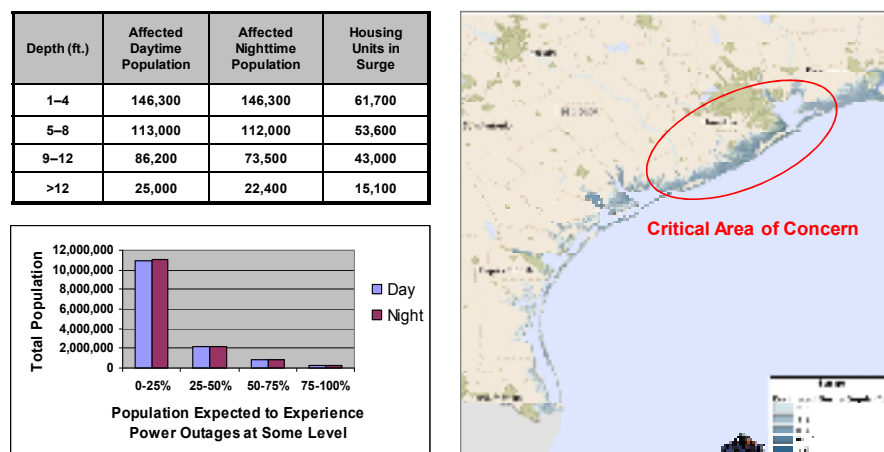
Susan Cutter (2006) of the University of South Carolina has studied social vulnerability to disasters and has developed a social vulnerability index that considers the following factors:

- Housing stock
- Infrastructure and facilities

- Special-needs populations
- Age
- Commercial and industrial development
- Rural/Urban
- Medical services
- Housing tenancy
- Population growth
- Socioeconomic status

Knowledge of physical and social vulnerability is used by FEMA during its planning process through the use of its loss estimation modeling tool HAZARD-US Multi Hazard (HAZUS-MH), or through the use of storm surge models. Figure 4 shows the preliminary estimate of homes at risk from Hurricane Ike's storm surge and the expected impact of power losses. FEMA managers were able to translate this physical impact information into expected demands for shelter, food, water, and other commodities.

Projected Storm Surge and Power Outages



5

Figure 4

Problems in estimating required capabilities and capacity:

The problem of understanding social vulnerabilities. Social vulnerability is the product of social inequalities. It is defined as the susceptibility of social groups to the impacts of hazards, as well as their resiliency, or ability to adequately recover from them (Cutter and Emrich, 2006). This susceptibility is not only a function of the demographic characteristics of the population (age, gender, wealth, etc.), but also

more complex constructs such as health care provision, social capital, and access to lifelines (e.g. emergency response personnel, goods, services) (Cutter et.al, 2003; Cutter et.al, 2000; Cutter, 1996).

The problem of determining location/size of vulnerable populations. Social vulnerability to disaster is a social dynamic rooted in gender, class, race, culture, nationality, age, and other power relationships (Enarson et al., 2006). In addition to the sheer number of people at risk, emergency managers have the additional task of identifying those residents who may be the most vulnerable (Cutter, 2006b).

The problem of determining requirements of special needs populations. Individuals in need of additional response assistance may include those who have disabilities; who live in institutionalized settings; who are elderly; who are children; who are from diverse cultures; who have limited English proficiency; or who are non-English speaking; who are homeless, who are seasonal tourists or who are transportation disadvantaged. Populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to: maintaining independence, communication, transportation, supervision, medical care (FEMA, 2008).

Problems in translating disaster caused needs to required response capacities. The concept of vulnerability has been accepted conceptually but is difficult to implement operationally. Managers are looking for simplified indices that will help them estimate needs and deploy resources. The problem is compounded by our poorly understanding of how cascading impacts (e.g. loss of power leading to loss of water and sanitation and health care) increases the needs of vulnerable populations and therefore the requirement for response capacity and capability.

Issue 4: Mobilizing external resources.

As demonstrated by Hurricane Katrina, an extreme event requires a rapid and extensive mobilization of response resources.

Best Practice 4: Mobilization of special teams and development of mutual aid agreements and protocols

Three major initiatives have occurred in the United States that significantly improve the ability to identify and mobilize essential response resources

- National special teams. The Federal government has created teams of experts that are trained, equipped and deployable during incidents of national significance. These include the 28 Urban Search and Rescue Teams (state and local teams funded by FEMA), FEMA led National and Regional Response teams, Incident Management Assistance Teams (IMATS), Mobile Emergency Response Teams (MERS), and National Communication Systems teams
- The Department of Health and Human Services can deploy Disaster Medical Assist Teams (DMAT) and Disaster Mortuary Teams (DMORTS)
- State mutual aid. State governments have established a system of facilitating mutual aid among states that does not require the intervention or assistance of the federal government. As stated on the EMAC web site (www.EMACweb.org):

“Through EMAC, a disaster impacted state can request and receive assistance from other member states quickly and efficiently, resolving two key issues upfront: liability and reimbursement. Since being ratified by Congress and signed into law, in 1996, (Public Law 104-321), 50 states, the District of Columbia, Puerto Rico, Guam, and the US Virgin Islands have enacted legislation to become members of EMAC. EMAC is the first national disaster-relief compact since the Civil Defense and Disaster Compact of 1950 to be ratified by Congress.

The strength of EMAC and the quality that distinguishes it from other plans and compacts lies in its governance structure, its relationship with federal organizations, states, counties, territories, and the ability to move just about any resource one state has to assist another state, including medical resources.

EMAC offers the following benefits:

- EMAC assistance may be more readily available than other resources.
- EMAC allows for a quick response to disasters using the unique human resources and expertise possessed by member states.
- EMAC offers state-to-state assistance during Governor declared state of emergencies: EMAC offers a responsive and straightforward system for states to send personnel and equipment to help disaster relief efforts in other states. When resources are overwhelmed, EMAC helps to fill the shortfalls.
- EMAC establishes a firm legal foundation: Once the conditions for providing assistance to a requesting state have been set, the terms constitute a legally binding contractual agreement that make affected states responsible for reimbursement. Responding states can rest assured that sending aid will not be a financial or legal burden and personnel sent are protected under workers compensation and liability provisions. The EMAC legislation solves the problems of liability and responsibilities of cost and allows for credentials to be honored across state lines.
- EMAC provides fast and flexible assistance: EMAC allows states to ask for whatever assistance they need for any type of emergency, from earthquakes to acts of terrorism. EMAC's simple procedures help states dispense with bureaucratic wrangling.
- EMAC can move resources other compacts can't - like medical resources.”

3. Regional mutual aid: Another structure for mutual aid is the relatively recent National Emergency Management Network (NEMN). As described on the NEMN website, www.nemn.net.

A result of the innovative leadership of the Public Entity Risk Institute (PERI) and the International City/County Management Association (ICMA), NEMN is a nationwide network comprised of participating communities, businesses, and nonprofit organizations that are willing to share resources with stricken areas, and with each other in the event of a disaster. NEMN membership is supported by software technologies and educational resources, including a comprehensive database of people and physical assets available for emergency response and recovery efforts and a geo-mapping and situational awareness tool to identify, select, activate, track, and manage assets before, during, and after emergency incidents

Resource Mobilization Problems.

- The problem of unexpected requirements. It is difficult to anticipate requirements for extreme events that have not yet occurred. FEMA has initiated a catastrophic preparedness project to try to determine the capabilities needed to respond to specific catastrophic scenarios
- The problem of communicating through chaos. It is difficult for an impacted area to know what resources are needed immediately after an event. It is even more difficult to communicate these needs to organizations that are capable of providing resources.
- The problem of political leadership. The failure to estimate needs before an event or to the failure to adequately assess post event impacts can result in a failure to act or a failure to request needed assistance, as was seen during the Katrina response. At the other extreme, there is a temptation to request everything and anything, resulting in an expensive and counter productive commitment of resources. This tendency can be exacerbated by an overly aggressive federal response.

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Best Practices in Disaster Management

Using Information Technology in

Dilek Ozcelylan, John R. Harrald, PhD, Institute for Crisis, Disaster, and Risk Management, the George Washington University

Introduction

The rapid evolution of information technology is providing capabilities that are dramatically changing our ability to prepare for, respond to, and recover from extreme events (Harrald, 2005).

According to Pine (2007) technology has had major effects on all organizations, allowing emergency managers to predict hazards more quickly, respond more effectively, communicate quickly, develop a better understanding of hazards, improve response, increase coordination, improve efficiency, improve training and risk communication programs. It provides more robust, interoperable, and priority-sensitive communication; better situational awareness and a common operating picture; improved decision support and resource tracking and allocation; greater organizational agility for disaster management; better engagement of the public; and enhanced infrastructure survivability and continuity of societal functions (NRC, 2007).

The objective of this paper is to describe best practices in the use of information technology in disaster management. The discussion draws extensively from the recent National Research Council Report *Improving Disaster Management: The Role of IT in Mitigation, Preparedness, Response, and Recovery* (NRC 2007). The four areas of information technology best practice identified are:

1. Warning Systems
2. Decision Support Systems
3. Interoperable Communications
4. Geospatial Technologies

Issue 1: To ensure that people in harm's way have the information required to take protective action.

It is possible to protect people from many extreme events such as hurricanes, tsunamis, tornadoes, storm surges and riverine flooding by providing both safe haven and adequate and timely warning

Best Practice #1—Warning Systems

Early warning is the provision of timely and effective information, through identifying institutions, that allow individuals exposed to hazard to take action to avoid or reduce their risk and prepare for effective response (GDACS, 2008).

With increasing damage caused by natural disasters in last decade, the implementation of effective Early Warning Systems (EWS) has become a major issue on the agenda of international, national, and local authorities (Meissen and Voisard, 2008). Early warning has been recognized as an effective tool to reduce vulnerabilities and to improve mitigation, preparedness and response to natural

hazards (Pattie and Voisard, 2008). It is important that warnings are disseminated effectively and efficiently in a timely way and targeted to people at risk (Hui et al, 2008; Meissen and Voisard, 2008).

The UN Inter-Agency Secretariat of the International Strategy for Disaster Reduction (UN/ISDR, 2006) has defined four key elements as components of EWS: (i) risk knowledge, (ii) monitoring and warning service, (iii) communications and dissemination of understandable warnings to those at risk and (iv) response capability. The National Oceanic and Atmospheric Administration (NOAA) and the Federal Emergency Management Agency (FEMA) have developed warning systems for hurricanes that have saved thousands of lives. Figure 1 shows NOAA hurricane tracking and forecasting for Hurricane Ike and Figure 2 shows the storm surge predictions for Ike used to evacuate millions of people out of harms way prior to Hurricane Ike's landfall.

Hurricane Ike

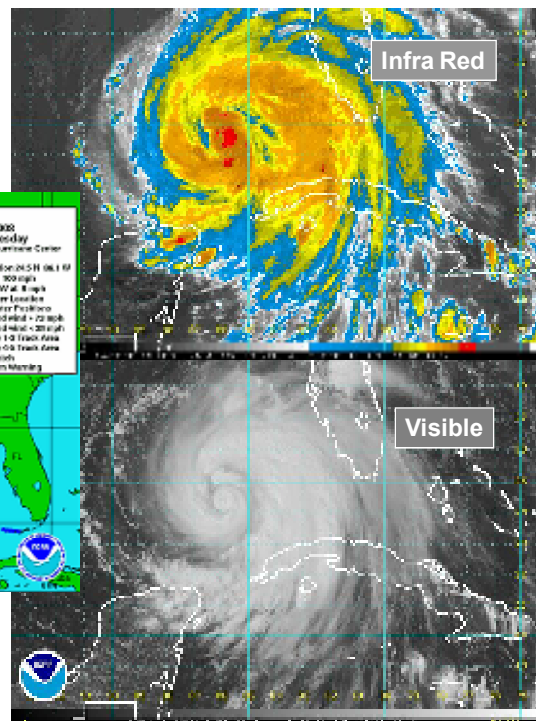


Figure 1

NOAA Track Prediction—Hurricane Ike



Storm Surge – 'worst case' scenario-10 percent chance of surge height being exceeded

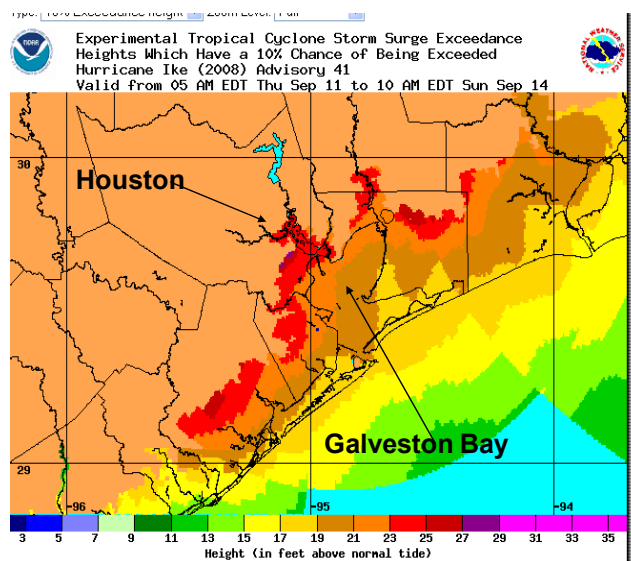


Figure 2

Storm Surge Predictions—Hurricane Ike

Implementation issues/problems

The information technology needed to create an all hazards warning system exists. But one important challenge in the successful implementation or improvement of an EWS is evaluating and monitoring its efficiency (Meissen and Voisard, 2008).

Fragmented responsibility and lack of coordination leads to inconsistent messages and/or overly broad messages instead of the desired authoritative and targeted warnings (NRC, 2005) and these situations cause inefficiency (UN/ISDR, 2006).

Warning messages must be received and understood to be effective. Warning systems must consider people's perception, interpretation, and reaction to the warnings. It requires significant knowledge of the population, in terms of their demographics, societal culture, and past events that have occurred in the location (Pattie and Dannenmann, 2008).

Besides these, lack of legal frameworks, insufficient investment, lack of participatory approaches and inadequate identification and sharing of methodologies and good practices are also seen as a barrier to being effective (UN/ISDR, 2006).

Issue #2: Using technology to improve the management of disaster response.

Disaster managers face unexpected situations, must act during periods of great chaos, and must make critical decisions based on incomplete and inconsistent information. Using information technology to support key decision makers and the making of critical decisions has been a major priority for the US Federal Emergency Management Agency since Hurricane Katrina.

Best Practice # 2—Decision Support Systems

Decision support is needed to help frame crucial decisions, to structure the analysis of alternatives, and in monitoring results after decisions are made. For example, the decision to “evacuate those at risk” must be supported with how many are at risk, where should they be evacuated to, and address the “how can we do this” part of the task. Where are shelters? Which hospitals have beds? How will casualties be transported, and how can the process be managed, and who needs to know? (Carver and Turoff, 2007)

DSS can be designed to work with individuals or with groups, and the groups may work in the same time and place or at distant locations, working perhaps asynchronously over the Internet. The systems can be built on large databases or models or both, or they can simply seek to organize and communicate results to differently skilled groups of decision makers to build a shared understanding (French and Turoff, 2007).

An emerging decision support technology is the development of consistently formatted comprehensive information displays, or “dashboards” that present critical information to high level decision makers. Figure 3 illustrates the information dashboard used by FEMA national decision makers during the response to the 2007 southern California wildfires.

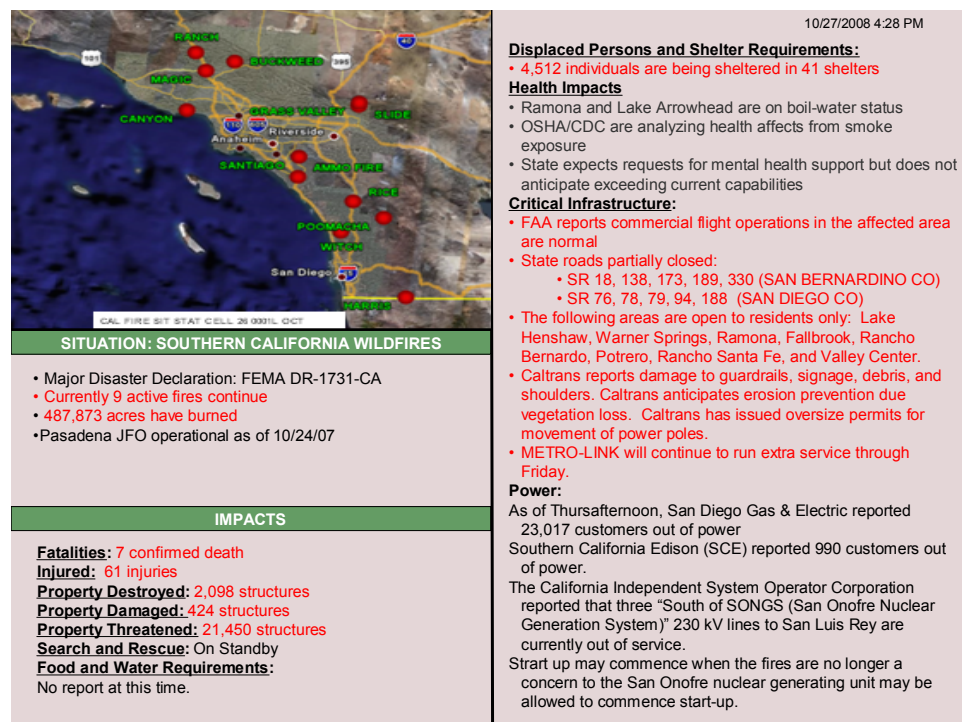


Figure 3
California Wildfire Dashboard

Other information displays are designed to support specific, recurring decisions. Figure 4, for example, was used by the US Army Corps of Engineers to deploy debris removal teams after Hurricane Gustav in 2008.

Metric Slide - USACE /ESF 3
As of Sept 2 at 0800 EDT

GUSTAV Debris Modeling

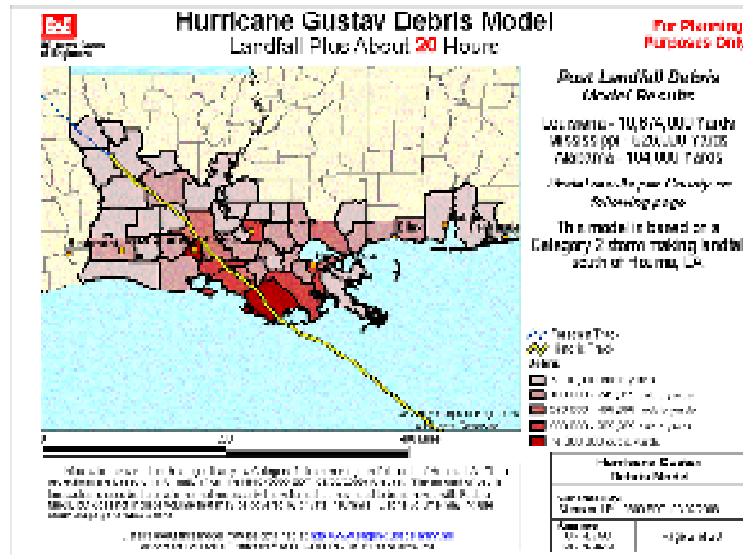


Figure 4

Hurricane Gustav Debris Removal Decision Support

Implementation issues/problems

The major issues in the design and development of decision support systems are;

1. *The pre-event identification of critical decisions.* Disaster managers are often faced with unexpected conditions that have not been anticipated during planning and exercises. Decision support systems must be robust and flexible enough to support unexpected critical decisions.
2. *Erroneous identification of decision makers.* Decision support is only useful if it is available to the appropriate decision makers. If systems are developed to support national headquarters, for example, and decisions are actually made by decentralized regional and local officials, the technology will be of limited use.
3. *Inability to get the right information to the right place at the right time.* Decision support systems depend upon information. Information gathering, analysis, and distribution capabilities must support the decision support technology.

Issue 3: The ability of response organizations to communicate with each other during the response to complex, extreme events.

The response to a complex, extreme event can involve hundreds of organizations and thousands of trained responders. These organizations and individuals must be able to communicate critical information without overwhelming their technology

of themselves. The tragic loss of lives among responders when the World Trade Center towers collapsed after the attacks of 9/11 dramatically demonstrated the critical importance of effective emergency responder communication systems. After that interoperability has widely recognized as a vital to effective emergency response by the United States Department of Homeland Security.

Regardless of the approach, major change will take many years. Systems that can be deployed in the short term to provide even limited capabilities to bridge existing communications systems are a useful interoperability tool. Achieving the goal of widespread deployment of interoperable systems requires a long-term strategy for migrating from today's systems to the desired capabilities. The federal role in improving interoperability is limited largely to providing guidance, coordination, and technical assistance. Federal government could, for example, provide a road map, a policy framework, and an architectural framework to create a system of systems. It could also support initiatives that motivate local agencies to move toward standards-based systems. A number of federal programs, including the DHS's SAFECOM, are aimed at providing such support (NRC, 2005).

SAFECOM, is working with existing Federal communications initiatives and key emergency response stakeholders to address the need to develop better technologies and processes for the multi-jurisdictional and cross-disciplinary coordination of existing systems and future networks. On July 22, 2004, President Bush formally announced the RapidCom initiative, a program designed to ensure that a minimum level of emergency response interoperability would be in place in ten high-threat urban areas by September 30, 2004. With the initial work of RapidCom now complete, incident commanders in each of the urban areas now have the ability to adequately communicate with each other and their respective command centers within one hour of an incident (<http://www.safecomprogram.gov/SAFECOM/>).

Implementation issues/problems

Federal interoperability activities are diverse and they require coordination. DHS's Office for Interoperability and Compatibility has created an umbrella program to coordinate these federal interoperability efforts. Interagency efforts are also underway to address the need for coordination. Still needed are a road map and a more coherent policy framework within which federal agencies can work together. Interoperability and coordination issues are also evident at the state level. A number of states have developed statewide communications interoperability plans, but many thus far involve only the state police. Localities have begun to recognize the need to better coordinate planning and communications. This work began in the 1990s and was accelerated by the events of September 11, 2001 (NRC, 2005).

The National Research Council (2005, p43) points out that interoperability is not solely a technological issue and offers three cautionary notes;

1. One cannot operate without being able to operate in the first place.

2. No single communication or information system is likely to suffice in a major disaster, no matter how comprehensive its scope or how much investment has been made in its interoperability and technical robustness.
3. Technical communications interoperability does not address the challenges of data interoperation among organizations.

The National Research Council also notes that implementing standards broadly is a slow process, given the time it takes to build consensus among the relevant communities and the resources and planning required to replace legacy systems. The NRC reminds managers that interoperability once achieved, must be maintained. As jurisdictions upgrade their technology to fulfill their own acquisition plans, a stair stepping effect occurs, with the result that localities' systems are frequently incompatible with their neighbors' systems. Overcoming the effects of these mismatches requires better-coordinated and synchronized acquisition cycles.

Issue 4: Gathering, analyzing and displaying information to enhance the understanding of complex, dynamic events

Best Practice # 4—Geospatial Technologies

Geospatial technologies include, but are not limited to, geographic information systems (GIS), global positioning systems (GPS), remote sensing, and location-based systems (LBS) (Sui, 2008). These technologies can play a vital role in helping us cope with our uncertain world (Bednarz and Bednarz, 2008).

A GIS is an organized collection of computer hardware and software designed to create, manipulate, analyze, and display all types of geographic data. A GIS can assist in emergency rescue operations by identifying where help is needed and helping to direct resources in an efficient manner. It is easy to determine the potential damage from a flood and see who will be affected. A GIS allows the user to select features in a layer (e.g. special needs populations) that intersects with another layer (a flood zone). You could communicate directly with residents in the flood zone in a pending flood. You could see the interstates and plan evacuation routes. You can also attain a list of critical facilities from looking at this map, and you could make special arrangements to evacuate residents in those facilities (Pine, 2007).

A global positioning system (GPS) is a system to identify and record a geospatial reference point on the Earth's surface using a set of satellites orbiting Earth. GPS technology has many applications. These applications can be broken down into five broad categories which are determine the location, navigation, tracking, mapping and timing (Pine, 2007). Following Hurricanes Katrina and Rita, survey teams were dispatched to New Orleans to use GPS to record the extent of flooding at street intersections or in open areas. In addition, the precise locations of residential and commercial buildings in New Orleans were identified using GPS units. High water marks were then measured on these structures in order to verify

water depths throughout the city. GPS technology was essential in accurately recording the extent of flooding and the location of high water marks (Pine, 2007).

Remote sensing has most commonly been employed as a method for the detection, identification, mapping, and monitoring of hazards and effects of disasters (Showalter, 2001). Doppler radar is used to identify and track hurricanes, tornados, and other weather phenomena. Networks of earth and structure motion detectors provide information about the severity and nature of earthquakes. Satellite imagery is used to map and plan operations in major wildland fires. Tsunami detectors provide advanced warning of the location and nature of tsunamis. Interferometric synthetic aperture radar (IfSAR), which uses an aircraft-mounted sensor to measure surface elevation, produces topographic imagery. Light detection and ranging (LIDAR) technology can measure the speed, distance, rotation, and chemical composition of a remote target, where the target can be either a clearly defined object or a diffuse object (NRC, 2007).

Extensive examples of the use of Geospatial technologies in disaster management may be found on the NOAA GOES web page (www.goes.noaa.gov), the fire services environmental monitoring web site (www.fs.fed.us/raws/), and on the commercial site of the firm Image Cat www.imagecatinc.com.

Implementation issues/problems

The objective of Geospatial technologies is to inform and to improve management. Too often maps and other products are produced without adequate knowledge of their potential use (what functions and decisions they will support). Inversely, manager use geospatial displays without an adequate knowledge of limitations created by incomplete or inaccurate data incorporated in the display.

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A Brief Summary of Response Literature

Social Science Warning and

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Introduction

For more than five decades, researchers have explored the dynamics of warnings and warning response in the disaster context. This report is intended to briefly summarize findings related to this topic. The ultimate goal is to provide a basic understanding of how social science research related to warnings and evacuations might inform policy makers and emergency managers.

Before we begin discussing the details of warning messages, the first and most important issue for readers to note is that the decision making processes of most evacuees and even non-evacuees are rational and calculated. Contrary to media depictions and other's perceptions of the public that suggest animal-like, irrational, or antisocial behavior it is important that we begin this discussion knowing that people typically "rise to the occasion" during disasters. Although it would be wrong to suggest that people *never* make irrational decisions it is important that we begin this summary by recognizing that when we look at the broad patterns of human behavior documented through scientific/empirical studies, people who are experiencing a disaster far more often than not act in very rational and predictable ways. This finding above all others holds true in social science research. It is important to recognize this truth because it allows policy makers and emergency managers to move beyond the notion that the problem with warning and response is "getting people to be rational and do what we say" and instead allows us to move towards understanding "how can we change our approach so that it takes into account how people process warning information. While the difference may seem subtle, in practice it is quite important. The first sees overcoming irrationality as the problem while the second sees the institutional/organizational approach to warning as the problem.

This report attempts to provide information that can help policy makers understand the factors that affect warning response in the US context. In so doing, this report addresses two important pieces of information. First, it outlines the stages of information processing that people move through when deciding to take or not take protective actions. Second, it summarizes findings from research on how social structural factors and patterns of human behavioral response influence people at each phase. The goal is to help readers better understand warning message processing.

The Warning Process

Within warning and response research there are literally hundreds of social science studies. Among these four major works (Donner 2007; Lindell and Perry 1992; Mileti and Sorensen 1990; Mileti 1999) have been instrumental in developing an

²This document was created through the compilation of a number of sources on warning and response available at the E.L. Quarantelli Resource collection. The most prominent contributions were made by Donner (2007) and an annotated bibliography produced by Mileti et.al.(2006.)

understanding of the phases of information processing that must be taken into account when designing a “warning system.” These works have outlined the following eight stage process of warning.

- Stage One-Receive the Warning-People must physically receive a warning.
- Stage Two- Understand the Warning-Once people receive a warning they must be able to process the message and understand what it means.
- Step Three- Believe the warning is credible-People must believe that the source of the warning is reliable.
- Step Four- Confirm the threat-People must take steps in order to verify that the threat described in the warning is real.
- Step Five- Personalize the threat-People must believe that the threat is something that can potentially effect them.
- Step Six-Determine whether or not protective action is needed-People need to decide if they need to take action.
- Step Seven-Determine whether protective action is feasible-People need to decide if they are able to take action.
- Step Eight- Take Protective Action- Finally people need to have the resources to actually do what is required

Below we address the relationship between these stages and present a very simplistic review of the main issues that affect people's interpretations at each stage.

Relationships between Phases

Although these stages were initially thought to operate in a linear fashion where a person must move through phase one in order to reach phase two and so on, it is now thought that later stages for one person or community often act on earlier stages for others. This is important because it highlights that the warning process is a matter of collective behavior, involving, among other things, cooperation, coordination, and interaction among people.(Donner 2007) In other words, these messages are processed by groups not by individuals alone. In addition, individuals' movement from phase to phase is affected by:

Interdependence- in other words decision made in one phase effect the range of responses people see as feasible or rational in other phases.

Movement through stages is based on interaction- this means that as people make choices at each phase they influence and are simultaneously influenced by other people's decision making process.

1. Social variables have complex effects on the process - In other words we need to recognize that characteristics such as age, gender, race, etc will have different levels and different types of influence at different phase (Donner 2007)
2. Resources matter- in other words regardless of if people want to act their ability to do so is limited by the resources they possess.
3. The process of responding to warnings is characterized by a complex process of information seeking, keynoting, and, most of all, interaction.

Thus, contrary to the beliefs of officials, warning response is not simply an “individual” decision that determines whether someone will seek shelter when faced with the possibility of tornadoes. Such a view is simplistic, poorly conceptualized, and ignores years of research. It is important to know that groups and families should be targeted rather than individuals. Messages should be tailored to specific sub-populations interests.

Social Factors that affect the Warning Process

As discussed above, many of the forces that drive the warning process are social and involve interaction, communication, and collective definition. Research strongly suggests, moreover, that pre-existing social structures and emergent behaviors (Turner and Killian 1987; Aguirre, Wenger, and Vigo 1998) also play a role in shaping warning response and evacuation behavior. In this section we discuss a few of the more salient factors. Empirical studies in the fields of sociology, political science, and anthropology continue frequently and consistently corroborate these ideas. As noted previously, there are a variety of factors including age, language and culture which might inhibit actors from understanding and successfully interpreting a warning message (Aguirre 1998; Bausell 1986; Belloc and Breslow 1972; Levanthal and Prohaska 1986; Linsk 1994; 2000; Nichols et al. 2002; Puleo 1996). The dynamics behind warning understanding are well documented as a result the following list presents an overview of these findings :

1. Social Power
 - a) The more freedom a person has to leave their place of employment, the more likely they are to respond to a warning message
 - b) Spousal control plays an important dynamic in warning decision making
2. Resources
 - a) Having resources increases the likelihood of a person responding to a warning message. Both Balluz et al. (2000) and Baker (1979) show the presence of resources increases the likelihood of response.
 - b) The perceived availability of resources shapes evacuation decision making. (Duval and Mulilis 1999) find clear evidence supporting the mere perception of resources as sufficient to motivate evacuation.
 - c) A person is more likely to respond to a warning message if their livelihood will be unaffected by their decision.
 - d) The experiences of Hurricane Katrina evacuees within the larger context of socio-structural limitations and builds upon previous research by Barnshaw (2006b) and Trainor, Donner and Torres (forthcoming 2007) which both demonstrated how the “choice” to evacuate was constrained by structured inequality, and a lack of social resources. The level of economic resources cannot be

overstated as

significantly influencing how evacuation from the impacted area was experienced. Frequently, individuals with greater resources in the form of economic capital were able to locate a place to stay and could move on to the other tasks which were competing for the time and attention of less affluent “underclass” evacuees’ who were most often found in the shelters.

3. Culture

- a) Culture is a salient feature of warning response. In particular, Perry and Hirotsada (1991) offer an instructive analysis of values and their influence on sheltering behavior among U.S. and Japanese evacuees. The researchers found the greater likelihood of sheltering among the Japanese chiefly attributable to a “collectivist culture in which citizens have higher expectations that authorities will provide care in the event of disasters or other disruptions in social life.” (112).
- b) Others (Aguirre 1988) find language a cultural artifact inseparable from the process of receiving tornado warnings, a finding suitably extended to slow-onset events, for there is little reason to believe that communication barriers play any less a role in the process of understanding, belief, and personalization.

4. Gender

- a) Women are more likely than men to respond to warning messages.

5. Characteristics of the Warning Message

- a) The probability of warning receipt and comprehension tends to increase with the dissemination of multiple

6. Characteristics of the Hazard

- a) Threat proximity, for example, is consistently acknowledged as a mechanism behind public response (Sorenson 1982): the likelihood of belief within warned communities located near a disaster is greater, which, of course, may be linked to the reality of greater response rates among those encountering environmental cues (Hammer and Schmidlin 2002; Mileti and O’Brien 1993; Tierney 1987).
- b) The more environmental cues the public observes, the more likely they are to respond to warning messages.
- c) Having confirmation of the disaster/hazard increases the likelihood of a person responding to it

7. Behavioral Response Patterns

- a) “People have a tendency to err on the side of normalcy,” McLuckie (1973). “Conditions are evaluated as all right until proven otherwise. Therefore,” he concludes, “the burden of proof is on the warning system.” In the absence of nearby environmental cues, this “normalcy bias,” described by Okabe and Makami (1981), triggers immediate *denial* on the part of potential victims.

- b) Defining a situation is necessary for action (Turner and Killian 1987) and such consensus is often produced through interaction. To be sure, there is strong evidence to suggest that the perception of immediate danger is a necessary factor in the decision to evacuate (Hammer and Schmidlin 2002).
 - c) Similarly, as suggested by Aguirre, Wenger, and Vigo (1998) in the case of building evacuation, people often made the decision to evacuate or stay based on a collective emerging definition of the situation and appropriate lines of action.
 - d) Risk personalization—or the perception that one is indeed under threat—is no less contingent upon social, psychological, and environmental factors.
 - e) Researchers have noted a fundamental difference between the belief of a threat or warning and the personalization of the threat (Donner 2007; Lindell and Perry 1983). Perry, Lindell and Greene (1980) found that actors are more likely to respond to a threat if they personally believe to be a stakeholder in danger.
 - f) Warnings need to take into account social time. For example take the example provide by donner : interviewee hesitant to inform her family of tornado warnings: arriving at the risk personalization stage, she nevertheless felt it unwarranted to contact her daughter about the tornado warning. Doing so, she believed, would have violated norms regulating when, how, and under what conditions the waking of another person is permitted. The reader may at this point be puzzled: are tornado warnings not grounds for violating sleep norms? We may indeed think so, but counterintuitive findings such as these should cause us to rethink our basic assumptions about the power norms hold over behaviors ordinarily thought instinctive
 - g) Response often happens in as “cascading” action toward protection. In other words people don’t always move to the safest location instead moving to a safer area in which further information was available (confirmation); further confirmation would then prompt them to seek shelter in the safest place they thought possible.(Donner 2007)
8. Social Networks
- a) People with children are more likely to respond to disaster warning messages, than people without children.
 - b) A related feature of social networks is spatial concentration within social networks. Spatial concentration, or network density, refers to the linkages between ties within a given space or time (Wasserman and Faust 1994; McPherson 1982). Spatial concentration may be significant in the transfer of social capital, particularly within a disaster context as geography may influence access to resources.
 - c) Many of the evacuees interviewed in Houston were working class elderly with few friends and represented a fragmented social network. As a consequence, these agents could not rely upon others for assistance in the evacuation process or in the securing of provisional resources.

- d) Having membership in social networks increases the likelihood of a person responding to a warning message.
 - e) Observing social cues increases the likelihood of a person responding to a warning message.
 - f) The more care-giving responsibilities a person has, the more likely they are to respond to a warning. (e.g. children, elderly, sick)
 - g) Receiving a warning message through a personal channel increases the likelihood of a person believing the message.
 - h) Kirschenbaum (1992) found that a majority of those who attempted to confirm institutionalized warnings, sought confirmation through auxiliary channels such as friends and neighbors.
9. Experience with a Hazard
- a) The less experience a person has with a disaster/hazard, the more likely they are to respond to a warning message.
 - b) A person who has had previous experiences with a disaster is more likely to hear a warning message.
 - c) If a person has had personal experience with a hazard/disaster in the past, they are less likely to believe and respond to a warning message.
 - d) The public is more likely to hear a warning about a disaster agent with which they are familiar, but is also more likely to verify/confirm longer before acting.
 - e) The more vulnerable the public feels towards a hazard/disaster, the more likely they are to believe a warning message and respond to it.
 - f) If a person has had experiences with the cancellation of warnings, they are less likely to believe and respond to warning messages.
10. Credibility of person/agency Issuing the Warning
- a) If warning information comes from an official source, the public is more likely to respond to the warning message
 - b) The public is more likely to respond to a warning message if it comes from an official source.
 - c) Citizens tend to use social networks to relay and receive warnings
 - d) Citizens make use of the mass media when attempting to manage information about hazards
 - e) The public is more likely to hear a warning from the mass media. When the media reports on the hazard/disaster with adequate information, the public is more likely to understand the warning message.
11. Knowledge and Ability to take Action
- a) The more knowledge a person has about protective responses, the more likely they are to respond to warning messages.
 - b) The more knowledge a person has about protective responses, the more likely they are to respond to warning messages.
 - c) The more knowledge a person has about protective responses, the more likely they are to respond to warning messages.

- d) People are more likely to respond to a warning message if it includes informative guidance and/or if there is a lack of response alternatives.
- e) although an actor may personalize the threat, the decision on what action an actor should undertake is a subjective decision open to a variety of interpretations, actions or a lack thereof. For example, Donner (2007) noted that some actors may believe that if institutional actors and organizations, such as public health officials and organizations are attempting to handle the crisis, no additional action is necessary.

Based on these findings we believe officials should take the following issues into account when constructing a warning message:

1. Do I have an effective pre-event public education program to teach people about warning messages and false alarms?
2. There are many popular myths on the subject of risks that need to be countered public education should identify and counter these. (ex. "tornadoes can't form in the mountains" or "tornadoes can't pass the river.")
3. Is the message in multiple languages?
4. Is the message tailored to this event?
5. What is the demographic make up of the warning message recipients?
6. Are there people who are at risk because they have weak social networks?
7. Have I identified local community leaders and partnered with them?
8. What are the most appropriate avenues to deliver messages?
9. Have we deployed the message using multiple methods?
10. How might social time play a role
 - a. Night or day?
 - b. Beginning or end of the month?
 - c. Cold or warm weather?
11. How might cultural differences come into play?
12. How much lead time do I have?
13. Have I clearly articulated what people can do to protect themselves?
14. What past experience has this population had with warnings and warning response?
15. It is imperative that emergency managers foster and maintain a sense of urgency and immediacy among the public warnings must be highly *personalized* before action is taken. Have I shown the potential affects from a different area? Have I linked this to effects on loved ones or self?
16. How can we capitalize on local knowledge and culture?

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A Brief Summary of Search and Rescue Literature

Prepared by: The University of Delaware- Disaster Research Center³

Basic Premises

The accumulated of research on search and rescue (SAR) allows us to identify repeating patterns that should be considered in the development of an effective plan for national emergency response: (1) SAR is not simply an organizational activity, it necessarily includes the social and collective behavior of volunteers; (2) Preexisting and emergent organizations, social statuses and social identities, such as neighborhood and work place relationships and family and neighborhood social identities, serve as a basis for the emergence of new SAR groups and constitute the fundamental concepts and categories that are needed to understand and improve SAR activities; (3) SAR activities do not emerge from a vacuum; as an example of the principle of continuity advocated by Quarantelli and Dynes (1977), there are always elements of the traditional social structure embedded within collective behavior entities, and their emergent division of labor, role structure, and activities are also dependent on prior social relationships and forms of social organization in the community or region; (4) Breakdown models of social organizational patterns in disaster are not useful to understand SAR. Television reports and misinformed reporters often misinterpret throngs of people moving seemingly at random at the sites destroyed by various hazards, and assume that the people were disoriented immediately after impact and had lost their ability to enact social roles. Despite these reports, scientific research shows the absence of widespread confusion, lack of coordination, and panic (Aguirre, 2005). The seeming disorganization and aimless movement of people is the result of their individual and collective acts as they try to accomplish multiple individual and collective goals under severe time constraints (c.f. Fritz & Mathewson, 1957). Creative problem-solving and rationality is a more accurate way of understanding their actions (Aroni & Durkin, n.d., p. 30). In short search and rescue (SAR) activities are part of the complex emergency response system that emerges in response to disasters.

A number of researchers in the USA have conducted systematic studies in order to understand what accounts for successes and failures of SAR activities. These works have chosen to explore everything from patterns of collapse to the effects of human use on the likelihood of being caught in a void space. For a near-exhaustive literature review see Poteyeva 2005 and Wenger et al 1990⁴. They came to the following conclusions:

³This document was created through the compilation of a number of sources on search and rescue available at the E.L. Quarantelli Resource collection. The most prominent contributions were made by Wenger et al 1990; Poteyeva 2005; and Trainor, Barnshaw, and Aguirre, 2008. Direct correspondence to jtrainor@udel.edu

⁴ For information on SAR during the Kobe, Japan earthquake of 1995 see Kunii, Akagi, & Kita, 1995; for the Kocaeli, Turkey earthquake of August of 1999 see Mitchell, 1999; for the Bam, Iran earthquake of December 2003 see Memarzadeh, Loghmani, and Jafari, 2004);

- (1) Volunteer and emergent group response is of critical importance.
- (2) Volunteers and emergent groups accomplish most initial SAR activities.
- (3) Since most survivors are rescued within the first 2 days, this emergent and volunteer activity is critically important to the rescue effort, especially because buried and entrapped victims are likely to suffer from injuries that require rapid life-sustaining intervention including compromised access to air, severe loss of blood and body fluid, crushing injury, and internal damage to essential organ systems.
- (4) Despite the attention they usually receive from the mass media (Quarantelli, 1991), most of the time urban search and heavy rescue (US&R) teams arrive too late to rescue anyone; instead, they undertake highly specialized recovery activities requiring sophisticated skills and equipment. This is due in large part to the particular nature of the social geography of disasters in which US&R teams are hampered by problems of timely access.
- (5) The integration of volunteer and established organizational activities is seldom efficiently achieved; many official responding organizations, particularly those from national governments, usually do not appreciate the work of the volunteers in SAR operations since they are often perceived as lacking sufficient credentialing, specialized training, and tools. In turn, the absence of disaster planning about how to use volunteers creates problems of its own as large number of volunteers converges on disaster sites (Quarantelli, 1996c). Problems of management of rescue activities are serious and include difficulties in coordinating activities across independent, autonomous organizations, disagreement over rescue strategy, and ambiguous authority relationships.

Types of Responders

Despite the level of focus most people place on formal organizational SAR response there is a range of actors that engage in these efforts all of which have been studied extensively. Of all these efforts, the most extensive study of SAR activity was undertaken during the late 1970s by Drabek, Tamminga, Kilijanek, and Adams (1981.) These researches conceptually recast search and rescue not only as a professional activity, but also as an emergent, inter-organizational activity. While reaffirming a number of the previous observations made in the literature up to that time, their study highlighted the inter-organizational and managerial difficulties inherent in SAR. They found four common operational problems: (1) difficulties in interagency communications, (2) ambiguity of authority, (3) poor utilization of special resources, and (4) unplanned media relations. Quarantelli (1983) analyzed the problem of locating victims and managing their entrance into the emergency medical system. Glass et al. (1977, 1979) provided epidemiological evidence on the etiology of injuries and deaths that had obvious implications for SAR behavior. The contrasting effectiveness of local SAR voluntary organizations and formal organizations such as fire departments in locating and rescuing victims

is in part a result of the interaction of ecological characteristics of the site of the disaster with other factors such as the (1) the social, cultural, and behavioral patterns and social relationships between victims and responders; (2) behavior of victims during entrapment; and (3) nature of the buildings and other structures and their collapse configuration. Here we explore the three main types of actors that engage in SAR.

Unaffiliated volunteers

Many studies have highlighted the importance of volunteer and community based responders. Building on Dynes and Quarantelli (1980) four types of disaster volunteers including organizational volunteers, group volunteers, volunteers in expanded roles, and volunteers in new roles. As (Dynes 1970) had theorized earlier, in the typical SAR site all of these types of volunteers become part of the process. Others have even gone as far as to suggest these are often the most important for SAR activities (Quarantelli, 1999). Quarantelli goes on to suggest that these preexisting networks of human relationships are often the most useful for alleviating novel and unexpected collective problems that demand attention. People typically expand their sense of responsibility toward each other, and in the case of disasters often do so by becoming members of new emergent groups that carry out SAR activities. These works suggest that SAR activities are part of the mass assault phase of disaster. As such, multiple individual and collective actors participate in it. Many trapped victims are rescued by the uninjured bystanders and surviving local emergency responders (Aguirre et al., 1995; Auf der Heide, 2004; Durkin, Coulson, Hajar, Kraus, & Ohashi, 1987; Durkin & Murakami, 1988; Kunkle, 1989; Noji, 2003; see other literature in Poteyeva, 2005; Prater et al., 1993).

For example, in southern Italy, in 1980, 90% of the survived trapped victims were extricated by untrained, uninjured survivors who used their bare hands and simple tools such as shovels and axes (Noji, 2003). Following the 1976 Tangshan earthquake, about 200,000 to 300,000 entrapped people crawled out of the debris and went on to rescue others (Noji, 2003). These volunteers became the backbone of the rescue teams. Durkin and colleagues (1987, 1988) specified that the primary rescue technique used by the SAR teams and volunteers was the human voice of victims as they tried to alert their rescuers or as the rescuers called them, crying for help or making noise with available objects.

Volunteer organizations

Another important mechanism of SAR in the US is the thousands of local volunteer organizations that carry out SAR activities throughout the United States. The majority of these volunteer organizations came about soon after there was a mass emergency, a disaster, or there were cases of missing persons in their communities for which there was no organization available to assist in the response. In a recent ongoing attempt to quantify this activity, we have identified more than 1000 SAR voluntary organizations in all 50 states, with more than 50 organizations in some states. Initially, most of these organizations were involved in mountain and wilderness search and rescue activities, although nowadays they engage in water rescue as well as a host of other response activities in the aftermath of mass emergencies and disasters. The most frequent team capabilities are: K-9 teams---31% of the teams had them; water rescue, 26%; technical rescue, 22%; wilderness rescue, 21%; and mine rescue, 17%. Seventy-one percent of the

organizations are supported by public donations, fund raising, and membership support; the breakdown for main sources of support mentioned by our respondents is: donations--- 56% of the teams mentioned it; sponsors, 41%; fundraising, 21%; member support, 13%; private grants, 8%; city, county, state governments, 15%; others, 6%. They compose a nascent industry in which, despite the recent effort by the Federal Emergency Management Agency (FEMA) to create a National Mutual Aid and Resource Management Initiative, there are at present no uniform training standards or certification. Instead, these organizations follow various professional standards such as those of the National Association of Search and Rescue (NASAR) and FEMA, although many are not certified by these national organizations; most have developed their own regulations: 6% of the teams in our sample train to NASAR standards and 2% to FEMA standards. NASAR estimates more than 50,000 SAR missions annually. Unpaid professionals carry out more than 90% of these missions. While not all of their activities are associated with mass emergencies and disasters, the sheer numbers still give a sense of the importance of these voluntary organizations. Perhaps the most splendid recent example of this type of activity was the heroic efforts of people who owned boats and engaged in rescuing their fellow citizens in the aftermath of Katrina, supporting governmental organizations carrying out these operations. They saved 1000s of people who would have otherwise drowned.

Formal Organizations

In contrast, another type of social actor, the urban search and rescue taskforces, has received a great deal of financial support and public attention. In the United States, the Urban Search and Rescue System (US&R) is a collection of multidisciplinary taskforces created from local emergency responders organized under a federal framework for response in the aftermath of structural collapses. These task forces arrive at the site complete with the necessary tools, equipment, specialized training, and skills. They were created to be deployed by FEMA at times of catastrophic structural collapse to engage in such varied activities as structural shoring, canine searches, complex rope systems, confined space entry, and technically assisted void search procedures, although for a number of reasons explored elsewhere (Trainor & Aguirre, 2005) they are now being used to do many other things not initially contemplated when the system was formed. In parallel, other taskforces are being formed by state governments in the United States and by national governments. FEMA's US&R System is of fairly recent origin, with the first US&R taskforce certified in 1991. The development of heavy rescue search capability was initiated in California, after the 1971 San Fernando Earthquake (Naum, 1993). In 1990, FEMA, fresh from the problems created by Hurricane Hugo and the Loma Prieta Earthquake, organized a week-long meeting in Seattle, Washington where more than 90 specialists representing various constituencies met and developed the outlines of the program. They set up a system of local US&R taskforces that would be made up of personnel from local agencies and who would be federalized and deployed nationwide at the request of FEMA. State emergency management agencies were only marginally involved in the organization, which instead instituted an organizational link between the taskforces and FEMA. The taskforces have structural engineers to assess risks created by the configuration of collapsed structures, medical and hazardous material personnel, canine units, and very extensive cache of sophisticated tools and equipment for use in heavy rescue environments. When fully implemented each has more than

200 people. Today there are 28 US&R taskforces. One of the great paradoxes of the present system is that U.S. federal and state funding is directed to these taskforces even though they too often arrive too late to save anyone, and that this is done to the near exclusion of the thousands of voluntary SAR organizations that do most of the rescuing and savings of lives in the United States.

Search and Rescue and Death and Injury

The morbidity and mortality patterns associated with disasters depend on many factors. Recently, Bourque, Siegel, Kano, and Wood (2006) reviewed the causes of death in disasters. They write: In most disasters, the majority of deaths occur because people drown, are crushed by collapsing buildings or other structures, are hit by moving objects, or are thrown against structures and objects. People drown in hurricanes, tsunamis, and floods, with death often occurring instantaneously. People die from crush and multiple traumatic injuries in tornadoes, earthquakes, hurricanes, tsunamis, and terrorist bombings. In hurricanes, floods, and tornadoes, people who are in motor vehicles, motor homes, and outdoors are at greater risk of injury or death; in earthquakes, people who are outdoors are at less risk of injury or death. Burns and asphyxiation are major causes of death and injury following volcanoes, terrorist bombings, and probably in wildfires. Many of these deaths could be avoided if warnings and evacuation plans were better and more effectively disseminated. Physical injuries are the primary cause of nonfatal casualties after all disasters; the majority is soft tissue injuries and fractures, generally to the arms and legs. When electrical service is disrupted, the use of generators and other sources of light and heat lead to increased incidents of carbon monoxide poisoning and burns. After every disaster, certain myths emerge about how disasters affect the health of populations. Prominent among them are the misconceptions that dead bodies cause disease, epidemics and plagues follow every disaster, local populations are in shock and unable to function, and outsiders are needed to search for bodies and bring supplies. In particular, our review did not find any evidence to support the popular belief about disasters and the occurrence of infectious disease outbreaks. Jean Luc Poncelet, Claude de Ville de Goyet, and Eric Noji have been among the most persistent in trying to address these misconceptions (e.g., de Ville de Goyet, 2004; Noji, 2005, n.d.; Poncelet, 2000).

Culture

Cultural and social arrangements are often of primary importance (Pomonis, Sakai, Coburn, & Spence, 1991). Reflecting cultural practices, occupancy of buildings by time of day and season is significant in determining occupant exposure to specific hazards (Durkin et al., 1987; Tiedemann, 1989). Kuwata and Takada (2002), in their study of the 2000 Western Tottori earthquake noted the low occupancy of buildings at the time of the disaster as a major reason for the low number of dead and injured; the earthquake occurred at 1:30 p.m. on a weekday, meaning that the inhabitants of the building were awake and at once perceived the dangers of the earthquake. In addition, the most important factor was that the majority of people were not at home; the inhabitant occupancy was estimated at 27%. Another issue is the increased vulnerability to disasters of minority group members and residents of low-income households. These categories of people have lower ability to protect themselves from disaster. Income is positively related to access to better and safer

housing and location. Older, un-reinforced masonry buildings and mobile homes, which are highly susceptible to collapse in earthquakes, constitute an important source of affordable housing for lower-income residents in earthquake-prone cities such as San Francisco and Los Angeles. Religious and ethnic minorities are often impacted by a number of erroneous assumptions about the management of the dead in the aftermath of major disasters which are often used to guide SAR activities. In Nicaragua, in 1998, because of an avalanche at the Casitas Volcano brought about by heavy rains from Hurricane Mitch, more than 2000 people died. Acting under the erroneous belief that human bodies are public health risks, and violating the rights of victims and their relatives to a burial in accordance to religious beliefs and local cultural practices governing the handling of the dead, the army incinerated more than 1000 victims; the rest were buried. None were identified. To this day they are listed as persons that are missing, an ambiguous status that creates legal and other difficulties for their surviving kin (Pan American Health Organization, 2004, pp. 163-170).

Time

Several studies examine the relationship between changes in response time and the saving of trapped victims (Coburn & Hughes, 1987; Kunkle, 1989; Pomonis et al., 1991; Quon & Laube, 1991). Kunkle claims that 80% to 90% of entrapped victims who survive are recovered in the first 48 hours after the disaster impact, and that many more entrapped victims could survive with timely delivery of appropriate medical care. Comfort (1996, p. 134) reports that in the 1995 Kobe, Japan earthquake the percentage of those rescued who survived was 80.5% for the first day after the earthquake, 28.5% for the second day, 21.8% for the third, 5.9% for the fourth, and 5.8% for the fifth day. Quon and Laube developed a predictive model that suggests that a 10% to 20% reduction in response time would yield a 1% to 2.5% reduction in fatalities. In the 1988 Armenia earthquake, 89% of those rescued alive from collapsed buildings were extricated during the first 24 hours. Noji et al. 1990; see also Olson & Olson, 1987) documented that most lives are saved and victims rescued during this immediate post-impact period. The probability of being extricated alive from the debris declined sharply over time, with no rescues after day 6. Noji (1991) points out that people have been rescued alive after 5, 10, and even 14 days of entrapment, but these constitute rare events. Pomonis et al. (1991) stress the importance of a victim's health condition inside a collapsed building at any given time; surviving entrapment can be expressed as a function of time and the injury level sustained at the moment of entrapment. Other factors need to be accounted for as well, such as exposure; dehydration or starvation after a long period of time; weather conditions and the amount of air voids that are created within the rubble; the weight of the rubble above the victim; and the victims' pre-entrapment health condition. Pomonis et al.'s study provides a number of empirical illustrations of the potential interplay among the mentioned factors. Entrapment is the single most important factor associated with death or injury (Durkin & Murakami, 1988). As Noji (2003) states, in the 1988 Armenia earthquake, death rates were 67 times higher and injury rates more than 11 times higher for people who were trapped than for those who were not.

Victim Age

Certain age groups are more vulnerable and have an increased risk for death and injury in disasters and others. People older than 60 years of age have a death rate that can be five times higher than that of the rest of the population during earthquakes. Children between 5 and 9 years of age, women, and the chronically ill also have an elevated risk for injury and death (Glass et al., 1977). As Noji (2003) points out, limited mobility to flee from collapsing structures, inability to withstand trauma, and exacerbation of underlying disease are factors that may contribute to the vulnerability of these groups. He also stressed the effect that certain social attitudes and habits of different communities may have on mortality distribution by age. For example, in some societies young children sleep close to their mothers and may be more easily protected by them.

Behavior of victims

Scientific studies of the behavior of victims in disasters are infrequent. While in need of replication, the few studies that have examined issues ranging from general behavioral patterns of communities during disasters to what building occupants did during the actual period of a disaster and experiences of trapped victims during SAR operations show that the much-feared social disorganization during the disaster periods is extremely rare (Aguirre, 2005; Durkin, 1989; Dynes, 1970), although conditions under which panic does occur have been identified in the literature (Dynes, 1970; Johnson, 1988). An atmosphere of human solidarity and cooperation characterizes the behavioral processes during and in the aftermath of a disaster. Residents of disaster-stricken areas are proactive and willing to assist one another. Research findings show that volunteer activity increases at the time of disaster impact and remains widespread during the emergency period (Dynes, Quarantelli, & Wenger, 1990). In the Guadalajara Gas explosion community residents who were not trapped or freed themselves from entrapment went to great lengths to search for their kin and neighbors (Aguirre et al., 1995). There were instances when individuals would call attention to other victims who were trapped nearby and could not free themselves; they would also speculate about the possible location of other victims, provided rescuers with information about the inner settings of the house, and reconstructed the architectural topography of the streets turned to rubble. Sometimes the victims, when trapped, were able to hear what was going on above or next door and thus maintained social ties with the world around them. They also engaged in imaginary interaction with significant others and saints, seeking spiritual and psychological support, which is so important for survival. More recently, Scanlon in a recent observation (2005) of the London Underground July 7th 2005 terrorist explosion also shows that victims helped fellow victims, that staff operating the trains helped the passengers, and that the first responders were not emergency personnel but people nearby, among them medical doctors who worked at the British Medical Association as well as workers from other commercial establishments. Studies have paid particular attention to the importance of family as an institution during mass emergencies and disasters (Form & Nosow, 1958; see also Aguirre et al., 1995; Alexander, 1990; Quarantelli, 1988). Family is a very powerful unifying factor for disaster victims, and, as Alexander points out, its influence could immediately dissolve other groupings such as friends. Family members are the first to be

rescued by their kin. As soon as the nuclear family is reunited they concern themselves with other relatives. Second in importance is the concern for immediate neighbors and other nearby residents, and then other people farther removed from the spheres of everyday interactions (Aguirre et al., 1995). While in need of replication, a research finding is that the chances of people surviving the Guadalajara explosion were directly proportional to the presence among the searchers of a person or persons who acted as proxies for the victims, reminding the searchers that the family member was missing, and supplying information about their possible location. Preliminary results from studies of building occupant actions during disasters and trapped victims behavior suggest that victims behave actively and assume responsibility over their rescue to the extent that they can do so. Thus victims trapped as a result of the Guadalajara gas explosion moved their bodies ever so slowly to create more room in the rubble; others called attention to themselves by screaming and making noise on the nearby debris (Aguirre et al., 1995). Seven of the eighteen victims trapped in the dormitory after the 1985 Mexico earthquake attempted to escape (Durkin et al., 1987).

Conclusions

The goal of this review was to present a number of findings related to the research on search and rescue conducted in the USA context. It is important to reiterate several of the most important ideas presented throughout the document that should be taken into account.

1. Search and rescue activities are undertaken by a number of different types of actors including unaffiliated volunteers, organizational volunteers, and formal organizations. Measures should be taken to most effectively utilize all of these resources.
2. It is important to take steps to empower local organizations and build local capacity because time is of the essence in these situations.
3. While formal organizations are the most technically proficient they are often hampered by their geographical distance from disaster sites.
4. It is important to recognize the importance of local cultural knowledge in helping to predict locations of victims and to assist in searches.

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The Netherlands: Crisis Management and Water Management

Generally, the Netherlands is a relatively safe country without a great variety of natural hazards, such as hurricanes, earthquakes, droughts, and with few major disasters. Over time, however, a variety of trends such as industrialization, heavy urbanization and a fast-growing population have increased the salience of man-made risks and disasters. Particularly over the past fifty years it has become more and more evident that consolidating disaster management is imperative.

Since 1000 BC flooding and particularly safety from flooding has been an important item on the political agenda and has been intertwined with Dutch history and culture. For a long time, however, safety from water was perceived as attainable through mere technological advancement and the mitigation of the threat. While such efforts have been successful, the threat remains and studies have shown that the risk of flooding has in actuality increased. Particularly, witnessing the great and horrifying consequences of the Tsunami in 2004 and hurricane Katrina in 2005 has however made the Netherlands realize that flood prevention needs to be complemented with flood preparedness and the consolidation of disaster management in the face of (possible) floods.

While particularly during the Cold War disaster management was motivated and determined by a fear of war and natural disasters, over time the sentiments underlying the disaster management system and subsequently the system itself as well. Both the fear of war and natural disasters gradually disappeared as the memory of the war converted into a distant memory and the fear of floods disappeared as the Netherlands invested in an effective preventive system against floods. As these fears slowly vanished, the Dutch felt that disaster management efforts could be re-directed and become an intricate part of society and serve the Dutch people on a daily basis. Disasters and wars were few, efforts needed to therefore be directed at fighting daily incidents.

While the Dutch sentiment in the light of floods currently cannot be defined as fear, the Dutch have increasingly become aware of the threat that floods continue to pose to them. The effectiveness of the preventive system had led to diminished risk awareness. The collective memory of the threat of floods was slowly disappearing. Through the mediatization of crises, however, the possible large scale effects of a (possible) flood reentered people's awareness. The effects of the Tsunami, hurricane Katrina, as well as the floods in the UK and some small-scale incidents in the Netherlands entered Dutch homes through the media and made the Netherlands realize they have to increasingly prepare themselves again for a possible flood, especially with respect to disaster management. The disastrous effects these disasters can bring need to be faced and we need to admit that we might not know when or where a flood will strike, but we can be certain that it will strike, despite our preventive systems being great and the chance of a flood occurring being small. Once again, disaster management needs to be directed towards natural disasters.⁵

⁵ Every year the Ministry of Interior and Kingdom Relations publishes their national risk assessment. Within the risk assessment the first and foremost risk to the Netherlands is perceived as a pandemic (category 1 risk). Flood is perceived as a category 2 risk. The categories are based on possibility and effect. Category 1 risk is likely and has great consequences while a category 2 risk is unlikely but has catastrophic effects (BZK, Nationale Veiligheid: Nationale risicobeoordeling bevestigingsrapport, 2007).

The awareness that flood prevention needs to be combined with consequence reduction, i.e. adequate disaster management in case of a flood, has become a primary issue for the Dutch government and has motivated the Dutch government to, for example, establish the Flood Management Taskforce (Taskforce Management Overstromingen, TMO)⁶⁷. This development is, however, rather recent and a great amount of work remains to be done before the Dutch crisis management system will be apt for floods. Aside from such endeavors as TMO, we need, for example, to learn from abroad. There is an array of countries that is not protected like the Netherlands and is therefore structurally faced with natural hazards. Subsequently, outside the Netherlands lies a great body of knowledge that will allow us to learn and enhance our disaster management before it's too late but also those systems of others. Many learn in the aftermath of a disaster, let us learn before. By sharing knowledge it is made possible for innovative developments to come about.

This paper is primarily written to allow those unfamiliar with the Dutch context of crisis management and water management to increasingly become acquainted. For debates and knowledge exchange to come about it is important for the basic information basis to be equalized, and this paper is supposed to do just that: give a contextual overview of the Dutch reality regarding crisis management and water management.

Firstly we will elaborate on the Dutch crisis management system. We will firstly sum up some relevant Dutch facts and figures. Then we will elaborate briefly on a number of relevant definitions when discussing crisis management in the Netherlands. This paper will then go into the legal framework of crisis management and the primary stakeholders and their responsibilities.

Paragraph 3 will go into water management. With respect to water management also a number of facts and figures will be put forward. Then the cultural and historical drivers and the system, including parties and their tasks, of water management will be elaborated on. To link water management to crisis management, i.e. to elaborate on water management, contingency planning throughout the water sector is discussed. For a more comprehensive understanding of the current situation of water management the paper will also go into a number of important recent developments.

Finally, the paper will elaborate on lessons learned, in the light of crisis management, from past flooding in the Netherlands. The 1953 flood, floods from 1993 and 1995 and extreme rainfall in 1998 will be dealt with.

Facts and figures: the Netherlands

⁶ The main task of TMO has been to increasingly prepare the Netherlands for a (possible) flood and to subsequently allow for the Netherlands to reduce a (possible) flood's impact.

⁷ <http://www.platformoverstromingen.nl/>

Capital:	Amsterdam
Capitol:	The Hague
Government type:	Constitutional monarchy
Number of municipalities:	483 municipalities
Number of provinces:	12 provinces
Number of safety regions:	25 safety regions
Number of inhabitants:	16,645,313 Inhabitants ⁸

⁸ <https://www.cia.gov/library/publications/the-world-factbook/geos/nl.html>

The Netherlands



www.kaart-europa.nl/layout/country/Nederland.jpg

Provinces



http://www.nationsonline.org/maps/netherlands_map.jpg



Safety Regions

Crisis management

Definitions

As trends were recognized and risks changed, the Netherlands developed a structure of disaster planning and response that finds its basis in the 1985 Disaster Act, particularly the conceptualization of disaster the act puts forward.

A disaster:

An event that causes a serious disruption of the general safety and security, that endangers the life and health of a great number of people or severely threatens material interests, and

which requires a coordinated effort of services and organizations from an array of disciplines to eliminate the threat or limit the harmful effects.⁹

It is this conceptualization that has come to reflect the prevailing premises on which Dutch disaster management rests, namely:

the general notion of a social and economic disruption of the society; the explicit demand for a coordinated governmental interdisciplinary effort.¹⁰

The definition of a disaster is based on the definition of crisis which has become prevalent after the cold war, namely:

A crisis¹¹:

1. a situation in which basic structures or fundamental values and norms of a social system are threatened, and
2. which, due to limited time and a high degree of uncertainty, requires critical decisions.

Central to this definition is the premise that the cause of a crisis situation is irrelevant: a crisis is “a situation”, and the premise that a reaction is required. Independent of the cause of a crisis, fundamental to crisis situations has become the power to act. Preparations, for example, would therefore no longer be directed at tackling a specific situation, but directed at dealing with the crisis situation at hand or the effects.¹² While the definition of a crisis remains to some extent

⁹ Wrzo artikel 1, b, 1.

¹⁰ Rosenthal, U., Hart, P. 't (eds.), Flood response and crisis management in Western Europe: a comparative analysis. Berlin: Springer-Verlag, 1997; Rosenthal, U., Bezuyen, M.J., Duin, M.J. van, en M.L.A. de Vreeze-Verhoef (eds.), The 1993 and 1995 floods in Western Europe: a comparative study of disaster response. The Hague: COT Universiteit Leiden, 1997.

¹¹ COT. 2001. *Crisis: oorzaken, gevolgen, kansen*, Kluwer en en COT Instituut voor Veiligheids- en Crisismanagement: Alphen aan de Rijn, pg. 12

¹² Brainich von Vrainich Felth, E.T.2004.*Het systeem van crisisbeheersing*.Boom Juridische Uitgevers en COT Instituut voor Veiligheids- en Crisismanagement. Pg.12

abstract, to prepare for more definite. The definition of a disaster defines particular vital interests that might be threatened and establishes that while normal situations might necessitate mono disciplinary action, disaster situations require an inter-disciplinary approach.

History: disasters in peace time vs. disasters in war time

Civil Defense Organization (Beschermering Bevolking, BB)

Shortly after WWII the nature of disaster management was characterized by a fear of war and a fear of natural hazards. While the Netherlands had regular emergency services, i.e. the fire department, the police, and the medical services, the Netherlands felt that extraordinary circumstances as a result of war or natural hazards required a separate entity. Within this context the Civil Defense Organization (Beschermering Bevolking, BB) was launched to 'fight' in times of extraordinary circumstances.¹³ Unlike current disaster management, the Civil Defense Organization was directed at preparation for a specific event, rather than for the effects as a result of any event.¹⁴¹⁵

Regionalization: the first steps

As the BB had been launched to fight extraordinary circumstances as a result of war or natural hazards, the regular emergency services continued 'fighting' daily incidents. It became apparent, however, that the scale of those incidents was increasing as a result of industrialization, urbanization and the fast-growing population. The locally organized fire departments were, for example, inapt to respond to large scale incidents. As a result, in the beginning of the 1970s local fire departments started regionalizing voluntarily in order for their response to suffice in case of large scale incidents and by 1974 the Netherlands knew twenty regional fire departments. The government responded to the new reality of daily emergency management with the policy brief *Emergency Services* of December, 1975.¹⁶ Throughout the policy brief the government acknowledged that regionalization was necessary for the fire department to respond adequately. Furthermore, it recognized that additional legislation regarding the emergency management command and coordination structure was necessary. Within this context the policy brief proposed for the fire department to fulfill a central role in the operational command and coordination structure of emergency management.

To further stimulate regionalization of the fire departments, the government decided to introduce a temporary arrangement of government contribution to regional fire departments in 1976.¹⁷

¹³ Concept memorie van toelichting op Wet Veiligheidsregio's, pg. 1-2

¹⁴ Brainich von Vrainich Felth, E.T. 2004. *Het systeem van crisisbeheersing*. Boom Juridische Uitgevers en COT Instituut voor Veiligheids- en Crisismanagement. Pg. 12

¹⁵ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 1

¹⁶ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 1

¹⁷ Concept memorie van toelichting op Wet Veiligheidsregio's, pg. 2

The Corp Mobile Units: incidents¹⁸

rapid response unit for large scale

As the fear of war and natural hazards subsided, the distinction between war-time disasters and peace-time disasters got to be perceived as artificial and inefficient.¹⁹²⁰ While the civilian emergency response system was developing towards an effective system capable of responding to large scale incidents, the Netherlands still envisioned that a specific rapid response unit ready to respond to large scale incidents, whether as a result of war, a natural hazards or something else, was necessary. As such it would be possible to get rid of that artificial distinction between war-time and peace-time disasters, yet there would be a specific entity ready and prepared. As such in 1980 the BB was dismantled and a new entity was introduced, namely the Corp Mobile Units (Korps Mobiele Colonne, KMC), an element of the Royal Army. Through this arrangement, in the 1980s the army attained an important role in the system of disaster management. As the system of emergency management transformed it became necessary to establish and make explicit the premises along which disaster management should evolve. As such the following principles were put forward and were to form the fundamentals of emergency management²¹:

- 1) Disaster management will be carried out in all circumstances by the services that carry out incident management on a daily basis.
- 2) The fire department will be the operational core to the new organization
- 3) The administrative responsibility of the municipality for disaster management is fundamental.

Coordination and command

The lack of legislation regarding coordination and command structures of disaster management in peace time identified in the policy brief *Emergency Management* would be resolved by the Fire Department Act, the Disaster Act and later also the Emergency Medical Service Act. In 1985 both the Fire Department Act and the Disaster Act came into effect. The Disaster Act established a command structure for disaster management in peace time while the Fire Department Act positioned the Fire Department at the heart of that command structure. Additionally the two acts established preparative obligations to ensure that the disaster management organization would be adequately prepared.

On November 14, 1991, both Acts were complemented with the Emergency Medical Service Act. Like the Disaster Act, this Act arranges the necessary command structure for the emergency medical service's response to disasters and large scale incidents as well as the preparative measures that need to be taken to ensure preparedness.²²

¹⁸ Concept memorie van toelichting op Wet Veiligheidsregio's, pg. 2

¹⁹ Concept memorie van toelichting op Wet Veiligheidsregio's, pg. 1-2

²⁰ Brainich von Vrainich Felth, E.T.2004.*Het systeem van crisisbeheersing*. Boom Juridische Uitgevers en COT Instituut voor Veiligheids- en Crisismanagement. Pg. 76

²¹ Concept memorie van toelichting op Wet Veiligheidsregio's, pg. 2

²² BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 1-2

As the civilian disaster management structures developed, professionalized and became increasingly prepared to deal with disasters and large scale incidents and the threat from the east had almost disappeared, the time to also dismantle the Corp Mobile Unit had come. At the end of 1991 the ministry of Interior and the ministry of defense decide to eliminate the Corp Mobile Units. The ministry of defense would, however, continue to support the emergency services in case the civil capacity would prove insufficient.²³

Legal framework

*The Disaster Act of 1985*²⁴²⁵²⁶²⁷

Central to the Disaster Act is contingency planning, disaster response, and to some extent aftercare. Subsequently, in addition to establishing the chain of command and the coordination structure of emergency management it establishes the preparative measures necessary to ensure preparedness.

Chain of command and Coordination: Administrative

The organizational structure of disaster management in the Netherlands is characterized by the involvement of different levels of government, namely the central, provincial and local level. The central level with respect to emergency management is, however, the local level. The local level is responsible for emergency management, i.e. the mayor holds the primary responsibility in times of emergency.²⁸

Chain of command and Coordination: Operational

The Disaster Act establishes that the Local Fire Chief is operationally responsible for the on-site coordination of the disaster response.²⁹

Preparative measures: contingency planning, training and exercise

The responsibility of emergency management comes with the obligation to prepare as much as possible for possible emergencies. As a result, the different provisions in the Disaster Act of 1985 concerning contingency planning are mostly direct at municipalities or the Board of Mayor and Aldermen. It is the Board of Mayor and Aldermen that is responsible for drawing up contingency plans that include the

²³ Concept memorie van toelichting op Wet Veiligheidsregio's, pg. 2-3

²⁴ This law has been replaced by the disaster and large scale incident Act (Wet rampen en zware ongevallen (Wrzo))

²⁵ Wet Rampen en Zware Ongevallen van 30 januari 1985

²⁶ Rosenthal, U., Bezuyen, M.J., Duin, M.J. van, en M.L.A. de Vreeze-Verhoef (eds.), The 1993 and 1995 floods in Western Europe: a comparative study of disaster response. The Hague: COT Universiteit Leiden, 1997; Rosenthal, U., Hart, P. 't (eds.), Flood response and crisis management in Western Europe: a comparative analysis. Berlijn: Springer-Verlag, 1997.

²⁷ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 3-4

²⁸ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. 3. Pg.3

²⁹ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 4; 15

local emergency management organizational structure, the activities that make up the response in case of an emergency and a list of agencies that might be involved in emergency situations. This contingency plan needs to be approved by the Municipal Council.

Aside from the contingency plan, a municipality is obliged to identify vulnerable/disaster prone sites within their municipality and design specific disaster control plans for these sites and for the specific calamities that might occur at these sites. Again, the mayor is responsible.

As the Local Fire Chief is responsible for the on-site coordination of the emergency response, they are also responsible for the necessary preparative activities required by the Disaster Act of 1985. Generally, the cooperation between the municipalities and the fire department is proficient and preparative measures are taken care of in collaboration.

In order for adequate preparation it's important to organize trainings and exercises. A plan will only allow for adequate emergency management if regularly put into practice. Subsequently, municipalities, provinces, regions and other governmental levels regularly organize tabletops and simulation exercises.

Emergency management quality enhancement Act (Wet kwaliteitsbevordering rampenbestrijding, WKR)³⁰

The Emergency Management Quality Enhancement Act of 2004 complements the Fire Department Act of 1985, the Emergency Medical Services in Case of Disasters Act and the Ambulance Transportation Act.³¹ Essentially, it introduces the need for a regional emergency management plan in addition to a cyclical trajectory of 4 years for all regional preparative emergency planning. Furthermore, it establishes that the provincial level and the central government are responsible for the supervision and reporting, thus to ensure quality is maintained and regularly enhanced.³²

Major Accidents (Risks) Decree (Besluit Risico's Zware Ongevallen)³³

The Major Accidents (Risks) Decree aimed at establishments where great amounts of hazardous substances may be present under license or may be generated while control of an industrial chemical process is lost. The objective of the Decree is to prevent major accidents and to limit any (possible) consequences for man and the environment. The Decree states that establishments need to ensure that great-scale hazards are identified and that the necessary measures are taken. Because the Mayor is responsible for ensuring safety and security within the municipality, the local government is responsible for the compliance of establishments within the municipality boundaries. As the fire department, as primary operational emergency service, holds more knowledge and expertise concerning the realization of safety,

³⁰ **WET KWALITEITSBEVORDERING RAMPENBESTRIJDING**, Staatsblad 184, 2004.

³¹ Brandweerwet 1985, de Wrzo, de Wet Geneeskundige hulpverlening bij rampen (WGHR) en de Wet ambulancevervoer

³² <http://www.wetten.nl/wet%20kwaliteitsbevordering%20rampenbestrijding>

³³ Besluit risico's en zware ongevallen van 27 mei 1999

the local government often delegates this responsibility to the fire department. To ensure adequate compliance to the decree the fire department generally defines norms, assists with the identification of major hazards and designs specific disaster control plans for the various identified hazards.

Sectoral legislation

In addition to legislation directly related to hazards and emergency management, the Netherlands also knows sectoral legislation in which articles concerning hazards and emergency management is taken in. One example of such legislation is Nuclear Energy Act of 1963.³⁴

The Nuclear Energy Act was established to regulate how radioactive materials are handled and how apparatus producing or utilizing ionized radiations function. It deals primarily with issues such as the construction, operation and maintenance of establishments in which nuclear energy is released, fissionable materials can be processed or stored, the transportation, possession and disposal of fissionable materials or ores, and the production, transportation, possession or utilization of fissionable materials, etc. While those issues are central to the Act, it also provides articles through which increasing protection from the dangers involved when handling nuclear energy needs to be realized. Chapter VI, for example, deals with the possibility of incidents. It dictates ways accidents should be prevented and gives guidelines to how one should intervene when such incidents occur.³⁵

The Nuclear Energy Act of 1963 is merely one example of sectoral legislation in which emergency preparation and management is taken into account. Also sectoral legislation regarding infectious disease, for example, includes articles concerned with preventive, preparative and response measures.

*Extraordinary circumstances*³⁶

Instead of an emergency declaration the Netherlands knows the concept of 'extraordinary circumstances'. Through the declaration of 'extraordinary circumstances' specific legal consequences are allowed. The declaration makes it possible to invoke extraordinary administrative powers (buitengewone bevoegdheden) also known as emergency powers (noodbevoegdheden), i.e. a hierarchical structure through which crisis situation can be dealt with more effectively. These extraordinary powers diverge from powers as derived from regular legislation and establish a temporary but functional hierarchy necessary for the situation at hand.

The definition of extraordinary circumstances is closely linked to the Dutch definition of crisis. While the definition of crisis requires the situation to be characterized by 'shortcomings/ inadequacy of normal means', extraordinary circumstances require an 'inadequacy of normal administrative powers'. As a result, throughout the Netherlands officials may speak of extraordinary

³⁴ Nuclear Energy Act of 21 February 1963. (Kernenergiewet (KEW; houdende regelen met betrekking tot de vrijmaking van kernenergie en de aanwending van radioactieve stoffen en ioniserende stralen uitzendende toestellen) <http://www.nea.fr/html/general/profiles/netherlands.html>)

³⁵ Kernenergiewet 21 februari 1963: Hoofdstuk 6 Bepalingen met betrekking tot interventie bij ongevallen of langdurige blootstellingen alsmede de voorbereiding daarop.

³⁶ Brainich von Brainich Felth, E.T.2004. *Het systeem van crisisbeheersing: bevoegdheden en verplichtingen bij de voorbereiding op en het optreden tijdens crises*. Pg. 20

circumstances if 1) a vital interest is threatened and 2) normal administrative powers are inadequate to contend with the prevailing threat. It must be noted that the concept of extraordinary circumstances is a legal qualification rather than a specific (large) event and that both prerequisites are based on two premises of emergency legislation, namely proportionality and subsidiary.^{37 38}

New developments

For over two decades regionalization has been one of the major topics throughout the field of disaster management. Most institutions involved view that Dutch disaster management would benefit from increasing cooperation. Subsequently, the past few years have seen increasingly more regionalization also at an administrative level. More and more municipalities opt to work together as they feel cooperation enhances their response to incidents, particularly large scale incidents. It can therefore be said that the development of regionalization in the light of emergency management continues and has spread from operational spheres to the administrative sphere.

To enhance regional cooperation a new Act (Safety Regions Act)³⁹ has been proposed and is currently under review of the senate. This Act should ensure that cooperation is stimulated, codified and uniformed. Safety regions will deal with 'daily' small scale incidents as well as large scale crises/ disasters.⁴⁰ Furthermore, practitioners and policy makers envision that the establishment of the safety regions will ensure that disaster management methods and procedures will become increasingly uniform, coherent and consistent throughout the Netherlands. The idea that many incidents and particularly large scale disasters increasingly require a regional approach. Regions need to be equally prepared and the response of various regions needs to be connected to some extent. As the safety regions will have the same scale as the current police regions, through their implementation the safety regions will be more apt to cooperate with police regions.

While more cooperation is desired, the new Act would also entail some major changes to the current crisis management organization. This Act would, for example, mean that municipalities give up certain tasks and powers to the board of the safety region. A board that will exist of all the region's mayors and that will be headed by a super Mayor. Also it will mean that in times of crises, the Super Mayor will be in charge.⁴¹

³⁷ Brainich von Brainich Felth, E.T.2004. *Het systeem van crisisbeheersing: bevoegdheden en verplichtingen bij de voorbereiding op en het optreden tijdens crises*. Pg. 20

³⁸ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 20-21

³⁹ Wet Veiligheidsregio's (31 117 nr. 2: Wetsvoorstel Veiligheidsregio's; sent to parliament July 30, 2007)

⁴⁰ <http://www.minbzk.nl/actueel/publicaties?ActIdt=82397>

⁴¹ Concept memorie van toelichting op Wet Veiligheidsregio's

In addition to this Bill, a General Instrument of Public Administration (Algemene Maatregel van Bestuur, AMvB) is being written. This AMvB is the implementation decree that will complement the Act. Throughout the AMvB the norms to which safety regions should adhere are laid out. The exact content of the AMvB has not yet been determined.⁴²⁴³

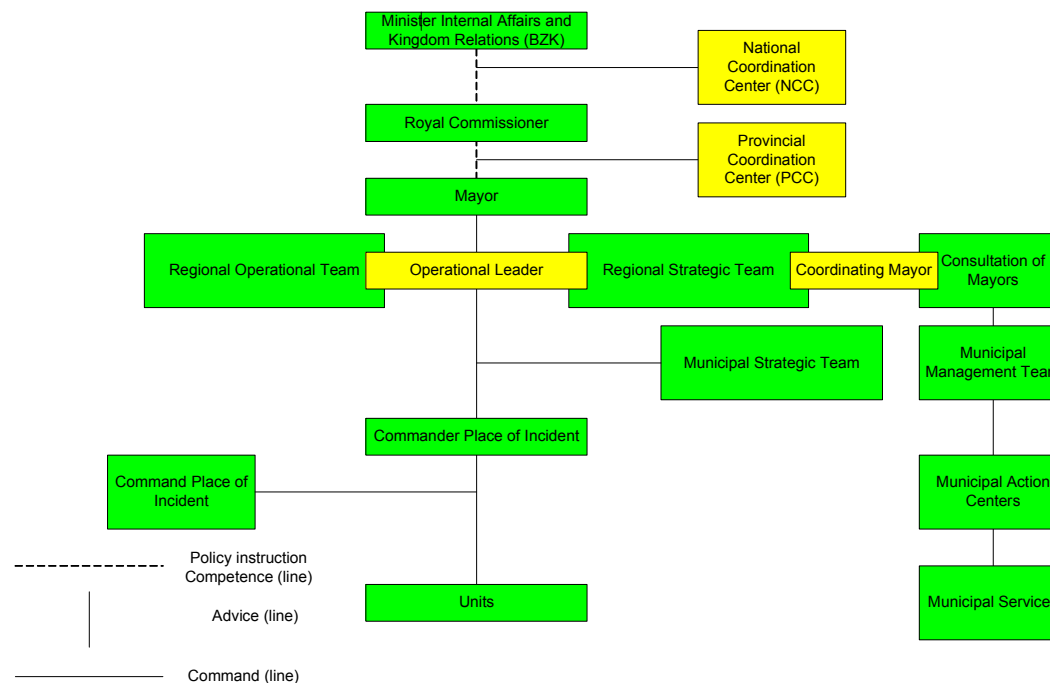
⁴² Politieonderwijsraad. 2007. Handhaving van de openbare orde: fysieke of sociale veiligheid?.

http://www.politieonderwijsraad.nl/cms/publish/content/downloadaddocument.asp?document_id=82

Beleidsnota Rampenbestrijding 2000-2004; de veiligheidsketen gesmeed. 1999

⁴³ Concept memorie van toelichting op Wet Veiligheidsregio's

Stakeholders and their responsibilities⁴⁴



⁴⁴ Wet rampen en zware ongevallen van januari, 1985.

*Municipality*⁴⁵

The municipality is the primary responsible governmental level for disaster management. Municipalities are considered capable to develop coherent safety and security policies, identify risks and as a response take adequate measures. The College of Mayor and Aldermen bears the responsibility of preparing the municipality to deal with disasters and large scale incidents.

Mayor

The Mayor is the sole responsible official during a disaster or large-scale incident, i.e. the mayor has supreme command. In addition to the supreme command during the response to a disaster or large-scale incident, the mayor is responsible for taking all necessary measures to prevent a disaster or large-scale incident from occurring. The mayor is therefore responsible for prioritizing and leading the emergency management organization, particularly at an administrative/ political level.

As disasters or large scale incidents requires a coordinated effort of all services and organizations such as the municipality, the police department, the fire department and the emergency medical services to take away the threat or limit damage, the mayor must ensure that all emergency services and other parties involved act in a coordinated fashion and are geared towards one another.

The Mayor does not need an official disaster declaration to become the supreme commander and use his/ her extraordinary competences.

Municipal Contingency Plan

As determined by the Disaster and Large-Scale Incidents Act, every municipality is responsible for designing an adequate municipal contingency plan. The College of Mayor and Aldermen draw up the plan. The plan determines tasks and competences in case a disaster or large scale incident occurs. The idea is that through such a contingency plan all parties involved know exactly what they when need to do in order for the effects to be limited as much as possible and return to a normal and stable situation as soon as possible and restore safety and security.

Because disasters and large-scale incidents require a great array of activities, most contingency plans include disaster management processes. During a disaster or large-scale incident the municipality is responsible for eight processes (civil care). These processes should be specified in detail. The processes are⁴⁶:

- Inform
- Relief and care
- Burial arrangements
- Registration of victim through the central registration and information bureau (CRIB)
- Provide primary necessities

⁴⁵ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 10

⁴⁶ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel B.1. Pg.66-92

- Register and deal with damage
- Environmental care
- Post impact care

Aside from these processes the contingency plan includes processes for which the emergency services are responsible. It is important to note here that not all incidents require all processes to be started. It is possible to merely initiate one or two depending on the nature of the incident.

In addition to the municipal contingency plan, municipalities need to have disaster control plans for specific vulnerable/ disaster prone sites.

As legally established, municipalities need to practice their contingency plans regularly. Municipalities practice more and more. They also practice more specifically the different processes they are responsible for.

It's legally established that all municipal plans need to be revised every four years.

Municipal Strategic Team ⁴⁷

The municipal strategic team has to adequately formulate decisions, taking into account the organizational, juridical and administrative reality of the situation. Furthermore, the municipal strategic team is responsible for delegating the decisions and measures on behalf of the mayor. The members of the strategic team additionally advise the mayor regarding the relevant processes. Representatives of the emergency services join the municipal strategic teams as advisers to the mayor. They are responsible for policy coordination and are not concerned with the operational activities. Depending on the situation, the mayor can decide to invite relevant experts to the strategic team.

Municipal Management Team

The municipal management team includes those responsible for the necessary municipal processes of crisis management. The municipal management team translates decisions made by the municipal strategic team into specific actions that need to be executed by the activated municipal action centers.

Action Centers ⁴⁸

The municipal services with operational tasks throughout the emergency management structures often times set up action centers to organize the internal coordination of those activities that are set out by the municipal management team. Due to their operational nature, the action centers fall under the command of the operational leader.

Emergency Room (Meldkamer)

The Emergency Room has a central role throughout the emergency management system as they provide information and alarm the necessary parties. Also the Emergency Room falls under the control of the operational leader.

⁴⁷ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel B.1 Pg.5

⁴⁸ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel B.1. Pg. 10

Fire Department⁴⁹

The Fire Department is both locally and regionally organized. Since the 70s the Fire Department has been developing towards more regional cooperation. Those development have, however, not been completed yet. Furthermore, the fire department is partly professional and partly voluntary.

The fire department is responsible for the following processes:

- Fight fire and the emission of hazardous materials
- Rescue and technical emergency service
- Decontamination of people and animals
- Decontamination of vehicles and infrastructure
- Observing and measuring
- Alarm the people
- Make accessible and clean up

Aside from these processes, it's the Fire Department who's operationally in charge during disasters and large scale incidents. While the mayor is responsible for the administrative and political command, the Fire Chief is in charge of the operational command within the emergency management structure.

Emergency Medical Services in case of Disasters⁵⁰

The Dutch public health service (Gemeentelijke Gezondheids Dienst) has a specific division, namely the emergency medical service (Geneeskundige Hulpverlening bij Ongevallen en Rampen, GHOR). Emergency medical services are organized regionally and the Netherlands currently exists of twenty-five regions. Every region has one emergency medical service bureau that coordinates the emergency medical services in case of large scale incidents. The regions are based on cooperative arrangements with municipalities. Per region, the emergency medical services are administratively and operationally positioned in the emergency services structure.

It is also the GHOR that is in charge of ambulance care. The primary processes of the emergency medical services are:

- somatic medical service
- Preventive public health care
- Psychosocial medical service

⁴⁹ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 9; Deel B. pg. 2; deel B.3. 5-22

⁵⁰ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 9; Deel B. pg. 2; deel B.3. 22-47

Police Department⁵¹

The police department in the Netherlands is also regionally organized. During any disaster or large scale incident the Police Department will work closely with the other emergency services and the municipality. Their primary processes are:

- Vacate and evacuate
- Enclose and shield
- Regulate traffic (traffic circulation)
- Maintain public legal order
- Identify victims
- Guidance
- Criminal research

Command Place of Incident (Commando Plaats Incident, CoPI)

⁵²The Command Place of Incident (CoPI) is responsible for the area where the incident took place and to ensure the incident is fought as efficiently and effectively as possible so that the consequences of the incident remain limited. The CoPI falls under the operational leader and ensures, on behalf of the Mayor, the execution of the coordinated response.

Specialized Services

In case of disasters and large scale incidents it is very rare that merely the municipality and the emergency services have a role. It is therefore important to realize that there are also a variety of external partners that will be involved throughout the emergency management system. It is possible that for example the Public Prosecution Services have to take action because there might be signs of foul play, or water boards and/ or the Directorate-General for Public Works and Water Management because of a threat of flooding. Increasingly, the emergency medical structure is also acknowledging that in case of emergencies it is often also necessary to include the private sphere, such as specialized organizations as the Dutch railway or a private company such as an airport and societal organizations such as schools. It has to be noted though that all parties involved, whether intrinsically part of the emergency management system or not, fall under the leadership of the mayor. The mayor will always have supreme command.

The operational services might include external parties throughout their activities, such as experts.

Regions

Security and safety issues are often regional and not bound by municipal boundaries. The Fire Department Act of 1985 increasing regionalization was created as it establishes through a General Instrument of Public Administration a number of regions. These regions contain a number of municipalities and include a regional fire department. Essentially these regions are Fire Department regions. It

⁵¹ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg. 9; Deel B. pg. 2; ; deel B.3. 47-66

⁵² BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel B.1. Pg. 10-11

is important to note here that these regions are not congruent with police or emergency medical services regions and that over the years, this incongruence has often times frustrated interdisciplinary regional disaster management efforts.

The Colleges of Mayor and Aldermen that belong to a region are jointly responsible for the organization of disaster management. The joint efforts include a regional fire department approach. The regional fire department is an important element when it comes to interdisciplinary disaster management preparations. Every four years the regional contingency plan, in which regional arrangements for disaster management are recorded, needs to be revised. This plan entails regional policy regarding interdisciplinary preparations for disaster management and must guarantee the necessary quality and capacity of the regional disaster management organization. Every emergency service needs to work out their individual organization plans.

The regional fire department carries out important facilitating duties during disasters or large scale incidents. Dutch legislation does not foresee a regional supreme command. It is, however, important coordination of mayors to be put into place, for example through a regulation that appoints a coordinating mayor.⁵³

Provinces

The Netherlands is divided into twelve provinces. Provinces are regions that include a variety of municipalities. A province is the level between the local and national level of government. A province is headed by a Royal Commissioner. The daily board of the provinces is the College of Provincial Executives (Gedeputeerde Staten).

With respect to disaster management, the province has a role throughout the preparative and response phase.

Firstly, the provinces need to have their own provincial coordination plan. The Royal Commissioner is responsible for the development and maintenance of this plan. The plan should include the chain of command and the provincial response during disasters and large scale incidents. Additionally, it should provide regulations concerning the request and provision of assistance in times of crises.

In addition to internal responsibilities, the province also has external responsibilities. Throughout the preparative phase, this responsibility exists of a supervisory role to municipalities and water boards. Furthermore, the College of Provincial Executives has the power to assess and comment on municipal and regional plans, as well as on plans of those in charge of waterworks, such as water boards. Lastly, the province represents the primary link between the local and national administrative level.

During a disaster or large scale incident, the Royal Commissioner has the power to give policy instructions (beleidsaanwijzingen) to mayors within the provincial borders. The Royal Commissioner can, for example, instruct a mayor to take certain decisions or actions. The Mayor can take these indications into account. Also the Royal Commissioner needs to facilitate and ensure adequate communication between the local and national level and is in charge of

⁵³ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg.11

coordinating assistance.⁵⁴ The Royal Commissioner is advised by a disaster staff. This staff comes together in the Provincial Coordination Center (PCC).

Central Government – Ministries

The Central Government is essentially responsible for a qualitative national disaster management structure. In practice they ensure that there is adequate legislation and resources for each component to execute their responsibilities.

The Minister of Interior and Kingdom Affairs reports every four years to parliament about the status of disaster management and its preparation.

The inspection Public Order, Safety and Security examines together with other Central Government inspection bodies the quality of regional preparations for disaster management.

Incident research is primary done by the independent research council (onderzoeksraad).

The Central Government, particularly the Directorate-General for Public Works, is also custodian of waterworks (coastal waterworks). In case of a 'danger', like a flood, the minister of the Ministry of Transport, Public Works and Water Management has the power to deviate from regulatory requirements set out through legislation.

The Central government is also responsible for disaster management at sea. The Incident Control North Sea Act (Wet bestrijding ongevallen Noordzee, wet BON) gives the minister of the Ministry of Transport, Public Works and Water Management that responsibility. The organization and execution of this responsibility is laid out in the Disaster Plan for the North Sea. According to the plan the operational command and coordination lies with the Director Coast Guard.

Interdepartmental Strategic Team (Interdepartementaal Beleidsteam, IBT)

During crisis situations the Interdepartmental Strategic Team (Interdepartementaal Beleidsteam (IBT) is the highest administrative decision making body. The IBT includes for representatives of all relevant and involved departments.

Administrative Crisis Consultation Body (Ambtelijk Crisis Overleg, ACO)

In the light of a threat or disaster it is possible to activate the Administrative Crisis Consultation Body (ACO). The ACO is meant to allow for crisis coordinators of different departments to come together and coordinate their efforts. Additionally, such a consultation allows for all parties to attain necessary information.

⁵⁴ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel A. Pg.13

Ministerial Strategic Team (Ministerieel Beleidsteam, MBT)

Decision making at a political/ administrative level is often done by a Ministerial Strategic Team (MBT). The Minister of Interior and Kingdom Affairs (BZK) activates the MBT and operates as coordinating minister.

National Crisis Center, NCC

The NCC assists the inter department decision-making structures.

National Operational Coordination Center (Landelijk Operationeel Coordinatiecentrum, LOCC)

The LOCC coordinates the operational efforts of the classic emergency management services. It is the operational counterpart of the NCC. The primary task for the LOCC is to ensure an efficient and effective national operation.

Departmental Coordination Center, DCC

Whenever an incident requires the involvement of a ministry, i.e. has escalated to the national level, the ministry at hand activates a Departmental Coordination Center (DCC). At the DCC the coordination takes place. Furthermore, the DCC ensures that the departmental response activities are executed. One of the tasks of the DCC is for example directed at coordinating decision-making in order for the ministry to be able to act in times of crisis.

Essentially, the DCC is the primary point of contact of the department at hand, coordinates, and if necessary supervises, actions within the department and with other departments, informs and advises the departmental officials and safeguards the integral decision-making process.

Interdepartmental crisis coordination

Whenever a crisis has direct and far reaching consequences for policy sectors of several national governmental departments and interdepartmental coordination is required, the Ministry of the Interior and Kingdom Relations activates the National Crisis Center (NCC). The NCC operates as the facilitating staff for interdepartmental crisis decision making at a bureaucratic and political-administrative level.

Essentially, the NCC takes care that information is adequately disseminated between the different levels of government involved.

Preparative activities

Through the Disaster Act of 1985, it has been legally established that preparative measures need to be taken at a local level. Central to these preparative measures is contingency planning, training and exercising.

Over time the approach has become more process oriented and activities such as training have become more specific and often based on the different processes central to crisis management. While the responsibility of preparation continues to lie legally at a local level, there's a development towards more regional

cooperation. As a guiding principle the focus of the preparative activities has become 18 disaster types⁵⁵, namely:

1. aviation incidents
2. Incidents on water
3. traffic incidents on land
4. Open air incidents with flammable/ explosive materials
5. Open air incidents with toxic materials
6. Nuclear incidents
7. Threat to public health
8. Pandemics
9. Incidents in tunnels
10. Large buildings on fire
11. Collapse of large buildings
12. Panic of large crowds
13. Disruption of public order
14. Floods
15. Fires throughout nature
16. Extreme weather circumstances
17. Disruption of public utilities
18. Disasters at a distance

As each of these disasters has unique characteristics, the preparative measures are specific for each type of incident. Subsequently, for each disaster type a specific plan is made taking into account the unique nature of the incident. Such a plan will for example include the amount of time an organization has to take action, i.e. how much time does an organization have to install the crisis management organization, which processes need to be initiated, where the administrative and operational coordination will lie and what kind of aftercare will be necessary.

Response organization

Operational Organization

With respect to the operational character of emergency planning, it's the local and regional fire brigades that are the central operational service involved. The Disaster Act dictates that the local Fire Chief has the primary operational responsibility for the on-site coordination of local disaster responses. Generally, local emergency management coordination centers and operational centers are established. In addition to these centers, the so-called 'action centers' become active. Here teams composed of members from specific divisions perform tasks in fields including public relations, civil services, public works, environmental services, etc.

Regionally Coordinated Incident Management Procedure⁵⁶

The Netherlands knows a Regionally Coordinated Incident Management Procedure (Gecoördineerde Regional Incidentbestrijdings Procedure, GRIP) which is a national agreement concerning the up-scaling from incident – to disaster management for the professional emergency services such as the fire department, the police department and the emergency medical services.

⁵⁵ Ingenieurs/ adviesbureau SAVE en Adviesbureau Van Dijke, Leidraad Maatrap, i.o.v. het ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2000

⁵⁶ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel B.1. Pg. 2. 11-18

The procedures regulate up-scaling at an operational level at the place of the incident, in addition to at the administrative level of the municipality and if necessary also national.

The GRIP procedure differentiates between different up-scaling stadia, otherwise known as GRIP 1 to 4. At each stage the response organization is expanded to include the necessary actors. Additionally at each stage the different elements of the organization and officials attain specific tasks, powers and responsibilities.

GRIP 0	Regular way of operating of the operational services
GRIP 1	Suppression of source
GRIP 2	Suppression of source and effects
GRIP 3	Threat to the wellbeing of (large groups) of the population
GRIP 4	Intermunicipal incident, possible lack of resources
GRIP 1	Incident place command (COPI)
GRIP 2	COPI + operational team (OT)
GRIP 3	COPI + OT + Municipal strategic team (Gemeentelijk Beleidsteam, BT)
GRIP 4	COPI + OT + Regional strategic team (Regionaal beleidsteam, RBT)

Depending on the nature, size, gravity and trend of the (possible) incident can many partners be involved of the public/ private organizations.

Aftercare ⁵⁷⁵⁸

The aftermath is often labeled aftercare in the Netherlands. Utilizing such a term suggests that firstly that there is a strict moment when the response phase ends and the aftermath period is initiated. However, while the term might suggest such a strict moment, often the transition from the response phase to the aftercare phase is blurred. Equally blurred is when the aftercare period is finished; when the situation has become normal again.

⁵⁷ BZK. 2003. Handboek voorbereiding rampenbestrijding. Deel B.4. Pg.1-9

⁵⁸ Leidraad Nafase, COT, M. van Duin en M. Zannoni, september 2005; Gemeente Amsterdam, PMB. 2006. Nazorgplan Bos en Lommerplein.

Secondly, the term aftercare underlines the governmental responsibility of taking care of those affected by a particular incident.

Because the transition between the different phases is often difficult to define, some municipalities choose to install an aftercare organization responsible for defining the situation, the initiation of the phase and the end of the phase by for example defining certain objectives in the phase need to be attained. A variety of processes and issues come together when discussing aftercare. The aftercare period is often characterized by the follow-up activities necessary after the crisis, for example financial or judiciary processes.

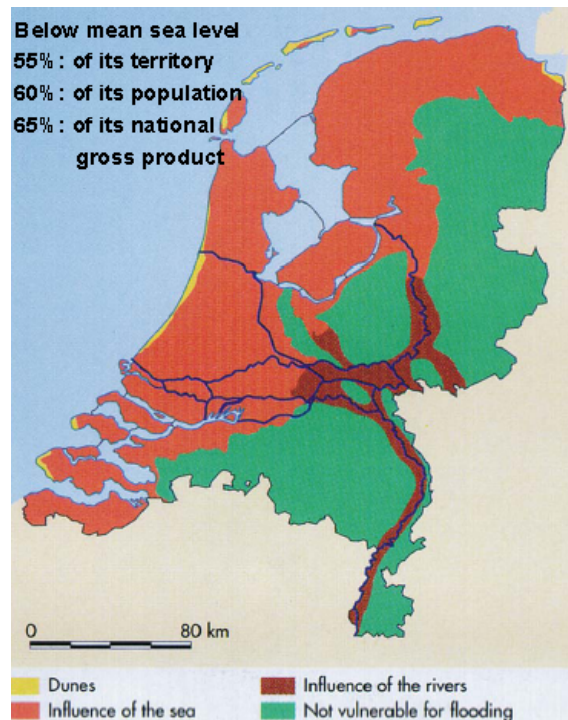
Water management in The Netherlands

Facts and Figures

Area:	<i>total:</i> 41,526 sq km <i>land:</i> 33,883 sq km <i>water:</i> 7,643 sq km
Comparative size:	Slightly less than twice New Jersey
Coastline:	451 km
Terrain:	Mostly coastal lowland and reclaimed land (polders); some hills in southeast
Elevation extremes:	Lowest point: Zuidplas polder – 7 m Highest point: Vaalserberg – 322 m
Land use:	<i>arable land:</i> 21.96% <i>permanent crops:</i> 0.77% <i>other:</i> 77.27% (2005)
Geography note:	located at mouths of three major European rivers (Rhine, Maas or Meuse, and Schelde) ⁵⁹

⁵⁹ <https://www.cia.gov/library/publications/the-world-factbook/geos/nl.html>

Total land surface area	13,000 square miles	~ 25% of Mississippi
% surface water	20%	2x North Carolina
Population	16 million	~New York
GNP	\$ 700 billion	2x Georgia



As the figure demonstrates, the Netherlands is characterized by having 55% of its territory, 60% of its population and 65% of its national gross product below sea level.

The Cultural and Historical Driver of Dutch Water Governance⁶⁰

The 'fight' against water has not just shaped the Dutch landscape, but has also engraved deeply its imprints in Dutch culture and society as whole. One of the Netherlands' primary premises is the idea that living with (the threat of) water is not an item that can be dealt with individually. Carrying out drainage, building dikes etcetera are activities that require collective execution. The Dutch polder model – a Dutch model of decision making characteristic to the Netherlands and distinguished by elements such as consultation, consensus and compromise – is one of the most famous elements of Dutch society that finds its roots in this premise.

⁶⁰ Unie van Waterschappen. 2008. *Water Governance*. Opmeer drukkerij bv.

The Water Board System

Another primary Dutch element that has been founded on that premise is the water board. The Water Board, the regional water authority, is the fourth governmental institution of the Netherlands that has been the administrative and functional result of the realization that water requires a collective approach. It is often repeated that the Dutch Water Boards were one of the first true forms of public decision making based on consensus, i.e. one of the first Dutch democratic institutions.

To this day the water boards hold an independent position throughout the Dutch democratic structure. Historically, 'dry feet' and sufficient and qualitative water resources have been considered vital to the Netherlands. Subsequently, water related decisions and tasks are excluded from the general political context so that they would not become subject to the general political weighing of interests.

As the Water Board system has proven to be adequately designed to accomplish its tasks, it's financially self-supporting and has proven to be sustainable as it exists for over 800 years,

The water boards system is internationally known as it has proven to be well designed to accomplish its tasks and it's financially self-supporting . Additionally, it has proven to be a sustainable system as it has existed for over 800 years.

While often the Dutch people take water management for granted and may not realize the great effort that is required to keep the Netherlands dry, produce high quality water and to harmonize water management with social functions in a densely populated country. Without the Dutch water management system the safety of nearly 11 million people would be put in danger and more than 50% of the Netherlands would be under water.

There are currently 27 Water Boards. Over time the number of Water Boards has greatly decreased as cooperation seemed more effective. For centuries, each polder had their Water Board.

Boundaries

While the boundaries of the Water Board may seem random, they are not. The boundaries of the water boards are determined by hydraulic factors such as dike rings and pumping and storage areas. Because of the variables the boundaries are based on, they do not correspond with municipal or provincial borders.

Governance

Water Boards are governed by a governing board, an executive committee and a chairperson (also known as count of dikes). The governing board is elected and consists of representatives of stakeholders.

Unlike provinces and municipalities, Water Boards are to a large extent financially independent as they have their own tax area. The central government merely contributes substantially to their flood protection tasks.

In 2006 the total Dutch government expenditure on water related tasks was up to 5.1 billion Euros. Two billion of this expenditure was spent by the water boards.

Partners in Water Governance

Ministry of Transport, Public Works and Water Management

The Ministry of Transport, Public Works and Water Management is responsible for protecting our coastline and the maintenance of the infrastructure in the Netherlands. They ensure a safe, versatile and reliable accessibility both over land and water and through the air. Furthermore, they are in charge of protecting the Netherlands from floods and ensuring the existence and sufficient supply of clean water.⁶¹

Directorate-General for Public Works and Water Management

The Directorate-General for Public Works and Water Management is the executive branch of the ministry. They implement the policies developed by the ministry. While over the years many ministries have been evolving into bureaucratic structures preoccupied with the management of their sectors, the Directorate-General for Public Works and Water Management continues to embody a vast amount of expertise throughout their sector. Subsequently, aside from a management function they continue to be a governmental body encompassing a large body of knowledge.

Water Management Tasks⁶²

Flood Protection

Flood protection is the responsibility of the central government and the water boards.

The central government, or the Ministry of Transport, Public Works and Water Management is entrusted with the maintenance of the Dutch coastline in addition to the management of dams that close off the arms of the sea in the west of the country.

The other infrastructural works, such as dikes, and storage embankments are managed by water boards.

Water Quantity

The management of the amount of surface water throughout particular bodies of water lies also with the central government and the water boards.

⁶¹ <http://www.verkeerenwaterstaat.nl/onderwerpen/water/>

⁶² Unie van Waterschappen. 2008. *Water Governance*. Opmeer drukkerij bv.pg. 20-21

The central government manages the so called 'main water systems': the large rivers, the IJsselmeer, the Amsterdam-Rijnkanaal, the Noordzeekanaal, the Wadden Sea, the Eems-Dillard estuary, the Delta waters and the territorial part of the North Sea.

The management of the quantity of water in the bodies of water that are of regional and local interest is generally the responsibility of water boards.

Water Quality

Water quality concerns the prevention of surface water getting polluted. Water quality is important on an ecological level as well as for the extraction of drinking water or for agriculture.

Again, the central government and the water boards are the primary actors responsible.

Waterways

The maintaining of the sheet piling and the depth of waterways, in addition to the operation of locks and bridges is the responsibility of the central government and the provinces. They do, however, sometimes delegate these tasks to the water boards.

Dike Rings⁶³

For the protection of the Netherlands, the Netherlands is divided up into 53 dike rings. Dike rings are areas enclosed by a system of protective mechanisms, such as dikes, or high grounds which protects it from flooding. The protection of a dike ring is determined by law and the norms are determined by the risk, thus chance multiplied by effect. The norms, however, were determined right after 1953 and the risks, thus the norms, are therefore not up to date. The effects, for example, take into account the economic situation and population of the fifties, rather than the current population which has changed drastically.

Furthermore, the effects merely take into account economic effects and population, rather than for example other important societal elements such as culture.⁶⁴

9 Contingency planning for the water sector

⁶³ Ministerie van Verkeer en Waterstaat. November 2005. Veiligheids Nederland in Kaart – Hoofdrapport. B-2

⁶⁴ <http://www.platformoverstromingen.nl/overstromingslexicon2/dijkkring>

Floods, Crisis Management and the Water Sector

As one of the 18 disaster types, the regular crisis management organization and structure also applies for (possible) floods. The problem is, however, that the regular crisis management organization and structure is based on an up-scaling procedures, while with a flood, because it will immediately entail the national government, actually requires down-scaling. The procedures, should therefore, be somewhat different. Another specific issue regarding floods is the issue of evacuation. The minister of interior and kingdom relations has the power to call a mandatory evacuation according to the Displacement of People Act.

The Directorate-General for Public Works and Water Management is in charge of warning the right actors in case of a threat.

National Response Plan for High Water and Floods

The National Response Plan for High Water and Floods includes three different parts. The first part is preoccupied with guidelines for cooperation between governmental departments in case of a flood. It pays attention to information lines, decision-making structures, cooperation with provinces and safety regions, and other partners of the departments. The objective is to describe how both administrative as well as operational parties can cooperate as effective as possible in order for the effects of a possible flood to be limited and/ or managed. Part two describes the role of the central government with respect to the coordination of available capacity. The operationalization of the coordination of available capacity the central government, or the ministry of the Interior and Kingdom Relations, has delegated through the circulaire of June 15, 2006, to the National Operational Coordination Center (LOCC). They have to coordinate assistance and the operational services.

The objective of part 2 is to facilitate an effective match of supply and demand.

Part 3 is an explanatory commentary to the plan.

National guidelines High Water and Storm Surge Crises

These guidelines describe the way the functional 'water' parties have to work in times of high water and/ or storm surge crises situations. This plan is written from the perspective of the Ministry of Transport, Public Works and Water Management.

Complementary plans

Throughout regions, municipalities and provinces different plans concerned with high water and/ or floods exist.

Recent Developments

Since the devastating effects of the Tsunami and Katrina, the Netherlands has become increasingly aware of its vulnerable position and the effects of flooding, particularly in metropolitan areas. As a delta, The Netherlands is the delta (with a

coastline approximately 350 kilometers long) where the major European rivers like the Rhine and the Meuse flow into the North Sea. As sea levels rise, a problem might occur as rivers cannot release their water into the sea. This might lead to drastically increasing risks of flooding.⁶⁵ Vulnerable areas lie along the coast and the rivers. These areas are primarily protected by dunes and dikes. Nearly 11 million people live in these threatened areas. Additionally, the threatened areas are the fulcrum of the Dutch economy: Schiphol Airport, the Port of Rotterdam, Amsterdam, the capital, and The Hague, the capitol; the seat of government. An estimated 65% of the Netherlands' GNP is produced in the lowest region of the Netherlands (some of which are several meters below sea level).⁶⁶

Flood Management Taskforce

The Flood Management Taskforce (Taskforce Management Overstromingen, TMO) has been established by the Dutch government to increasingly prepare the Netherlands for a (possible) floods, particularly to prepare the Netherlands for the impact of a possible flood. While prevention continues to be the primary Dutch strategy to decrease the risk of flooding (risk = possibility x impact), preparation in order for the possible impact to be reduced as much as possible has become an important policy issues.

For TMO the underlying idea is that through an adequately prepared governmental organization, the impact of a possible flood can be reduced as different societal levels are capable and equipped to handle. Within this light, several layers of government have initiated different processes to verify and enhance their preparedness for a possible flood in the form of planning, training, and exercising with the different partners involved.

The last objective of TMO is to test the current crisis management system in place. This will be done through "waterproof", a large scale national flood exercise.

Waterproof

In November 2008 the taskforce wants to test the system using worst case flood scenarios. Throughout 2007 and 2008 different regions (municipalities, first responders, provinces, water boards, etc.) have developed plans and exercised flood scenarios. Through the large scale flood exercise it will be possible to determine whether all preparative measures have been sufficient and are in actuality adequate.

Worst Case Flood Scenario – Northern Coastal Flooding⁶⁷

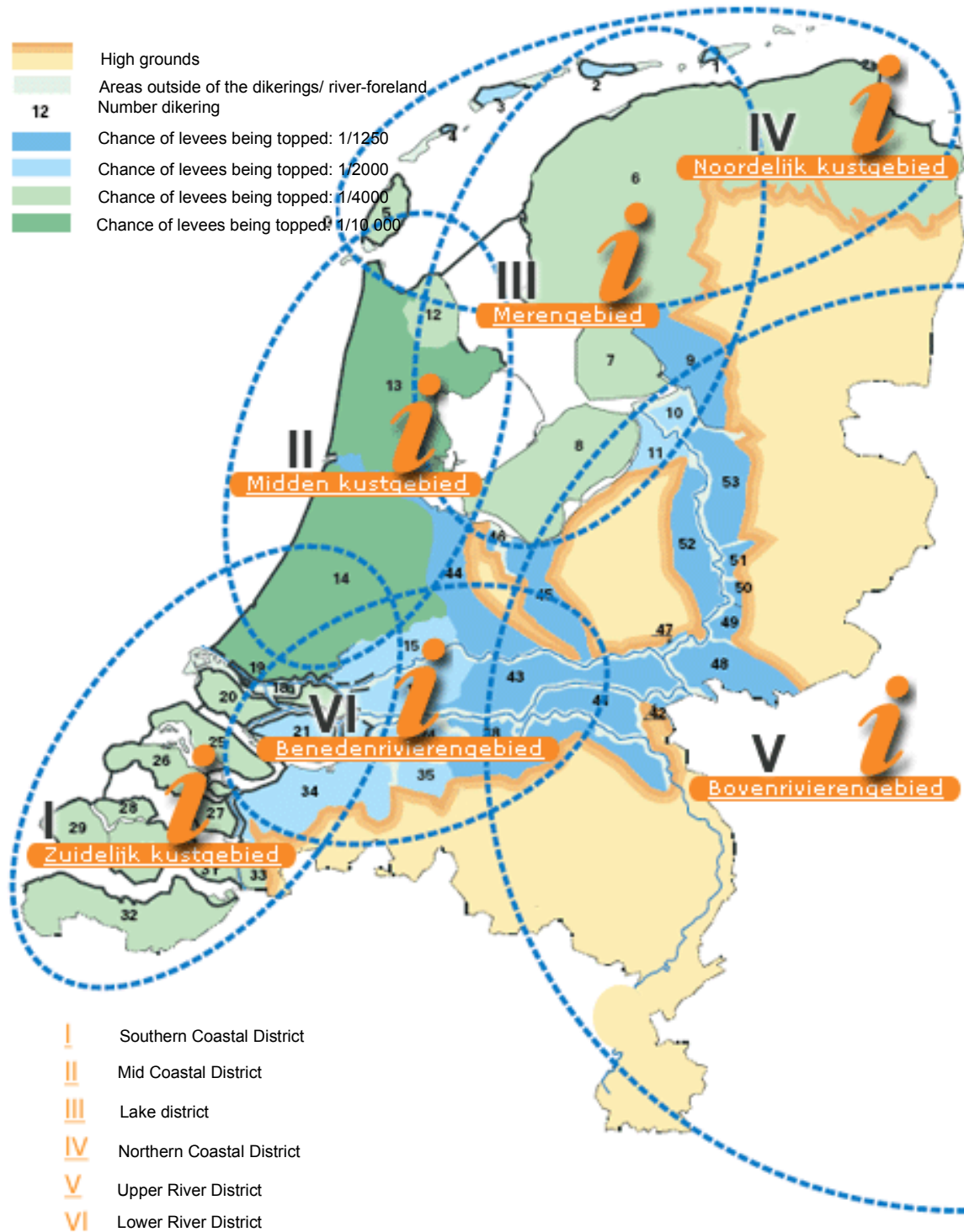
In order for one to get a better understanding of the possible effects a flood, one of the worst case scenario's as developed by the water sector will be elaborated on. The greatest threat for a coastal flood is the occurrence of a storm surge caused by winds characterized by hurricane strengths. Depending on the location of the

⁶⁵ Delta commissie

⁶⁶ Delta commissie

⁶⁷ <http://www.platformoverstromingen.nl/overstromingsscenarios2>

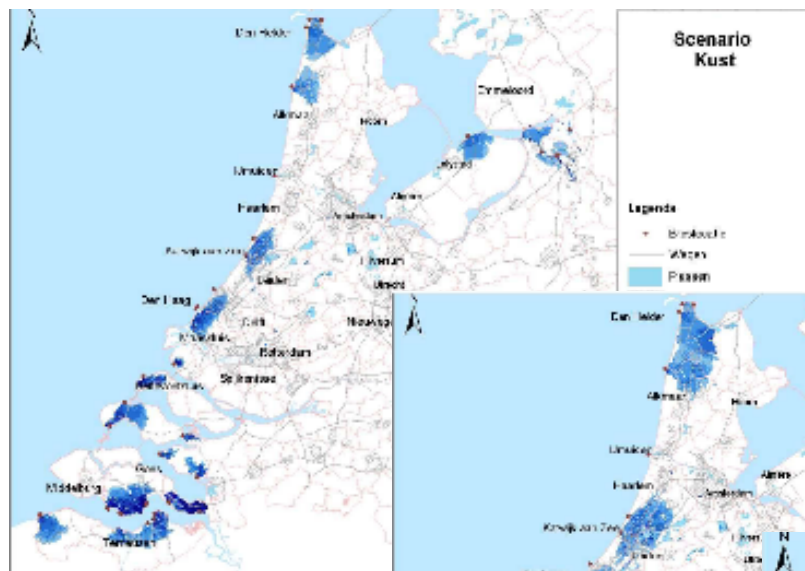
depression, low pressure area, either the western (from the province of Zeeland up to the province of North Holland) or northern coast (from the province of North Holland up to the province of Groningen) would be hit.



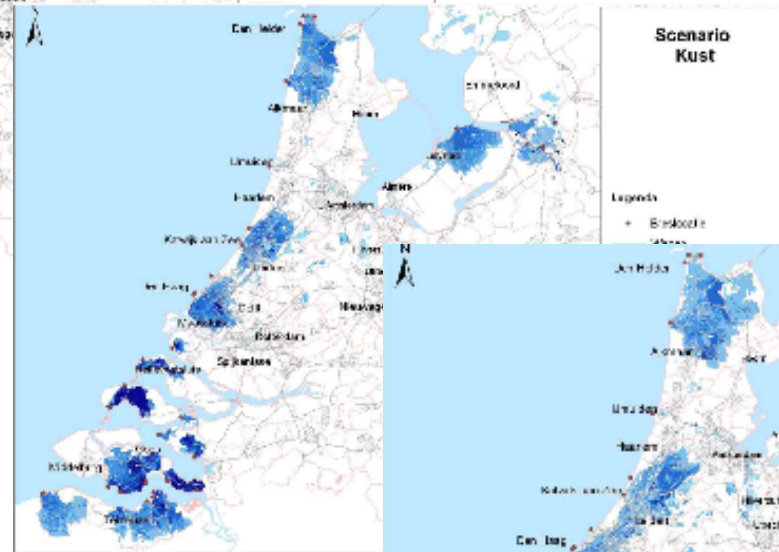
It needs to be noted that the worst case scenario's are merely scenario's and do not give certainty regarding which dike rings will be hit if an extreme situation takes place. That depends on uncertain factors, such as weather situation and unexpected circumstances regarding the flood protection system.

Scenario

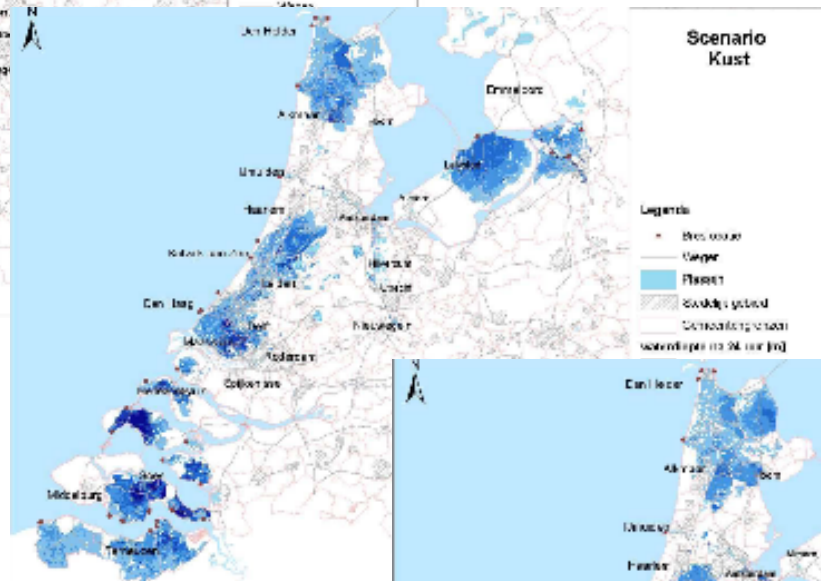
The scenario of the western coastal area includes the coast of Zeeland, Zuid-Holland, Noord-Holland and the IJsselmeer. The flood occurs when a depression in combination with winds characterized by hurricane strength draws over the North Sea towards Denmark for at least one and a half day. This situation occurs at the least once every 100 000 years. The flood protection system would fail at several places. Fourteen dike rings would fill up entirely or partly with water. An area of 2796.17 square miles would flood. In that area approximately 2.3 million people live. The damage would go up to 121 billion Euros.



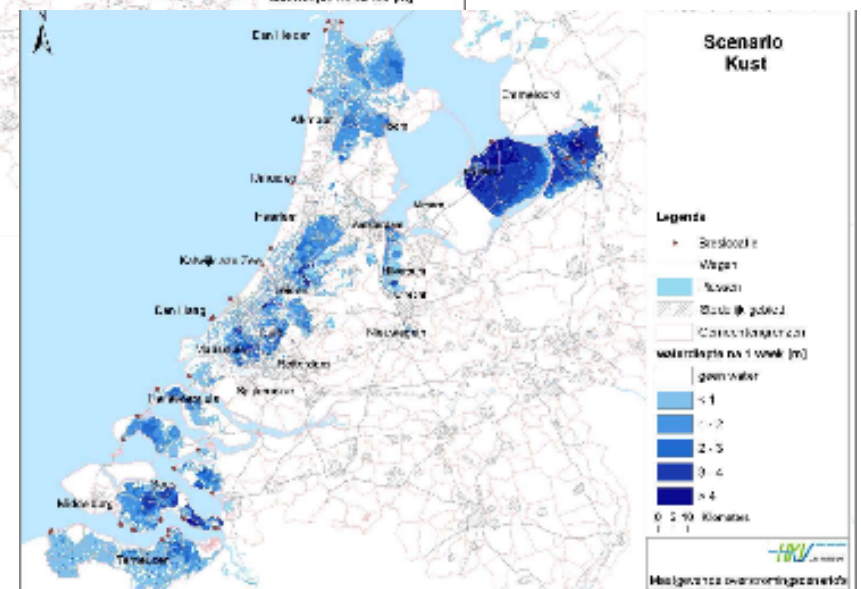
After 4 hours



After 12 hours



After 48 hours



After 1 week

Development Flood after Breach

In approximately three quarters of the affected area the water will reach up to 1 meter. According to experts, merely 1% of the inhabitants of the affected areas will have been evacuated, primarily because of the weather and the rapidly spreading water. Around 10,300 people would die in this scenario.

Delta Committee Advice

The government of the Netherlands requested an independent committee of state (the Delta committee) to give its advice on flood protection and flood risk management in the Netherlands for the next century, while keeping the country an attractive place to live, work and invest. The Netherlands delta is safe, but preserving this safety requires, according to the committee, immediate action.

The advice was presented on September 3. The advice was guided by three elements, namely 1) moral choices (do we remain collectively responsible for water safety; how do we define safety levels in relation to people, economy, environment), 2) aspirations (the Netherlands wishes to retain its attractive living environment, sustainability, availability of quality of surface and drinking water) and 3) implementation processes (safety as a central objective, integrated and multifunctional solutions, flexibility). The Netherlands is safe, but has to start work on the future now. The Delta Committee has made twelve recommendations to 'future proof' the Netherlands, even over the very long term, securing the country against flooding, assured of adequate fresh water, while remaining an attractive place to live. The basic issue is security, but the advice interfaces with life and work, agriculture, ecology, recreation and leisure, landscape, infrastructure and energy. Together, the twelve recommendations make up the Delta Programme, which must be financially guaranteed by a Delta Fund.

A new Delta Act will provide the legislative anchor for the political-administrative organization for the improvement of water security and the Delta Fund.

Lessons learned: Flooding in the Netherlands

The Flood Disaster of 1953⁶⁸⁶⁹⁷⁰

The largest peacetime disaster of the last centuries in the Netherlands took place on January 31st and February 1st of 1953. On those days, a heavy northwestern storm combined with high water levels led to floods in the southwest the Netherlands. This flood killed 1853 people, tens of thousands of animals, demanded the evacuation of almost 75,000 people and resulted in mayor economic damages. Unfortunately, so much has changed since 1953 that most of the lessons learned in 1953 are not applicable to today's situation. Nevertheless, some lessons may be interesting and helpful.

Emergency and Crisis Management

- Coordination and synchronization of responsibilities on different governmental levels (municipality, province, and national level) was one of the primary obstacles.
- Improving preparedness nationally, but also internationally is important and might have facilitated the response.

⁶⁸ Source for this entire section is COT's evaluation of the disaster: COT, *Getuige de Ramp, De Watersnoodramp 1953 in Crisisperspectief*, Alphen aan den Rijn: Kluwer, January 2003.

⁶⁹ ISONEVO en Committee on Disaster Studies of the National Academy of Sciences – National Research Council, Volume I – Introduction Communications in the Stricken Area in February 1953, *Studies in Holland Flood Disaster 1953*, ISONEVO en National Research Council, Amsterdam/ Washington: 1955

ISONEVO en Committee on Disaster Studies of the National Academy of Sciences – National Research Council, Volume II – Survey of Evacuation Problems and Disaster Experiences, *Studies in Holland Flood Disaster 1953*, ISONEVO en National Research Council, Amsterdam/ Washington: 1955

ISONEVO en Committee on Disaster Studies of the National Academy of Sciences – National Research Council, Volume III – Community studies: A study of the Destruction of A Community; A study of Social Disorganization in a Community; A study of Social Disorganization in a Community, *Studies in Holland Flood Disaster 1953*, ISONEVO en National Research Council, Amsterdam/ Washington: 1955

ISONEVO en Committee on Disaster Studies of the National Academy of Sciences – National Research Council, Volume IV – General Conclusions, *Studies in Holland Flood Disaster 1953*, ISONEVO en National Research Council, Amsterdam/ Washington: 1955

⁷⁰ Rosenthal, U., Sutides in Holland flood disaster 1953: an essay on the proto-sociology of disaster, in: *Journal of Mass Emergencies and Disasters*, Volume 6, No.3, University of Delaware, Newark, Delaware: 1988

Behavioral aspects concerning flood response

- When comparing today's Dutch people with the Dutch in 1953, it is possible to say that people in 1953 were more "tolerant" to disasters. People's behavior has changed and become less accepting and more demanding. Especially more demanding towards the central government. Today, governments cannot remain aloof or characterize a disaster as natural.

Evacuation

- Throughout the 1953 flood disaster, policies and regulations regarding evacuation were not clear. Some of the questions that arose were: When should evacuation be forced, when should it merely be insisted, and when should it be voluntary? (97)

Recovery

- Recovery as a result of the 1953 flood went hand in hand with recovery from World War II. This, in combination with societal and other differences, leads to a situation where for current crises no relevant lessons can be distilled from recovery activities after the 1953 flood disaster.

Floods in 1993 and 1995

In 1993 a number of European countries, including the Netherlands, suffered from riverine flooding. In the Netherlands, the river Meuse flooded in December of 1993. Thirteen months later, January 1995, a similar incident occurred, on an even larger scale and including multiple rivers in the Netherlands (Meuse, Rhine, Waal). In both cases the (imminent) floods were caused by high levels of rainfall in Belgium and France. During these crises tens of thousands of people were evacuated – in 1995 up to a quarter million people, hundreds of thousands of cattle were evacuated, and thousands of houses were flooded.^{71 72}

Emergency and Crisis Management

- Before 1993, regional disaster plans for riverine flooding were did not exist in several of the affected regions. Additionally, those plans that were in place were often brief and incomplete. Due to the flooding of 1993 many regions developed or adjusted and improved their plans. Subsequently, in 1995 crisis management had improved.
- Experiences and lessons learned from the 1993 flooding allowed for damages in 1995 to be contained. Due to last-minute precautionary measures taken before the flood of 1995 (based on experiences in 1993) reduced the damage in 1995 (1997: 246-247, 411). Nevertheless, long-term precautionary measures as well as last-minute measures were aimed

⁷¹ M.J. van Duin (et al.), *Evacuatie bij Hoog Water: Zelfredzaamheid en Overheidszorg*, Leiden: COT, December 1995; and: U. Rosenthal et al. (Eds.), *The 1993 and 1995 Floods in Western Europe, A Comparative Study of Disaster Response*, Leiden: COT, May 1997.

⁷² Rosenthal, U. en M. Bezuyen, Flood Emergency Management in Developed Countries: The experience of 1993, 1995 and 1997 in Europe, in: D.J. Parlur (ed.), *Flood*, Routledge, London: 2000

- specifically at the early stages of the floods, and did not consider the later stages after evacuation (1995: 117).
- In 1993, coordination between the Netherlands and other countries slowly developed. As a result of lessons learned in 1993, in 1995 such coordination efforts developed more quickly. (1997: 229, 231).
 - Although in some cases the coordination process improved after 1993, it was often still inadequate (1997: 259). For instance, coordination between water authorities and emergency services or political authorities was insufficient, both in 1993 and 1995. Additionally, coordination within and between municipalities, regions, and provinces, was not always up to par (1997: 258-260, 262).
 - The volume of information was too great, which made it hard for the coordination centers to operate effectively (1997: 260).
 - The flooding in 1993 was the first time since 1953 the military was employed for a peacetime crisis situation. Although the military assistance was useful, civil authorities reported several problems and misunderstandings when cooperating with the military. Additionally, the military was pulled back very quickly, thus there was no protracted involvement. In 1995, the military assistance was better organized and civil authorities praised the military efforts (1997: 258-260).
 - Despite the fact that the province of Gelderland had not been affected by the floods of 1993, the city of Nijmegen, a city in the same province, did decide to step up its emergency planning. This turned out to be very effective in 1995. Although there were definitely some shortcomings, the approach the city used put it a step ahead of other municipalities in the region. Nijmegen was better prepared, and thus able to deal with and anticipate the consequences of the crisis better (1997: 247-248, 250-251). At the same time, a decision made by Nijmegen to evacuate made it harder for neighboring municipalities not to evacuate, even if they did not deem this necessary (1995: 118).
 - From both cases it became evident that disaster planning was primarily valuable in order to raise awareness. (1995: 117).

Behavioral aspects concerning flood response

- Especially in 1993, civilians did not take the dangers of flooding very seriously, therefore often refused evacuation. In 1995, this was less the case, even throughout the regions that had not been hit in 1993 (1997: 248-250; 1995: 120).

Crisis-communication/media

- To citizens it appeared important to attain a timely warning of a (possible) flood. In 1993, warnings were insufficient, too late, and sometimes unclear or even outdated. This may result in chaotic evacuation and angry civilians (1997: 234-240).
- The use of media by governments (local, regional, and provincial) proved beneficial. Governments could show their involvement, and the public was able to get important information (1997: 241-242). Especially in 1995, the media were the most important source of information for the population (1995: 120) In certain areas, however, there was a lack of adequate media management and coordination, especially in small and unprepared regions with few facilities. Good media is important during crisis situations. Without coordination of the media, the quality of media efforts reduces and it is

likely for chaos to arise as its usefulness for the audience remains limited. (1997: 243).

Evacuation

- In 1993 decision-making was very reactive, and a product of improvisation to unforeseen and quickly changing circumstances. The plans that were in place often did not cover the events or were not taken seriously by authorities. As a result, evacuations were for example badly organized and last-minute, and thus did not take place in an orderly fashion (1997: 248-249).
- In 1995 improvements had been made. For instance, the decision to evacuate was taken earlier. Additionally, a system of modalities had been created for authorities to choose from: no evacuation, encouraging voluntary evacuation, disseminating an urgent notice to evacuate, and declaring a compulsory evacuation. With this system it turned out to be easier to encourage people to go, even if they were not obliged to do so. This made the process of evacuation more orderly (1997: 249-250).
- Preparations in place in the light of evacuation had unforeseen consequences: people perceiving preparations being made, assumed they had to leave even though such a decision had not yet been made. (1995: 117-118).
- The water board authorities, sometimes using external expertise, advised whether or not to evacuate. These authorities turned out to be very important in the decision-making process. However, coordination and harmonization between these authorities were not always sufficient. Lack of coordination and harmonization between the water boards sometimes resulted in confusion and other problems (1997: 252).

Recovery

- Recovery was primarily concerned with compensation. There was hardly any need for aid organizations. Nevertheless, the evacuation of 1995 did have an impact on the lives of the evacuees and it took quite some time before they returned to normalcy (1995: 121).
- As the Netherlands knows no flood insurance, private insurance companies did not cover the flood damage. After 1953 it was decided that insurers would not be able to deal with a flood in the Netherlands. Floods would lead to great financial problems among insurers (1997: 263-264). Subsequently, governments and their benevolence play an important role when determining, for each separate case, the rules for compensation in each separate case. As no laws or regulations exist, compensation is often fairly arbitrary (1997: 271-272).
- Actual costs are hard to gauge. Indirect costs such as costs resulting from the closure of a factory, are difficult to specify (1997: 271).

Extreme Rainfall 1998

The year 1998 knew the most rainfall in the entire 20th century. In fact, one day in September brought more than 100 mm (4 inches) of rain to some areas in the country. Less than two months later, the same happened again. The Dutch water management system could not cope with the high amounts of water, and large

parts of the country had to deal with flooding. Many questions were asked, several lessons were learned. Here, those lessons are mentioned. In this case no life threatening situations occurred. This should be kept in mind while taking these lessons learned into account.⁷³ (13, 173)

Emergency and Crisis Management

- A number of problems were identified during the extreme rainfall in 1998. The most problematic areas were: coordination, preparation of different levels of government, internal communication and the exchange of information between different levels of government (e.g. Mayor, Minister of Internal Affairs, Royal Commissioner, dike reeve, Provincial Executives, Minister of Traffic and Public Works) (173, 177). This led to, for example, several municipalities being caught by surprise by the flooding (175). Also risk analyses turned out varied throughout different levels of government (175).
- Emergency and crisis management was highly influenced by contextual issues (history, personal style, differences between provinces or municipalities, and the like) (174). For instance, some regions use a more plan-based approach, others use exercises to prepare for emergencies. Although this situation has slightly improved compared to previous experiences, there is still a gap (176) between both approaches.
- The flooding problems were caused by a combination of unfortunate circumstances such as strong winds and an already high level of water combined with soil saturated by water due to incessant rainfall in the period preceding the particularly heavy rains. Although it could have been obvious to those responsible that such heavy rain would lead to flooding, the precipitation in the described period exceeded what the water management system could absorb (174-175).
- General emergency management plans were not always available. It is not necessary to have plans specifically aimed at dealing with emergencies due to extreme rainfall. It is however important to be able to deal with crisis situations adequately. Plans are, subsequently, important. (176)
- The fact that the flooding was a combined result of natural and human factors implies that it should be possible to implement measures that reduce the damage done by similar incidents (175).
- In general, preparation was insufficient. There is not enough awareness that circumstances such as extreme rainfall could lead to flooding and requires general emergency management. Those type of emergencies are insufficiently acute and life threatening, thus preparation is not considered necessary. In addition to inadequate contingency planning, parties also exercise too little. Insufficient preparedness generally leads to executive problems during the crisis (176-177).
- Often times the different parties involved are not clear about their responsibilities and responsibilities end up overlapping. It may, for example, be unclear who's the coordinator and what his or her tasks and responsibilities are. For example: when a crisis concerning excessive water is labeled 'incident' the dike reeve is in charge of coordination and is responsible. However, as soon as the situation is labeled a 'disaster', the mayor becomes responsible. In several cases the dike reeves operated independently, and carried out tasks that generally are also among the mayor's tasks.

⁷³ Source for this entire section is COT's evaluation of the incidents: COT, *Extreme Regen 1998*, Alphen aan den Rijn: Samsom, June 1999. The page numbers used are indicated throughout the text.

- The borders of water board regions, municipalities and provinces are incongruent. Furthermore, their structures are very different. This often leads to a situation in which a water management region may need to deal with several municipalities or provinces. The more organizations are involved, the harder it is to coordinate and manage the situation (178).
- As a large area was affected by the flooding, coordination should have ceded to a higher authority. This did not always happen. Although it did not have very severe consequences, in case of more acute emergencies it has demonstrated to be important to upscale in a timely fashion. In more acute emergencies this focus on the local level may lead to more problems and conflicts (179).
- Decision-making on critical issues such as deliberate flooding of polders to relieve the pressure and threat for other areas was generally adequate, although it was often done based on the opinion of water management experts only. No counter-expertise was used, which led to under-representation of the negative aspects of deliberate flooding. Lessons learned with deliberate flooding in previous situations were not used to improve crisis management in this case (179-180).
- Use of mobile phones by emergency workers and teleconferences between mayors was very successful and led to more time for other activities (182).
- The use of the fire department for draining water was often merely symbolic. Nevertheless, this did have a psychological effect for the population, seeing that the government took control (182).

Behavioral aspects concerning flood response

- Although this type of flooding caused by rainfall is categorized in the Netherlands as an “acceptable risk”, political and societal acceptance of flooding proved limited. Therefore, a high amount of rainfall leads to disruption of Dutch society and high material costs (175).

Crisis-communication/media

- During the crisis itself, crisis communication would not influence the severity or scale of the events. However, in the aftermath, external communication was adequate and helped people better understand what to do in order to have damages covered. In some cases, even when crisis management was on a regional or national level already, crisis communication remained at local (municipality) level. In addition, some coordination problems occurred concerning external communication between several authorities (180-181).

Evacuation

- Very few people were evacuated during this crisis, since no life-threatening situations existed. Nevertheless, some problems were witnessed, especially in interpreting the severity of the situation, and thus the necessity of evacuation. Authorities responsible for making the decision on whether or not to evacuate rely on technical information like weather forecasts and quality reports on dikes or barriers. It may be hard for those authorities to interpret these details, for the information is often too technical and/or detailed. The technical and often detailed nature of the information may make it difficult for administrative authorities to make a well informed decision on whether or not to evacuate (131-134).

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