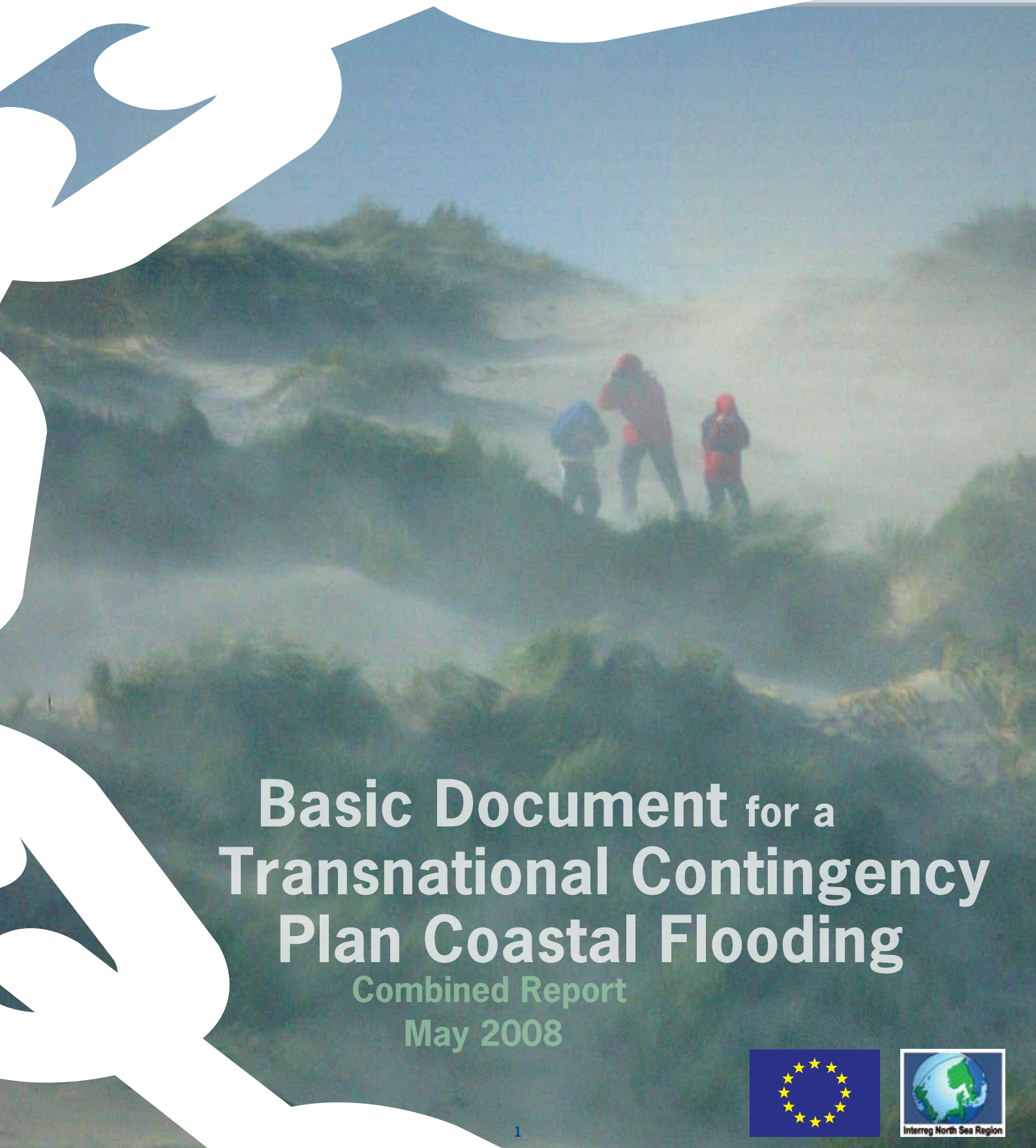
CHAIN OF SAFETY

covering the whole north sea region



Basic Document for a Transnational Contingency Plan Coastal Flooding

Combined Report

May 2008

Interreg North Sea Region

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Initiative to a Contingency Plan for flooding

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1. Introduction

This report combines all reports of the project Chain of Safety. During the projectperiod has been concluded that all actions were so related that a combined report gives better assurance that future initiatives will start from the output of our project than four different reports.

The project was carried out under the Interreg IIIB-programme. The Interreg IIIB North Sea Programme emphasizes transnationality and cross-sectorality as important principles, elements which feature strongly in the Chain of Safety project. Transnationality includes cross-border approach, but is about cooperation between countries that are not necessarily direct neighbours.

The aim of the project was to facilitate cooperation, exchange of experience and mutual assistance between North Sea Regions in the event of coastal flooding. The overall objective of the project was to initiate a contingency plan for flooding covering the whole North Sea Area. This would be in cooperation with all relevant stakeholders, in order to combine best practices and experiences. Furthermore, a network of stakeholders in the North Sea Region was established in order to implement the contingency plan during the programme period 2007-2013.

The project followed the EU Floods Directive (2007/60/EC) and assumed the EU-coordination by the EU Monitoring and Information Centre (MIC) is the way to organise international assistance during a crisis, when there is no possibility to assist directly bilateral.

The lead partner of the project was the Province of Zeeland (the Netherlands). Other partners were the Ministry of Transport, Public Works and Water Management (the Netherlands), the Ministry of the Interior and Kingdom Relations (the Netherlands), the Essex County Council (UK), the Danish Coastal Authority (Denmark), the Ministry of the Interior of the Land Schleswig-Holstein (Germany) and the Flemish Ministry of Transport and Public Works (Belgium).

Sub-partners of Chain of Safety were the Province of East-Flanders (Belgium), the Province of West-Flanders (Belgium) and the Municipality of Schouwen-Duiveland (the Netherlands). An associated partner of Chain of Safety was the Province of Antwerp (Belgium).

The project consisted of the following actions, which are described in this report:

- Action 1: A comprehensive analysis of the existing local, regional and national flood plans in the North Sea Regions
- Action 2: Defining a contingency plan for flooding for the North Sea Region based on a common approach towards the Chain of Safety in the North Sea Area
- Action 3: Inventory into the research to implement the chain of safety and of the available equipment for implementing the chain of safety for the North Sea Region into practise
- Action 4: Dutch-Belgian coastal regions example to be utilised for further implementation

1.1 Development of this document

The content of the Chain of Safety project was linked or related to several other projects within the North Sea Programme, such as ESCAPE, FLOWS, FRaME, ComCoast, Safecoast, but also to projects in other INTERREG-Programmes, i.e. NOAH in the NWE-Programme and AWARE in the INTERREG IIIc West Zone-Programme, and Nazorg ('Aftercare') in the IIIa-Scheldemond Programme. The results of this project can also be used in the Baltic Sea Region and other INTERREG programmes.
The main difference of the project Chain of Safety in comparison to the other projects under INTERREG IIIB is that this project focused on crisis management, whereas the other projects dealt with risk management. Therefore Chain of Safety was complementary to those projects.

Chain of Safety was partly built on the results and outcomes of the ESCAPE-project, in particular on action 1 of this project. Within ESCAPE necessary content, requirements, and conditions for contingency plans have been formulated. Since disasters and flooding do not stop at regional or national borders , more then one region or even more then one country will be involved. Realising this should be the reason for defining and implementing a common contingency plan for flooding based on the chain of safety methodology.

By bringing together all knowledge and experience on coastal flooding within the whole safety chain throughout the North Sea Region, we aimed at optimalisation of cooperation amongst those regions. We hope and expect this report will also provide efficient and well organized sharing of equipment, recourses, knowledge and experiences.

Within the Dutch-Belgian coastal region the results of actions1-3 were compared to the existing situations. This resulted in an example on how to deal with the NSR contingency plan for coastal flooding.
The Flemish Dutch case demonstrates the interdependence in a low lying area vulnerable for coastal flooding as this part of the Scheldt estuary represents. In this situation common contingency planning and execution is of mayor importance for surviving such extreme events together. The pilot coastal contingency plan will serve as a step and learning exercise towards future North Sea contingency planning in cross-bordering areas.

The structure of the project was that all partners were involved in all activities of the project. The activities were carried out in all participating regions.
The hosting for meetings of the Steering Committee and the working committees rotated amongst the participating regions, thus aiming for embedding the project in the partner regions and organisations at the best possible way. Besides the involvement of the partners, also relevant stakeholders such as emergency services were involved in the project's meetings, workshops and conferences.

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The project ran from April 2006 till July 2008. After a starting meeting the organisational structure was agreed with a steering committee and working committees. Workshops were organised with experts in the field of making contingencyplans, organizing assistance, and knowledge-exchange.

For the communication about the project a website was launched, which will stay in the air after the projectperiod:
www.chainofsafety.com
Also four newsletters were published and distributed widely in the North Sea Region.

During the projectperiod contacts grew with the Interreg IIIb-projects ComCoast and Safecoast. A mutual DVD was made together:
Safecoast studied the changing risk of flooding and erosion and looked at general strategies to adapt to climate change.
Comcoast came up with new ideas and showed practical solutions of how to reorganize stretches of our coastal zone.
Chain of Safety has focused on what to do when all is not enough, and how to cope during and after a flood event, even across our administrative borders.

Together with Safecoast the final conference was organised and held in May 2008 in Scheveningen, The Netherlands.

1.2 The chain of safety principle

Since flooding disasters do not stop at local, regional or even national borders, and neither do the effects of such disasters, transnational cooperation in contingency planning is very important. Although the actual approaches are comparable, different structures and cultural differences make that interregional cooperation on pro-action, prevention, preparation, response and recovery, i.e. the chain of safety is not always uniform. The European member states and the European Commission are developing initiatives and strategies covering the whole of the chain of safety. National and regional regulations and operational programmes will have to be amended by the outcomes of these European developments.

The concept of the chain of safety approach is embraced by the partners and recently also in the new EU Floods Directive (2007/60/EC). One of the objectives of the Chain of Safety project was to provide input and recommendations to the European discussion regarding this field, by exchanging knowledge and experience available within the partnership, which includes both national and regional authorities.

Dutch safety and security policy is based on what is referred to as the chain of safety, a schematic representation of all the activities focused on the promotion of safety and applicable to all sub-areas within safety policy. In practice the chain of safety can be approached from an operational point of view as well as from an administrative point of view. A distinction is usually made between five links: pro-action, prevention, preparation, response and recovery.

Figure 1. The chain of safety.

The chain of safety has several links. These links differ from each other in their time scope (from long term prevention to medium-term recovery) and aim. Five different links can be distinguished:

- **Pro-action:** the elimination of structural causes of danger, thereby preventing the development of dangerous situations.
- **Prevention:** the minimization of risks and the restriction of the consequences of
any accidents that occur.
- **Preparation**: the preparations for the control of accidents, disasters and crises.
- **Response:** the operational control of dangerous situations that have occurred,
including the provision of the necessary assistance.
- **Recovery:** the concluding link in the safety chain. Recovery focuses on the return to the normal situation, together with evaluations that result in procedural improvements.

1.3 Outline of the Report

After this introductory chapter part 2 will set forth the scope of the main products of the Chain of Safety project. It comprises flooding maps of several coastal regions in the North Sea Region. Furthermore, the existing framework of European Union (EU) Crisis Coordination Arrangements will be sketched out in order to gain a clear picture into the European legislative framework and base for transnational cooperation concerning flood management. The last part of the scope is about a checklist we came up to for the recovery-phase.

Part three describes the products of the project. An inventory scheme of capacities and capabilities of the various partners in the field of flood risk-management and relief, our study on the available equipment, the organizational outline of scaling up-schemes of the partners and their respective inventory systems of equipment and a summary of the pilot project on a cross border coastal flooding-scenario set in Zeeland and West-Flanders. The final product is about the combination of knowledge related to crisismanagement in a coastal flood scenario, and the ambition to centralise this knowledge in the near future.

Finally, part 4 ends with conclusions from the report and initial recommendations regarding the follow-up to the Chain of Safety project.

This report will be published on the project website www.chainofsafety.com.

2. Scope

2.1 Scenario and Flooding Maps for Evacuation Planning

Storm surges represent a major natural hazard in the North Sea region. Around 40,000 km_ of low-lying land at coastal flood risk in the Netherlands, Germany, Belgium, Denmark and the UK are at risk for flooding from sea. If during a major storm the flood defence measures cannot resist the pressure of a storm, large areas are flooded.

To make good preparation on flood disasters, it is important to get insight in the potential scale of a coastal flooding. The memo 'Flooding Maps for Evacuation Planning' in appendix 2 presents the threatened areas of a 'worst credible flood' in the North Sea Region. A 'worst credible flood' is defined as "a flood, which occurs during a very extreme storm, however still possible situation". Contingency planners can base their preparations on these 'worst credible flood' scenarios.

In the framework of the Dutch "National Strategy for High Water and Storm Surge Crisis" flood defence experts have developed the 'worst credible flood' scenarios and translated them to zones in which different areas maybe flooded simultaneously. The scenarios are based on situations that exceed the level of protection. These storm surges occur with wind speeds of 12 Bft or more. The duration of storm surges depends on the tide and the duration of the storm. In these scenarios the duration is set on 45 hours. The average prediction time is 15 hours.

Based on these insights and on historical data of storms occurred in the past, a qualitative extrapolation into the North Sea has been made (See figure 2). It has been assumed that the location of simultaneous flooded areas along the North Sea depends on the wind pattern direction of the storm: NW storms threaten the Dutch coast (III), N storms threaten the German bight and North Holland (IV) and when a N storm runs more to the southern part of the North Sea, Southeast England, Belgium, South West Holland are threatened (II). N storms threaten the Southeast coast of the United Kingdom (I) and a W storm will threaten the coast of the Germany and Denmark (V). But of course during a storm winds can change rapidly. More than one of the described areas can be effected then.

Three areas were chosen for a case study. The Belgium-Dutch coastal border zone was chosen as the site for the case study (II or III). Breaches were supposed near Knokke (B) and Cadzand (NL). The flooded areas were defined using a Mike21 flooding model, which was set up in the framework of the Comrisk project.

For Denmark the area around the town of Ribe was chosen as the site for the case study (V). A breach was made in the dike around the location of the Ribe Sluice, which is a weak point in the sea defence. The additional flooding caused by the closing of the sluices is not taken into account; this would cause an additional water-volume of around 6 Million m3 (Comrisk sp7).

For Germany the area around the mouth of the river Elbe was chosen as the site for the case study (IV or V). A breach was made in the dike around the division between Kemper Marsch and Wilstermarsch, at an area where the hinterland was relatively low. Because of the rough elevation model used for the calculation of the predicted water volumes no differences in the flooded area are visible in the different timesteps.

For the United Kingdom there was no elevation data available during the time of writing. Due to this no flooding maps could be made.

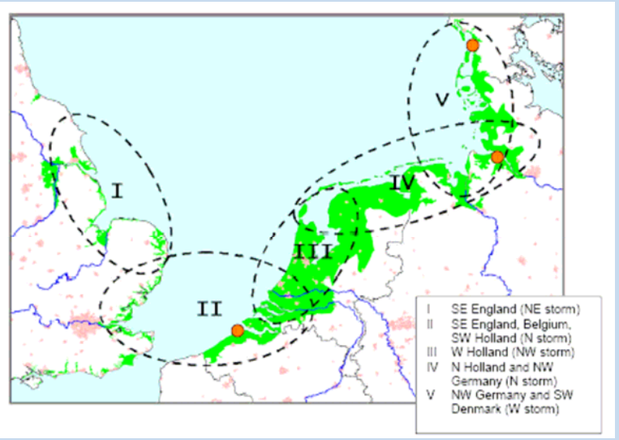


Figure 2. Coastal areas at risk to flooding from sea; the red dots represent the case studies of the project; the central part of the Danish West Coast is not shown.

2.2
EU Crisis Management and Coordination Arrangements

2.2.1 EU Crisis Coordination Arrangements (CCA)

The manual on EU emergency and crisis coordination arrangements was submitted to the Council in June 2006 as a response to the request by the European Council (The Hague Programme, point 2.4,) to set up an integrated EU arrangement for crisis management with cross-border effects. It is considered to be a living document which requires permanent updating and adjustment by the Presidency and General Secretariat of the Council.

This manual is based throughout on the key principle of subsidiarity - Member States have primary responsibility for the management of crises within their territory. It does not impose any obligations, nor does it change existing competences. Equally, the manual seeks to recognise the value of mutual support provided between Member States in a spirit of solidarity in the response to emergencies of a significant scale.

In the context of this manual, the notion of crisis management encompasses a wide range of sectors including civil protection, law enforcement, public order and the private sector. The manual is cross pillar and relevant both to external crises and crises within the EU and aims to assist Member States during emergencies. It is without prejudice to existing Crisis Management Procedures for the handling of crisis situations in the context of the Common Foreign and Security Policy (Title V of the Treaty of the EU).

A few of the most severe emergencies or crisis are of such wide-ranging impact or political significance that they require a coordinated EU response on a political level.
These emergencies/crisis are covered through the EU emergency and crisis coordination arrangements (CCA), setting out how the EU Institutions and affected Member States interact in Brussels in a crisis mode.

Procedures within the CCA.

The flow chart in figure 3 is a summary depiction of information flows and alternative actions to be taken by the affected Member State depending on the impact of the breaking emergency/crisis.

In an emergency/crisis the affected Member State will evaluate whether the response can be handled without the support from other countries or the EU institutions.
o If yes, all response actions are taken solely at national level without relying on assistance from other countries or the EU. The affected Member State might however - depending on the scale of the emergency/crisis - inform the specific Rapid Alert System (RAS) of the Commission (e.g. MIC).
o If no, the Member State will evaluate whether the emergency/crisis is of such an impact that

• no political EU level coordination is required:
In this case the affected Member State will either
- alert the specific RAS (e.g. MIC) and/or
- trigger bi- and multilateral agreements and/or
- consult the default contact details of the manual.

• political EU level coordination is required:
In this case, the information will be conveyed to the SitCen immediately.

The Monitoring and Information Centre (MIC) from EU is the contact for the national coordination centres to organize mutual assistance between countries, as far as no bilateral agreements make this possible directly.

Information on any breaking emergency or crisis shall be conveyed immediately to the General Secretariat of the Council (SITCEN). The SITCEN is operational 24 hours a day, 7 days a week. The SITCEN duty number is +322-281-5000.

The Director of the Sitcen or his designated replacement shall immediately relay the information to the Presidency (duty officer in the Permanent Representation), the Directors of the Private Office of the Secretary-General and Deputy Secretary-General of the Council and to the Commission (ARGUS - duty service number +322-292-2222).

The Permanent Representative of the Presidency (or his or her designated replacement) will confer with the Council Secretariat (Deputy Secretary-General or designated replacement) and the Commission (Secretary-General or designated replacement), as well as with the Permanent Representatives of any directly affected Member States, to determine whether an emergency or crisis has occurred or is anticipated which warrants triggering the crisis coordination arrangements. The decision on whether to activate them will be taken by the Presidency, in agreement with the Member States directly affected, and be based on expert judgement, in particular on whether the interests of several Member States are engaged in conjunction with those of the EU institutions.

If the Presidency (Permanent Representative) decides to convene a Crisis Steering Group, the Council Secretariat (SITCEN) and the Commission shall immediately be informed of the time and venue of the meeting and the Member States to be invited.
If the Presidency (Permanent Representative) concludes that the arrangements need not be activated at that juncture, he or she shall inform the Council Secretariat, the Commission and Member States consulted.

The Council Secretariat (SITCEN) will convene the principal members of the Crisis Steering Group. It will send a message to the duty officers of all Permanent Representations informing them that a meeting of the Steering Group has been convened. Duty officers in the Permanent Representations will also serve as a point of contact should any information be requested from that Member State by the Crisis Steering Group.

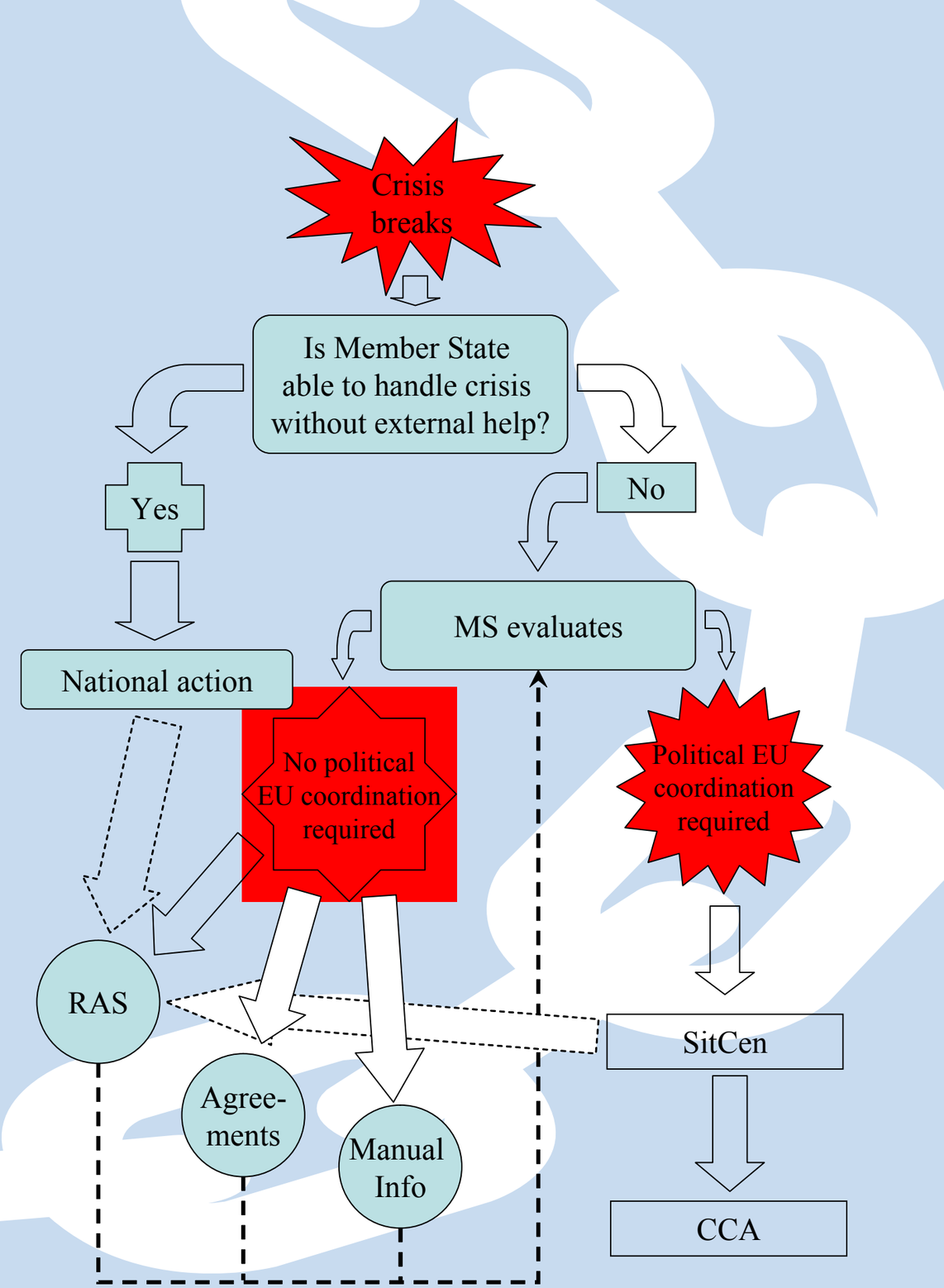


Figure 3. Procedure in the event of a breaking emergency or crisis when political coordination is required.

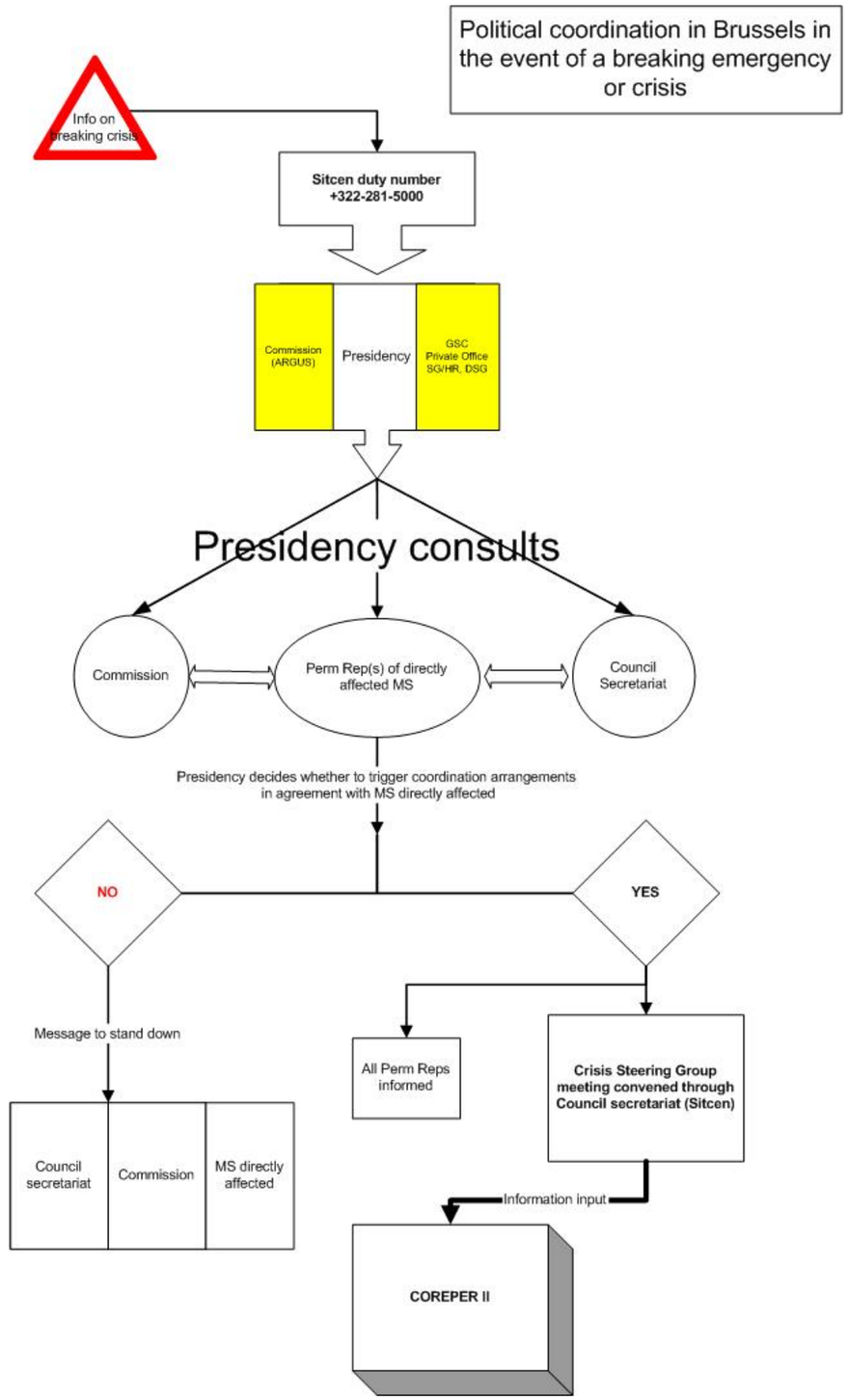
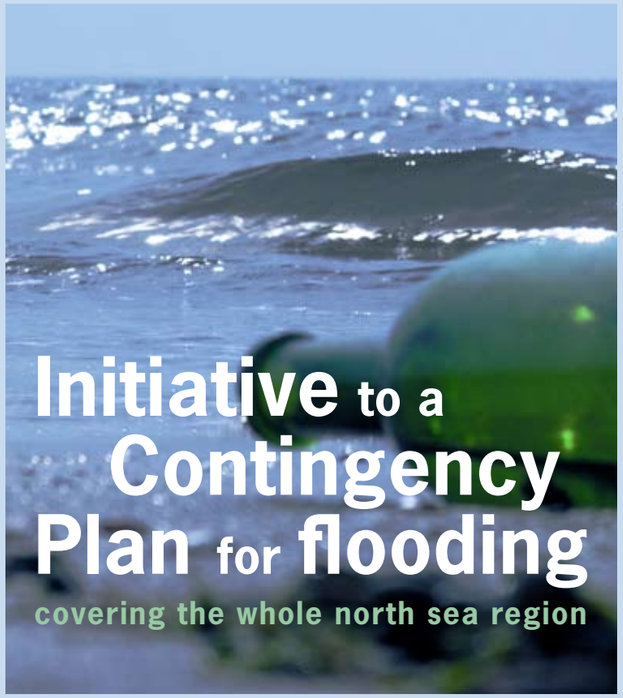


Figure 4. Political coordination in Brussels in the event of a breaking emergency or crisis.

2.2.2 EU Crisis Management Arrangements

It is important to note the existence of continuously developing forms of transnational cooperation at EU level. For the purposes of the Chain of Safety-project, there are elements in EU civil protection cooperation that form a useful backbone for future cooperation concerning coastal floodings in the North Sea Region.



The EU's Crisis Management Arrangements focus on three links in the chain of safety: prevention, preparation and response. The European Commission is responsible for supporting and supplementing efforts at national, regional and local level with regard to disaster prevention, the preparedness of those responsible for civil protection and the intervention in the event of disaster.

The Commission focusses its efforts on information, as correct information dissemination and sharing is essential for cooperation to work effectively. This entails collecting and pooling information on national civil protection capabilities.

EU cooperation also calls for the rapid mobilisation of intervention teams, experts and other resources on request in the event of major emergencies in order to alleviate the effects of a disasters during the first days. The Commission is entrusted to facilitate this as well to offer technical support, including satellite images if these are required.

After emergency relief operations are over, work starts on further information-sharing. In the case of major operations, the Commission organises lessons-learnt sessions which greatly contribute to identifying best-practice in preparation for other emergencies. In the recovery phase, the Commission also grants financial assistance to the affected state via a Solidarity Fund.

The legislative framework

The legislative framework for European civil protection enabled the Commission to establish a framework for effective and rapid co-operation between national civil protection services when mutual assistance is needed. The following tools for civil protection have been created at EU level:

1. The Community Action Programme, which supports major projects, workshops and training courses in the field of prevention, preparedness and response to natural disasters both at land and at sea.

2. The Community Mechanism for Civil Protection involves the participation of 30 European states which pool their civil protection resources that can be made available to disaster-stricken countries.

In 2005, the Commission adopted a Proposal for a Council Regulation establishing a Rapid Response and Preparedness Instrument for major emergencies. This proposal provides the future legal framework for the financing of civil protection operations. The Commission proposes a major increase in the future financing for European civil protection actions, with annual amounts ranging from €16 million in 2007 to €30 million in 2013. This proposal was adopted in March 2007 as Council Decision 2007/162/EC establishing a Civil Protection Financial Instrument.

The Community Mechanism for Civil Protection

The Community Mechanism for Civil Protection was established by Council Decision 2001/792/EC. It was subsequently operationalized by Commission Decision 2004/277/EC, which laid down the rules for the implementation of the Community Mechanism, defining its duties and the functioning of the various tools made use of in the Mechanism. When natural or manmade disasters strike a country, both inside and outside the European Union, it is possible to mobilise the necessary operational resources to assist and provide prompt response. The Mechanism was recast by a Council Decision of June 2007.

The main role of the Community Mechanism for Civil Protection is to facilitate co-operation in civil protection assistance interventions in the event of major emergencies which may require urgent response actions. This applies also to situations where there may be an imminent threat of such major emergencies.

In accordance with the principle of subsidiarity, it can provide added-value to European civil protection assistance by making support available on request of the affected country. This may arise if the affected country's preparedness for a disaster is not sufficient to provide an adequate response in terms of available resources. By pooling the civil protection capabilities of the participating states, the Community Mechanism can ensure even better protection primarily of people, but also of the natural and cultural environment as well as property.

Monitoring and Information Centre

The Monitoring and Information Centre (MIC) is the operational heart of the Community Mechanism. It is operated by Directorate-General Environment of the European Commission and accessible 24 hours a day. It gives countries access to a platform, to a one-stop-shop of civil protection means available amongst the all the participating states. Any country inside or outside the Union affected by a major disaster can make an appeal for assistance through the MIC. It acts

as a communication hub at headquarters level between participating states, the affected country and despatched field experts. It also provides useful and updated information on the actual status of an ongoing emergency. Last but not least, the MIC plays a co-ordination role by matching offers of assistance put forward by participating states to the needs of the disaster-stricken country.

The Community Mechanism for Civil Protection can be activated through the MIC by any participating state seeking prompt international assistance following a major disaster. A state usually calls on the Mechanism when the effects of the disaster cannot be matched by its own civil protection resources.

As soon as the MIC receives a request for assistance, the Centre immediately forwards it to its 24-hour network of national contact points. These contact points represent the participating states' civil protection authorities. They assess their available resources and inform the MIC whether or not they are in a position to help. The MIC then matches the offers made to the needs and informs the requesting state of the type and quantity of available assistance from the Community.

Arrangements for the dispatch of the accepted assistance (delivery, transport, visa requirements, customs, etc.) are made directly between the offering and requesting states. If required, the MIC may play a facilitating role. Any intervention teams or assistance sent from the EU to a disaster area remains under the direction of the national authorities of the affected country, which has the right to ask European teams to stand down at any time. European teams are subject to local law and should operate in conformity with national rules and procedures governing their work.
To facilitate the technical co-ordination of European civil protection assistance a small team of experts can be despatched on site by the MIC. This team will ensure effective liaison with local authorities and any other relevant actors so as to integrate European civil protection assistance into the overall relief effort and facilitate the work of European teams on the ground. Moreover, as they continue to monitor the emergency and assess its development, they can keep the MIC headquarter updated.

Other tools in the Community Mechanism are the Common Emergency and Information System (CECIS), which is a web-based alert and notification application created with the intention of facilitating emergency communication among the participating states, and a training programme, set up with a view to improving the co-ordination of civil protection assistance interventions by ensuring compatibility and complementarity between the intervention teams from the participating states

Cross-border pilot projects

In 2006, the European Parliament allocated additional sums of money for specific projects related to civil protection cooperation. The projects were intended to test innovative approaches in the field of civil protection by developing operational cross border civil protection modules. Modules are specific, predefined arrangements of member states' civil protection resources, consisting of equipment, personnel or a combination thereof. Their goal is to either perform support functions or to meet priority needs arising from emergencies.

Several projects related to floodings were proposed and accepted: Flood management cross border (led by Germany), Fight floods (led by Latvia) and EU Flood Command (led by the United Kingdom). See http://ec.europa.eu/environment/civil/prote/crossborder.htm for more information.

2.3 Recovery

Three Dutch organisations 'HKV Lijn in water', 'COT' and 'Impact' produced a concept checklist together as a fine example for preparations in the recovery-phase. During one of our workshops experts from 'HKV Lijn in water' introduced and explained this checklist. We were allowed to use this document.

This checklist is intended to create insight into the recovery-phase by illustrating issues and actions that need to be taken by crisis teams. Other goals of the checklist include improving the care given to victims and the acceleration of reconstruction in flooded areas.

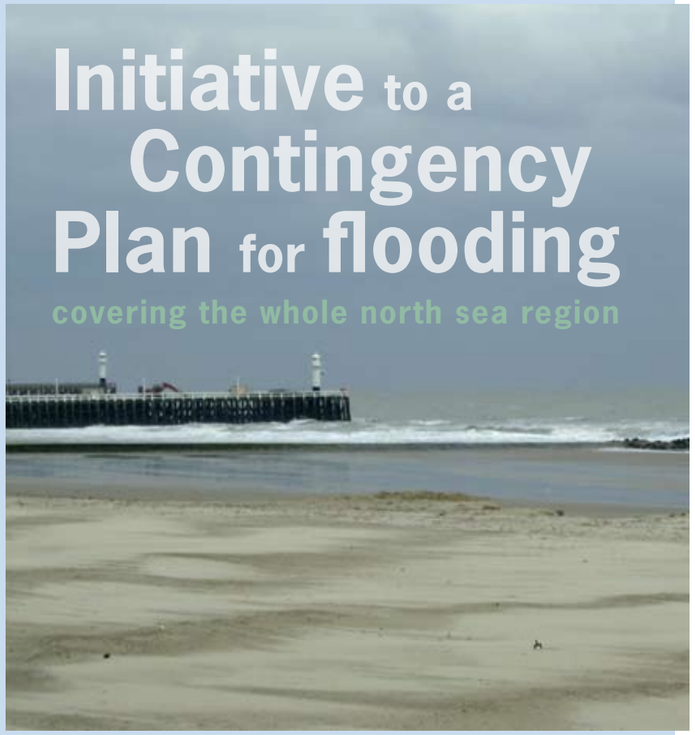
The described aftercare activities are sub-divided in four groups:
I Reconstruction
II Temporary services
III Shelter of victims
IV Remediation management

Activities related to the psychosocial aftercare are shown in coloured boxes.

In appendix you will find the complete concept checklist.

3. Products of the Chain of Safety Project

Within the EU each member state is responsible for its own system of disaster relief and crisis management.
However when taking into account the natural hazard 'flood' and taking into account the forthcoming sea-level rising a disaster that goes beyond the capacities of one member state to handle, such a disaster, can occur.



International (European) assistance is one of the ways to handle such a crisis in one ore more effected member states.
The Chain of Safety project focussed on a new way to handle this problem. Not from the point of view of who is responsible (by law) and which organisation can contribute to mitigate the effects of a flood, but first identify a worst credible flood in the North Sea Region, then identify the cross-border or transnational effects and then identify the possible assistance. It should all lead to a trans- national contingency plan on coastal flooding.

Why focus on such a contingency plan? Don't we have a strong defence against the North Sea? Yes, we have! And we are safer than ever, but there is no 100% guarantee that flooding will never happen again. Following the safety chain, we know that we can perform better, especially regarding response-preparedness.
So, there is a paradigm shift moving from "defend and manage" to "anticipate and respond".
There is also a shift from "the government protects society from floods" to clear choices about living with the risk and the roles of government and those of other actors. Information, communication, awareness raising and response-planning become essential.

Taking into account directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risk; not only preventive measures are important but there should be a balance between prevention and mitigation of the effects. The safety chain is a very useful instrument to give a first insight in the basic capabilities/capacities in the countries of the partners and if there is a balance in the links.

The inventory scheme in appendix 4 therefore could be the base to identify the areas on which further survey could be undertaken.

Because preventive measures are already of a high standard and ongoing business in the member states of the partners the accent in the Chain of Safety project laid on the links preparation and the response and on the recovery link.

In the inventory, in each link, you can see the capabilities that are needed to handle a flood.

To be effective, it is advisable that the different member states of the partners should develop their local, regional and national plans, systems, risk-mapping etc. in such a way – to a trans-national contingency plan - that they complement each other capabilities to optimize the mitigation effects when an EU-region is effected. In the various workshops the experts pointed out that the best way to structure such plans is with strategic, tactical and operational layers.
To make transnational planning and assistance more complementary the Chain of Safety project developed a realistic flood scenario for the North Sea Region and gave special attention to:
- inventory of plans with capacities and capabilities;
- modulating equipment;
- evacuation planning;
- recovery planning;
- getting to know the crisis-management systems of the partners.

Besides the products on the above mentioned themes and based on these themes a PILOT cross-border contingency-plan is developed and tested in an exercise.

To produce these results knowledge is gathered and combined in a KNOWLEDGE DATA BASE, that will be part of the future Knowledge Centre on Crisis-management Coastal Flooding.

3.1 Inventory Scheme of Plans (Capacities and Capabilities)

To succeed in transnational contingency planning against floods local, 'regional' and national plans should fit and complement each other to meet the needs by demand of the worst credible flood.
Therefore the development of a worst credible flood scenario for the North Sea Region is a premise for succesful planning on local, 'regional', national and NSR-level with respect of the capabilities and the responsibilities of the sovereign governmental bodies.

In order to get a short overview of the existing contingency planning within the participating partners of this project, a quick scan has been made. In appendix you will find the output of this quick scan in an inventory scheme.

The inventory scheme outlines the basic capability or capacity along the links of the Safety Chain, regarding the Member States of the North Sea Region/Partners of the Project for different – governmental - levels. The goal is to get a rough insight in the necessary preparation to respond together when multiple members are affected by coastal floods. For each item bear in mind that the activity or capacity is based on a common/agreed/written plan, scheme, strategy, blueprint, design or scenario.

Connected to this scheme, detailed plans of the partners are available on the website of the project www.chainofsafety.com (database "Knowledge").

The scheme is the result of contributions from all partners and the discussion of the meetings at Blankenberge (BE) and Colchester (UK).
Some aspects of the scheme are also dealt with in other international networks:

a. Vital Infrastructure (water defence works) is taken care of in the EU Project Critical Infrastructure Protection
b. Modelling the chances (now and in future) of a flood happening, and the technical consequences of a flooding, is taken care in the EU Project Safecoast
c. Risk awareness is dealt with in the Flood Awareness and Prevention Policy project (FLAPP)
d. An evacuation practicum is an additional activity in the EU-Intereg IIIC project Attention to Warning And Readiness in Emergencies (AWARE)
e. In the response link the item Assistance of neighbouring countries is tackled on EU level with the Monitoring and Information Centre (MIC).
f. Regarding equipment, the project EUFloodCommand, which is co-financed by the EU-Commission, will deliver an EU system of modular maritime (Search And Rescue) based aid for floods in May 2008.
g. Regarding knowledge, a project CRUE – flooding European Research Arena net – is being developed. Other related projects are ENCORA, with a coastal portal, and flood projects related with the EU Research institute at Italy.

3.2 Table of Contents for an Evacuation Plan

During one of the workshops a list of important issues that should be dealt with in an evacuation plan was created. This list is a framework or the table of contents for the different plans that have to be worked out in each partner country. It can also be used as a checklist to update the plans that allready exist. It provides a tool for the partners of the North Sea Region for deriving the benefit of a common ground to work together in case of flooding in the NSR.

Note from the workshop is that all types of evacuation (were it a nuclear disaster, a bomb or a flood) are basically the same.

The workshop results are listed, in random order, below and based on the contributions of the partners and their experts.

- Preparation phase / checklist
- Warning & information of the people
- Accommodation / shelter places / transport (people / livestock / cultural inheritance)
- Care for the evacuated people (social structure / medical aid / food / clothes / mobile fuel tanks)
- Recovery / repatriation (also long term)
- Define different scenario's (it may occur or it occurs)
- Traffic circulation plan (contra flow measures)
- Critical infra-structure
- Recovery (pollution / mental help)
- Continuity of operation (rescue-workers rescue their relatives first?)
- Public awareness (self-reliance)
- Who is responsible for what? How do they communicate? / responsibilities
- Assistance (national and international)
- Foreigner assistance & support
- Decision-making / -levels
- Security aspects (area)
- Time of incident (winter/summer, day/night, weekend/week)
- Training & exercise
- Define the areas where and the circumstances when you don't want people to evacuate to and prepare for non evacuees
- Media-management
- Prognoses

3.3 Crisis Management in National/Regional Governments

During the explanation by the partners of the marks in the inventory schemes of capacities and capabilities we noticed that it was important to know the global structure of the crisis-management organisation in the different partner-countries.

3.3.1 United Kingdom

In 2004 parliament passed the Civil Contingencies Act, which forms the basis of crisis management in the United Kingdom. It on the one hand lays down the requirement for local authorities to assess risks and prepare for emergencies, and on the other hand provides the responsibilities of the national government.

There are four different government levels relevant at times of a disaster in the United Kingdom. The district level is the lowest level, at this level emergency services cooperate. The UK is divided in 86 counties, which serve as the central party in crisis management. The county level contingency planning is located. At the regional level (the UK has 9 regions) the Regional Resilience Team and the Government Office function as a link between the national government and local authorities. In some instances the scale or complexity of an emergency is such that some degree of central government support or co-ordination becomes necessary. Central government will not duplicate the role of local responders who remain the basic level of the response to an emergency. The United Kingdom uses a national framework for scaling up the local multi-agency response to, and recovery from, emergencies. Levels range from bronze, silver to gold.

As mentioned, as the counties form a central role in crisis management, specific contingency planning is located there. Contingency plans for flooding for each county are set up by the county council; there is no national flooding scenario.

Also alerting of citizens is the responsibility of the county. Each county has a website on which they pay attention to civil security and safety (e.g. the website for the County Council of Essex is www.essexcc.co.uk). The national government uses the website www.ukresilience.info to inform citizens about civil protection.

3.3.2 The Netherlands

Crisis management in the Netherlands is laid down in different laws (Disaster Act; Fire Services Act; Medical Disasters Act etc.) which are united in the Act Safety Region that is expected to enter into force in 2008 or 2009. A safety region is geographically based on the Police Act and is operationally the base for crisis management for all first responder organisations and municipalities. Based on this law, several operational (not standardised) procedures are in use. On regional level that is the Gecoördineerde Regionale Incidentenbestrijdings Procedure, or GRIP (Coordinated Regional Crisis Management Procedure), which is a general organizational structure used for all kinds of disasters. GRIP uses four levels of management and makes a division between the operative (safety and health issues) and policy (governmental decisions) structure.

Some kinds of disasters have specific plans. The particular plan on the national level for flooding is the Nationaal Crisisplan Hoogwater en Overstromingen (National Plan of Response for High Water and Flooding, NRHO) by the Ministry of the Interior and Kingdom Relations.
All safety regions have their own specific plans and the Water boards and the Ministry of Transport, Public Works and Water Management have their own water management-scenario, which is closely linked to the NRHO. In case of a worst credible flood (appendix 4), the management level is immediately raised to a kind of 'supra' GRIP 4, which entails that the regions will use GRIP 4, but the national government takes a coordinating role over the municipalities.

In this case, all the municipalities report to the national level via the coordinating mayor to the provincial governments. The Queens Commissioner, on behalf of the provincial government, is spokesperson for all the municipalities towards the ministries.
The Netherlands has specific regional treaties with Belgium, Luxembourg and Germany, which give grounds for provincial authorities to make agreements with their foreign neighbours for arrangements in times of crises.

For alerting citizens during an emergency the regional (provincial) media are included. Every province has an agreement with the respective local radio and television. On www.crisis.nl, people can find information on how to prepare for an emergency. During an emergency, this website will be changed to give up to date information.

3.3.3 Denmark

Danish Civil Emergency Planning consists of two parts: Civil Preparedness and Rescue Preparedness. The regulations are laid down in The Danish Preparedness Act from 2000.

Civil Preparedness is defined as a plan for the continual function of society under extraordinary conditions. Its aim is to ensure that resources of the civil society are utilised in a co-ordinated manner.

The individual ministries are responsible for planning with their own respective areas in accordance with the principle of sector responsibility. The tasks that have been assigned to them are to maintain the functions of the Government and public administration, producing necessary legislation and providing guidance to regional and municipal authorities.

Furthermore the municipalities and the regional councils must likewise prepare contingency plans for all assignments that they are responsible for.

The Danish Emergency Management Agency (DEMA) has the coordinating responsibility on plans on national level on behalf of the Minister of Defence.

The main actors of Rescue Preparedness are the municipalities. The municipal rescue preparedness system must be capable of providing proper turnout services. In addition, it must be prepared to receive, accommodate and feed evacuees and other persons in distress, including victims of floods and other natural disasters. The municipal rescue services are supplemented by the national rescue preparedness system. It consists of five regional centres run by DEMA, which provide assistance to the Municipal Rescue Preparedness whenever such assistance is necessary, depending on the nature or extent of an accident or disaster. The regional centres train conscripts which make up the national rescue preparedness reserve.

Other important actors are the regional councils, which are responsible for the hospital preparedness, and the police, which is responsible for the co-ordination of the cooperation between different actors and for communication with the media and the public.

Twelve local co-ordinating groups have been established to co-ordinate the tasks in relation to all types of emergencies and catastrophes, which may occur in their respective geographical areas. The groups consist of representatives from the regional and local emergency management authorities and are chaired by the regional chief constables of the police. The purpose is to facilitate cooperation and coordinated utilisation of the resources in the region.

In case of major incidents that cannot be resolved in the individual regions The National Operative Staff takes over the role of coordination. The staff consists of representatives from the relevant authorities and its purpose is to strengthen co-ordination among the military, police and other authorities in the event of major national crises. The staff creates and maintains clarity and overview of a given situation as a basis for decision-making in the different sectors and nationally. The staff currently informs the National Crisis Management Organisation.

Due to the principle of sector responsibility the staff cannot make decisions which bind authorities or other actors. In crisis-situations the authorities must follow normal principles and procedures as far as possible. Authority is to a great extend delegated to the operative level, which means that the operative level may take the necessary measures without awaiting authorisation form the central level.

DEMA is responsible for coordinating the planning of the civil preparedness and national rescue preparedness and advising the authorities about civil emergency planning related issues.

Germany and Denmark has entered into a bilateral treaty in 1985 on mutual assistance at emergencies or serious accidents.

Contingency plans on flooding are part of the general municipal contingency plans. Recognising the higher risk on the West Coast of Denmark two separate warning and alarm services have been established. In the Wadden Sea Area some predefined meteorological and hydrographical criteria's - dependant of strength of the dikes – for preventive evacuation of people in the low-lying areas are introduced. A similar system is established on the central part of the West Coast of Denmark.

3.3.4 Belgium

As a federal state Belgium knows multiple levels of government. Three of these form the basis of crisis management: the local (municipal), provincial and national or federal level. These different governmental levels have a similar organization. In case of a local disaster the mayor organises a Municipal Crisis Centre, which consists of representatives of the emergency services and experts from the fields. This centre decides on both the operational and policy question. This team, however, will probably be divided in the future into an operational and policy side. When management is scaled up to the provincial level, the governor takes over the coordinating role. He as well sets up a Provincial Crisis Centre. At the federal level the Minister of Internal Affairs has the decision-making power. The Crisis Coordination Centre (Algemene Directie Crisiscentrum, ADCC) the Ministry of Internal Affairs is responsible for planning, organization during a crisis and also deals with issues of public order during major events. The ADCC is also the contact point for international aid in case of an emergency.

There is no national contingency plan in Belgium for an emergency concerning flooding. Every municipality has its own specific contingency plans on issues that relate to that municipality. The provincial authorities of West-Flanders have an overarching plan for their specific role during an emergency.

3.3.5 Germany

In German legislation, a distinction is made between civil defence and civil protection. The first lies within the responsibility of the Federation while the latter is a task of the Länder. Civil defence is an umbrella term for public and private measures to protect the population in a case of defence. In accordance with the Constitution of the Federal Republic of Germany, the responsibility for legislation in the field of civil defence lies with the Federation. The law is however largely enforced by the Federal Länder in administration by delegated authority. The tasks of the Federation are carried out by the Federal Ministry of the Interior, by other ministries within their remit, by the Federal Office of Civil Protection and Disaster Assistance (BBK) and by the Technisches Hilfswerk (THW). The Federal Ministry of the Interior provides a national crisis centre, which is the national contact point to the EU and other countries.

Any other cases of civil protection and disaster control in peace times are a matter for the Länder, which maintain civil protection procedures for this purpose. These are laid down in the Länder specific civil protection acts, e.g. in the Schleswig-Holstein State Civil Protection Act (Landeskatastrophenschutzgesetz Schleswig-Holstein). On the Länder level, the responsibility is broken down to regional administrative levels. For instance in Schleswig-Holstein, the Chief Administrative Officer of the Kreis (County) is in charge of civil protection and takes over the command in case of a disaster in his county. He is assisted by a specially qualified staff. In case more than one County has been affected by an emergency, the Ministry of the Interior of the Land Schleswig-Holstein is then involved and its State Office for Civil Protection and Disaster Control undertakes the entire command of operations.

The Federation and the Länder are working closely together in a spirit of partnership in order to have a combined, powerful system of damage protection. This is largely based on voluntary helpers from private and public civil protection organisations. The private and public relief organisations are:

- the fire services
- Workers' Samaritan Federation (ASB)
- German Red Cross (DRK)
- Johanniter-Unfall-Hilfe (accident assistance) (JUH)
- Malteser-Hilfsdienst (MHD)
- Deutsche Lebens-Rettungs-Gesellschaft (DLRG)
- Bundesanstalt Technisches Hilfswerk

3.4 Equipment

One of the goals at the start of the project was - according to the project plan - an inventory on the needed equipment.

These were the expectations of the Working Committee members on the output of Action 3 (Equipment):

- the inventory should be a special part of the trans-national contingency plan
- make a list of people who are in charge of equipment and logistics
- produce an agreement on exchange mechanisms
- the inventory should focus on the equipment not only on a regional but also on a national scale, needed to tackle a severe storm affecting more than one region (worst case scenario)
- both physical equipment and human resources should be included
- develop a system that stays actual (up to date-data) and delivers useful information

Following these expectations, a list of questions and actions was set up

1. What kind of equipment do we need? Defining a catalogue for
   a. physical equipment (sand, sandbags, water pumps, boats, helicopters, shelter places, etc)
   b. human resources (rescue personnel, carers, vets, engineers, etc.)
2. What equipment is available and where, who are the contact persons?
3. What structure of mutual assistance does already exist in and between the regions? (survey on the existing exchange mechanisms and structures e.g. by drawing a flow chart of the authorities in charge and their connections)

Ad 1. and 2.
A form has been drafted and sent around to the project partners to serve as a first inventory on physical equipment and human resources. But looking at the feedback and the results, the conclusion came up that it could not be feasible as a project's outcome to produce a detailed list or a central database of available equipment. This would mean double work, because resource databases are already kept and updated by the regional / national information and coordination centres. Hence it was proposed to concentrate on networking, i.e. making a list of contact points for resources. During the workshop discussions, invited experts pointed out that generally there is enough equipment available. The problem would mainly be to get it in time to the place where it is needed.

Ad 3
Further, the focus was directed to the question which structures of mutual assistance allready exist. In every country there are information and coordination centres on almost every level of administration. They gather information, process requests for assistance and coordinate rescue and emergency relief measures. On the EU level, the Monitoring and Information Centre (MIC) of the EU plays this role. Mutual assistance between the member states is based upon the Community mechanism for civil protection.

Finally the question was discussed whether a common form or checklist of relevant equipment/expertise related to flooding could be used when asking for assistance. We put this question to the MIC and we received the answer that the MIC uses no such guideline or checklist. As a reason it was stated that they want to avoid that assistance is supply driven.

Experts at the workshop on equipment in Ribe pointed out that when asking for assistance, rather capabilities than resources should be defined. Furthermore, the EU mechanism on civil protection and the existing resource databases at the MIC were assigned to be sufficient. The partners agreed that the European mechanism should be the scale to arrange support from other countries in case of a trans-national flood disaster at the North Sea. The project-partners are willing to assist the MIC in improving the EU Mechanism. The MIC can ask them to be part of a working-group that produces a MIC-form on the specific scenario of a coastal flooding in the North Sea Region.

3.5 Inventory of Domestic Equipment Organization

Equipment is a key-element in disaster management. During the project a division was made between 'human equipment' (human resources) and physical equipment. Human equipment can range from engineers for issues such as the repair of dykes to medical personal or veterinaries for medical care for evacuees. Physical equipment can range from sandbags and bulldozers, to transportation for evacuees (busses, helicopters, etc.). Also buildings for shelter or emergency medical stations are defined as physical equipment.

Although equipment-coordination is different in every country, there are several general problems that are encountered in almost all the partner-countries. The most important problems are related to keeping databases up to date and the (lack of) communication between levels of government.

Most countries put the primary responsibility for obtaining and maintaining equipment at the municipal level and have a national agency to assist in larger events. Differences between the systems are seen in the organization of the national institution (volunteers or professional, to what extend can equipment be used by lower levels of government, etc.).

In the United Kingdom, the lead department for Civil Protection is the Cabinet Office, they are in charge of the national policy. The Department of Communities and Local Government looks whether local governments have sufficient plans and equipment. In case of an incident involving terrorism, Home Office is in charge.

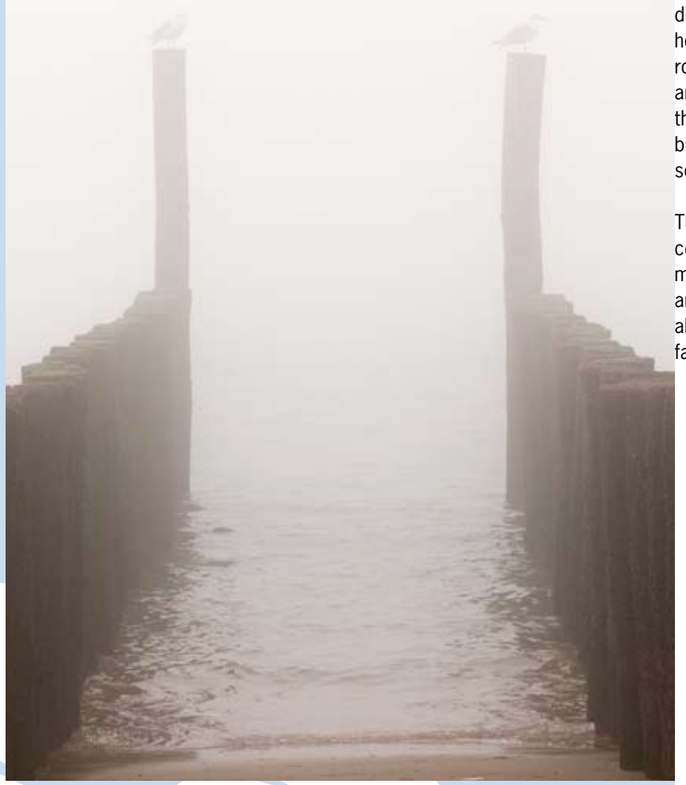
In the Netherlands, equipment-management is organised by the National Operational Coordination Centre (Landelijk Operationeel Coordinatie Centrum, LOCC). This institution is charged with the coordination of emergency services in case of a (national) disaster and functions as an 'umbrella' for all relevant organizations. At the moment an up-to-date list of equipment owned by the national government (and used by local authorities) is present, and efforts are made on setting up a list of relevant equipment of private owners. Special equipment listed in a catalogue is available in the Department of Defence as result of Cabinet-agreements about civil-military cooperation.

In Denmark the emergency level is built up as a multi-level system. The municipality emergency service (level 1) is in charge of day to day preparedness and response. The number and kind of vehicles and equipment are based on a local risk assessment. The municipal and government support points (level 2) assist by supplying equipment for the most frequent tasks while the five government emergency response centres (level 3) assist in larger, longer lasting or particularly personnel intensive accidents. The governmental centres are operated by DEMA.

In Belgium, the municipalities, and more specifically the local emergency services, form the backbone of the system for equipment coordination. This gives them the opportunity to focus specifically on the local demands. The Civil Protection unit (Civiele Veiligheid) of the Ministry of Internal affairs assists the local services.

In Germany, the Länder civil protection units are run and maintained by the private and public relief organisations, e.g. fire brigades, German Red Cross a.o. Additional equipment and training is funded and provided by the Federation. The units and facilities of the Bundesanstalt Technisches Hilfswerk (THW) provide back-up for civil protection when it comes to rescue and technical assistance.

The most mentioned problem is the communication between levels of government. It is often the case that municipalities cannot, or are not willing to supply a list of their equipment to e.g. the provincial level. The same is the case towards the national governments. Especially Germany and Belgium have problems with this, as in their case equipment is divided over all levels of government. Related to this is the fact that most national governments have troubles keeping their database up to date.



3.6 Summary of Pilot Cross-Border Region Zeeland-West Flanders

The Netherlands and Belgium each have their own organisational structure for crisis-management when a flood happens. Within the Province of Zeeland a special contingencyplan on flooding is signed by the combined responsible authorities. In Belgium the general contingencyplans are used.
For cross-border aspects an Euregional Protocol leads the way since 2003.

Within the Dutch-Belgian coastal region the results of the inventories on available plans and equipment were used to compare the existing situations. This has resulted in an example on how to deal with a transnational contingency plan for coastal flooding. The Dutch version of this 'Pilot Plan' will be printed for distribution. The English version will be put on the website www.chainofsafety.com.

Main aim was to establish the first steps towards the setting up of a joint contingency plan in a low laying bordering region, in which mutual cooperation is of essential nature for successful contingency planning and effectuation.
This included sharing information on technical issues, such as water level prediction schemes, inventories regarding detailed elevation maps and land usage. Better insight is generated for the areas most likely to be affected in case of flooding, focussing at the situation in real life, instead of restricting to administrative units.

Besides technical information the information on responsibilities of different authorities was shared in order to know which entities exist, how these are to be contacted, who has to be addressed for which role in calamities. Last essential input was to know what physical and technical infrastructures are present at what location; to provide the necessary support. This can be information on infrastructure, buildings to serve as shelters, equipment as boats, helicopters and so on.

The product is a cross-border contingency-plan for the scenario coastal flooding. This includes the risks and scenario's, the crisis-management and crisis-organisation in schemes of both countries and a cross-border scheme, the description of the main processes, alarm-schemes, a communication paragraph and information about facilities and logistics.

3.7 Combining and centralising Knowledge

One of the aims of the Interreg-NSR Project Chain of Safety was to facilitate the cooperation and the exchange of knowledge in the event of coastal flooding. Among other things, this project surveyed and compiled the existing knowledge regarding crisis-management in a coastal flooding. Contingency-plans, Response-measures and recovery-measures were the main topics. The need to combine and centralise this knowledge in a knowledge centre was one of the main conclusions. The partners agreed to ask the Province of Zeeland to organise this.
On the website of the project a database is filled with plans, documents and relevant links to other websites.

Important issue will be the added value for the European partners. To assure this in the organisational structure all cooperating partners will be involved; in a board or a steering committee. Also representatives of the professional safety-services are to be involved.

The Centre should host a library combined with a central data-base. There should be opportunities for research, studies, education and information. Not only for experts, but also for students and for the general public. The perspective is on a European scale.

The Knowledge Centre should be part of a European network of existing and planned regional knowledge centres/networks. Its aim should be to link research and practice. Furthermore, social, psychological and recovery elements should be included in this knowledge centre.

The project-partners in Chain of Safety have consented to house all this knowledge in a future Knowledge Centre on Crisis-management Coastal Flooding. They agreed on the location in Zeeland, where also an experimental area can be developed. The Province of Zeeland initiates and stimulates this.

The focus of the knowledge centre should be:
- to acquire knowledge, secure it and make it available; demand orientated
- storing knowledge; data-bases, library etc.
- to specialise in the field of preparation, response and recovery; and fill the gap between risk-management and crisis-management
- to create a link between that knowledge and the knowledge that is being gained within the framework of courses in other institutes
- to maintain interaction between water academy teaching staff and those who proffer knowledge
- to link applied research in the area of coastal defence, safety, processes within the chain of safety, risk- and crisis communication, public awareness
- to connect knowledge with education on a variety of levels; translate science to practical situations; academies will be involved in planning so as to intensify the interaction between training, knowledge and applied research. The aim is to have graduate (masters) students as well as undergraduate (bachelors) students conduct applied research
- to form a link between the knowledge centres on a European scale, like the Kennisnetwerk Deltawater (Knowledge Network Delta Water) in the field of coastal safety and safety risks
- to centralise the experiences of the general public, including victims, as input; and be accessible for the public as well
- to cooperate in public initiatives, in order to integrate and connect initiatives
- to support awareness among young people via educational programs
- give students specific tasks to develop ideas and products

4. Future Work and Recommendations

21st May 2008.

The European Project Chain of Safety is running to an end in June 2008. The Steering Committee, in which all the partners from the North Sea Region are represented, concluded that the aims of the project have been achieved successfully.
The recommendations will also be presented to the European authority that is responsible for civil protection and crisis-management.

The project-outcomes envisaged from the start were to combine all information about the national and regional initiatives to respond to a coastal flooding, and to produce a report as a basic document for a transnational agreement, e.g. a contingency-plan on coastal flooding for the North Sea Region countries.

4.1 Plans

While making this report a great job was done in making inventories on the already existing national, regional and local plans in the different countries.
With this linking document the representatives of the national governments can initiate a transnational meeting with their colleagues in the North Sea Region countries. Here they can promote the framework for a transnational contingency-plan on coastal flooding, and take the lead in producing the draft for this. The draft can be worked out in the final text for a transnational plan, or in a transnational treaty.

During the project the idea of a matrix of separate decision making stages linked to a time scale came up. The concept originates from a plan which is instituted in the United States of America after the hurricane Katrina disaster in New Orleans. The idea basically comes down to a timeline, linked with a check list, such as the Recovery Index (appendix). This timeline would mark several time-frames before an expected dike breach (e.g. in steps of days, 12 hours or 6 hours), and the decisions that have to be taken within that time frame. An example can be evacuation; if the decision to evacuate a certain area is not made in time, there is no more possibility to evacuate at all (because e.g. there is not enough time to prepare shelter area's, or roads will be blocked by the flooding, etc.).

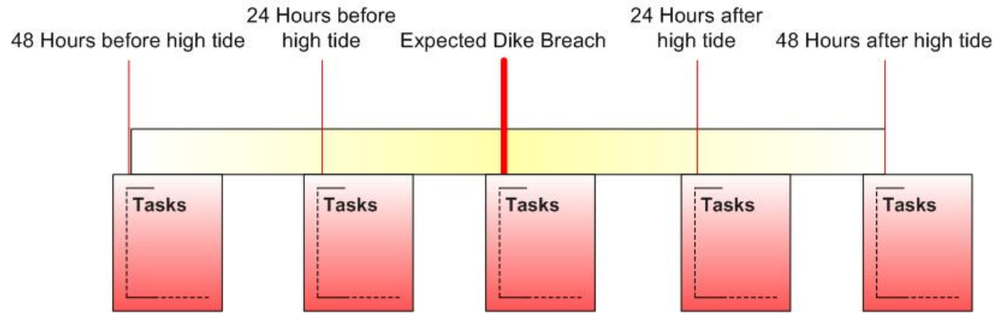


Figure 5. Example of a possible decision making timeline

As this report can be of help to everyone in the field, the results, including this report, the website and the database should be combined with the efforts of for instance the European Union working groups (e.g. the working group on modular equipment systems) and Dutch initiatives such as the Taskforce Management Floodings (Taskforce Management Overstromingen TMO).

4.2 Equipment

After a first inventory on the available equipment, as well human resources as materials, the conclusion is that most likely no country will have enough equipment to support itself, and there are no developed criteria based on capacity of equipment and personnel. Partners in the project subscribe the initiative of the Commission about modules (COMMISSION DECISION of 20 December 2007), because this meets the need to get an overview of equipment based on capacity.
Some countries have bilateral agreements to assist each other. These agreements are sometimes even worked out on a cross-border regional scale. But mostly the European Community Mechanism on Civil Protection (MIC) should be the scale to arrange support from other countries.

4.3 Knowledge

A data-base filled with the plans, relevant documents, useful websites and known expertise in the partner-countries is available on the internet. This data-base should be extended, but will be one of the tools that is going to be organised in the near future in the Knowledge-Centre on Coastal Floodings that will be situated in Zeeland, as part of the Water Academy there.
The knowledge centre in Zeeland will specialize on coastal floodings, including the relation with specific delta-areas. This can be further developed in a European project, where the partners of the Chain of Safety-project are invited to participate. The initiative for this lies with the Province of Zeeland. The knowledge-centre will take part in a European network of knowledge-centres related to floodings with its special expertise on floodings by salt water and the delta-specifics.

4.4 Pilot

As a pilot an initiative to for a contingency-plan “coastal floodings in the cross-border region West-Flanders and Zeeland” has been developed. This plan has also been tested in an exercise with the regional crisismanagement coordination-centres in both countries. This pilot will be a good example for other cross-border regions, but can also serve as input for the transnational contingency-plan.

4.5 General conclusion

The project was a good initiative to start to speak the same ‘language’ and will definitely accelerate the action-time in case of an event!

The conclusion can be drawn that the project succeeded in reaching its aims. However, one must also consider that the project-outcomes from the start were due to be the primary basic document, the framework, for a transnational contingency-plan on coastal flooding for the North Sea Region countries. It can therefore be concluded that the project should get a follow-up, preferably in the new Interreg-programme.

4.6 Recommendations

1. To have a mutual ‘legal’ base to develop plans that meet the effects of a flood effecting more than one country in the North Sea Region the existing national and regional agreements should first be analysed if they deliver such a base. For the moment there are some bi-lateral agreements and no transnational agreement. If the analysis is that there is no sufficient base, it is recommended that a Memorandum of Understanding could be the way to work out this transnational agreement.

2. It is recommended that the developed knowledge base in the project Chain of Safety becomes part of the Knowledge-Centre on Crisis-management Coastal Flooding in Zeeland. Here they will specialize on coastal floodings, including the relation with specific delta-areas. The partners of the Chain of Safety-project are invited to participate in the organisational structure, but also other interested partners can be involved.
The knowledge-centre should take part in a European network of knowledge-centres related to floodings with its special expertise on floodings by salt water and the delta-specifics. To assure that in this way a central information-point can be established this knowledge-centre should be presented to be adopted by the EU.

Glossary of Terms

CHAIN OF SAFETY

covering the whole north sea region

Glossery of Terms

For a common understanding of this document we will use the glossery of terms that was developed in the EU project FLOODsite in 2005. This concerns the field of risk-management.
As far as we know there is no such a list available on civil protection in EU-context in the field of crisis-management.

Title	Language of Risk, Project definitions
Lead Authors	Ben Gouldby and Paul Samuels,
Contributors	Frans Klijn, Frank Messner, Ad van Os, Paul Sayers, and Jochen Schanze
Distribution	All team members, Board Members, External public requests on approval of the Coordinator.
Document Reference	T32-04-01

Accuracy - closeness to reality.
Adaptive capacity - Is the ability to plan, prepare for, facilitate, and implement adaptation options. Factors that determine a community adaptive capacity include its economic wealth, its technology and infrastructure, the information, knowledge and skills that it possesses, the nature of its institutions, its commitment to equity, and its social capital.
Aims - The objectives of groups/individuals/organisations involved with a project. The aims are taken to include ethical and aesthetic considerations.
Attenuation (flood peak) - lowering a flood peak (and lengthening its base).
Basin (river) (see catchment area) - the area from which water runs off to a given river.
Catchment area - the area from which water runs off to a river
Bias - The disposition to distort the significance of the various pieces of information that have to be used.
Characterisation - The process of expressing the observed/predicted behaviour of a system and it's components for optimal use in decision making.
Cognition - The conscious or unconscious process of deriving meaning from sensory data. So .perceived risk. might be more correctly termed .cognated. risk.
Conditional probability - The likelihood of some event given the prior occurrence of some other event.
Confidence interval - A measure of the degree of (un)certainty of an estimate. Usually presented as a percentage. For example, a confidence level of 95% applied to an upper and lower bound of an estimate indicates there is a 95% chance the estimate lies between the specified bounds. Confidence limits can be calculated for some forms of uncertainty (see knowledge uncertainty), or estimated by an expert (see judgement).
Consequence - An impact such as economic, social or environmental damage/improvement that may result from a flood. May be expressed quantitatively (e.g. monetary value), by category (e.g. High, Medium, Low) or descriptively.
Coping capacity - The means by which people or organisations use available resources and abilities to face adverse consequences that could lead to a disaster.
Correlation - Between two random variables, the correlation is a measure of the extent to which a change in one tends to correspond to a change in the other. One measure of linear dependence is the correlation coefficient p. If variables are independent random variables then p = 0. Values of +1 and –1 correspond to full positive and negative dependence respectively. Note: the existence of some correlation need not imply that the link is one of cause and effect.
Critical element - A system element, the failure of which will lead to the failure of the system.
Damage potential - A description of the value of social, economic and ecological impacts (harm) that would be caused in the event of a flood.
Decision uncertainty - The rational inability to choose between alternative options.
Defence system - Two or more defences acting to achieve common goals (e.g. maintaining flood protection to a floodplain area/ community).
Design objective - The objective (put forward by a stakeholder), describing the desired performance of an intervention, once implemented.
Design discharge - See Design standard and Design flood
Design standard - A performance indicator that is specific to the engineering of a particular defence to meet a particular objective under a given loading condition. Note: the design standard will vary with load, for example there may be different performance requirements under different loading conditions.
Dependence - The extent to which one variable depends on another variable. Dependence affects the likelihood of two or more thresholds being exceeded simultaneously. When it is not known whether dependence exists between two variables or parameters, guidance on the importance of any assumption can be provided by assessing the fully dependent and independent cases (see also correlation).
Deterministic process / method - A method or process that adopts precise, single-values for all variables and input values, giving a single value output.
Discharge (stream, river) - as measured by volume per unit of time.
Efficiency - In everyday language, the ratio of outputs to inputs; in economics, optimality.
Element - A component part of a system
Element life - The period of time over which a certain element will provide sufficient strength to the structure with or without maintenance.
Emergency management - The ensemble of the activities covering emergency planning, emergency control and post-event assessment.
Epistemology - A theory of what we can know and why or how we can know it.
Ergonomics - The study of human performance as a function of the difficulty of the task and environmental conditions.
Error - Mistaken calculations or measurements with quantifiable and predictable differences.
Evacuation scheme - plan for the combination of actions needed for evacuation (warning, communication, transport etc.).
Event (in context) - In FLOODsite these are the conditions which may lead to flooding. An event is, for example, the occurrence in Source terms of one or more variables such as a particular wave height threshold being exceeded at the same time a specific sea level, or in Receptor terms a particular flood depth. When defining an event it can be important to define the spatial extent and the associated duration. Appendix 1 expands upon this definition.
Exposure - Quantification of the receptors that may be influenced by a hazard (flood), for example, number of people and their demographics, number and type of properties etc.
Expectation - Expectation, or .expected value. of a variable, refers to the mean value the variable takes. For example, in a 100 year period, a 1 in 100 year event is expected to be equalled or exceeded once. This can be defined mathematically
Expected annual frequency - Expected number of occurrences per year (reciprocal of the return period of a given event).

Expected value - see Expectation
Extrapolation - The inference of unknown data from known data, for instance future data from past data, by analysing trends and making assumptions.
Failure - Inability to achieve a defined performance threshold (response given loading).
"Catastrophic" failure describes the situation where the consequences are immediate and severe, whereas "prognostic" failure describes the situation where the consequences only grow to a significant level when additional loading has been applied and/or time has elapsed.
Failure mode - Description of one of any number of ways in which a defence or system may fail to meet a particular performance indicator.
Flood - A temporary covering of land by water outside its normal confines.
Flood control (measure) - A structural intervention to limit flooding and so an example of a risk management measure.
Flood damage - damage to receptors (buildings, infrastructure, goods), production and intangibles (life, cultural and ecological assets) caused by a flood.
Flood forecasting system - A system designed to forecast flood levels before they occur.
Flood hazard map - map with the predicted or documented extent of flooding, with or without an indication of the flood probability.
Flood level - water level during a flood.
Flood management measures - Actions that are taken to reduce either the probability of flooding or the consequences of flooding or some combination of the two.
Flood peak - highest water level recorded in the river during a flood.
Floodplain - part of alluvial plain that would be naturally flooded in the absence of engineered interventions.
Flood prevention - actions to prevent the occurrence of an extreme discharge peak.
Flood protection (measure) - to protect a certain area from inundation (using dikes etc).
Flood risk zoning - delineation of areas with different possibilities and limitations for investments, based on flood hazard maps.
Flood risk management - Continuous and holistic societal analysis, assessment and mitigation of flood risk.
Flood warning system (FWS) - A system designed to warn members of the public of the potential of imminent flooding. Typically linked to a flood forecasting system.
Flooding System (in context) - In the broadest terms, a system may be described as the social and physical domain within which risks arise and are managed. An understanding of the way a system behaves and, in particular, the mechanisms by which it may fail, is an essential aspect of understanding risk. This is true for an organisational system like flood warning, as well as for a more physical system, such as a series of flood defences protecting a flood plain.
Fragility - The propensity of a particular defence or system to fail under a given load condition. Typically expressed as a fragility function curve relating load to probability of failure. Combined with descriptors of decay/deterioration, fragility functions enable future performance to be described.
Functional design - The design of an intervention with a clear understanding of the performance required of the intervention.
Governance - The processes of decision making and implementation
Harm - Disadvantageous consequences . economic, social or environmental. (See Consequence).
Hazard - A physical event, phenomenon or human activity with the potential to result in harm. A hazard does not necessarily lead to harm.
Hazard mapping - The process of establishing the spatial extents of hazardous phenomena.
Hierarchy - A process where information cascades from a greater spatial or temporal scale to lesser scale and vice versa.
Human reliability - Probability that a person correctly performs a specified task.
Ignorance - Lack of knowledge
Institutional uncertainty - inadequate collaboration and/or trust among institutions, potentially due to poor communication, lack of understanding, overall bureaucratic culture, conflicting sub-cultures, traditions and missions.
Integrated risk management - An approach to risk management that embraces all sources, pathway sand receptors of risk and considers combinations of structural and non-structural solutions.
Integrated Water Resource Management - IWRM is a process which promotes the co-ordinated management and development of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.
Intervention - A planned activity designed to effect an improvement in an existing natural or engineered system (including social, organisation/ defence systems).
Inundation - Flooding of land with water. (NB: In certain European languages this can refer to deliberate flooding, to reduce the consequences of flooding on nearby areas, for example. The general definition is preferred here.)
Joint probability - The probability of specific values of one or more variables occurring simultaneously. For example, extreme water levels in estuaries may occur at times of high river flow, times of high sea level or times when both river flow and sea level are above average levels. When assessing the likelihood of occurrence of high estuarine water levels it is therefore necessary to consider the joint probability of high river flows and high sea levels.
Judgement - Decisions taken arising from the critical assessment of the relevant knowledge.
Knowledge - Spectrum of known relevant information.
Knowledge uncertainty - Uncertainty due to lack of knowledge of all the causes and effects in a physical or social system. For example, a numerical model of wave transformation may not include an accurate mathematical description of all the relevant physical processes. Wave breaking aspects may be parameterised to compensate for the lack of knowledge regarding the physics. The model is thus subject to a form of knowledge uncertainty. Various forms of knowledge uncertainty exist, including: Process model uncertainty . All models are an abstraction of reality and can never be considered true. They are thus subject to process model uncertainty. Measured data versus modelled data comparisons give an insight into the extent of model uncertainty but do not produce a complete picture. Statistical inference uncertainty - Formal quantification of the uncertainty of estimating the population from a sample. The uncertainty is related to the extent of data and variability of the data that make up the sample.
Statistical model uncertainty - Uncertainty associated with the fitting of a statistical model. The statistical model is usually assumed to be correct. However, if two different models fit a set of data equally well but have different extrapolations/interpolations then this assumption is not valid and there is statistical model uncertainty.
Legal uncertainty - the possibility of future liability for actions or inaction. The absence of undisputed legal norms strongly affects the relevant actors. decisions.
Likelihood - A general concept relating to the chance of an event occurring. Likelihood is generally expressed as a probability or a frequency.
Limit state - The boundary between safety and failure.
Load - Refers to environmental factors such as high river flows, water levels and wave heights, to which the flooding and erosion system is subjected.
Mitigation - see Flood management measures
Natural variability - Uncertainties that stem from the assumed inherent

randomness and basic unpredictability in the natural world and are characterised by the variability in known or observable populations.

Parameters - The parameters in a model are the constants, chosen to represent the chosen context and scenario. In general the following types of parameters can be recognised: Exact parameters - which are universal constants, such as the mathematical constant: Pi (3.14259...).

Fixed parameters - which are well determined by experiment and may be considered exact, such as the acceleration of gravity, g (approximately 9.81 m/s).

A-priori chosen parameters - which are parameters that may be difficult to identify by calibration and so are assigned certain values. However, the values of such parameters are associated with uncertainty that must be estimated on the basis of a-priori experience, for example detailed experimental or field measurements.

Calibration parameters - which must be established to represent particular circumstances. They must be determined by calibration of model results for historical data on both input and outcome. The parameters are generally chosen to minimise the difference between model outcomes and measured data on the same outcomes. It is unlikely that the set of parameters required to achieve a "satisfactory" calibration is unique.

Pathway - Route that a hazard takes to reach Receptors. A pathway must exist for a Hazard to be realised.

Performance - The degree to which a process or activity succeeds when evaluated against some stated aim or objective.

Performance indicator - The well-articulated and measurable objectives of a particular project or policy. These may be detailed engineering performance indicators, such as acceptable wave overtopping rates, rock stability, or conveyance capacity or more generic indicators such as public satisfaction.

Post-flood mitigation - Measures and instruments after flood events to remedy flood damages and to avoid further damages.

Precautionary Principle - Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Precision - degree of exactness regardless of accuracy.

Pre-flood mitigation - Measures and instruments in advance to a flood event to provide prevention (reducing flood hazards and flood risks by e.g. planning) and preparedness (enhancing organizational coping capacities).

Preparedness - The ability to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Preparedness Strategy - Within the context of flood risk management a preparedness strategy aims at ensuring effective responses to the impact of hazards, including timely and effective early warnings and the evacuation of people and property from threatened locations.

Probability - A measure of our strength of belief that an event will occur. For events that occur repeatedly the probability of an event is estimated from the relative frequency of occurrence of that event, out of all possible events. In all cases the event in question has to be precisely defined, so, for example, for events that occur through time reference has to be made to the time period, for example, annual exceedance probability. Probability can be exp ressed as a fraction, % or decimal. For example the probability of obtaining a six with a shake of four dice is 1/6, 16.7% or 0.167.

Probabilistic method - Method in which the variability of input values and the sensitivity of the results are taken into account to give results in the form of a range of probabilities for different outcomes.

Probability density function (distribution) - Function which describes the probability of different values across the whole range of a variable (for example flood damage, extreme loads, particular storm conditions etc).

Probabilistic reliability methods - These methods attempt to define the proximity of a structure to fail through assessment of a response function. They are categorised as Level III, II or I, based on the degree of complexity and the simplifying assumptions made (Level III being the most complex).

Process model uncertainty - See Knowledge uncertainty.

Project Appraisal - The comparison of the identified courses of action in terms of their performance against some desired ends.

Progressive failure - Failure where, once a threshold is exceeded, significant (residual) resistance remains enabling the defence to maintain restricted performance. The immediate consequences of failure are not necessarily dramatic but further, progressive, failures may result eventually leading to a complete loss of function.

Proportionate methods - Provide a level of assessment and analysis appropriate to the importance of the decision being made.

Proprietary uncertainty - indicates contested rights to know, to warn or to secrete. In both risk assessment and management, there are often considerations about the rights of different people to know, to warn or to conceal

Random events - Events which have no discernible pattern.

Receptor - Receptor refers to the entity that may be harmed (a person, property, habitat etc.). For example, in the event of heavy rainfall (the source) flood water may propagate across the flood plain (the pathway) and inundate housing (the receptor) that may suffer material damage (the harm or consequence). The vulnerability of a receptor can be modified by increasing its resilience to flooding.

Record (in context) - Not distinguished from event (see Event)

Recovery time - The time taken for an element or system to return to its prior state after a perturbation or applied stress.

Reliability index - A probabilistic measure of the structural reliability with regard to any limit state.

Residual life - The residual life of a defence is the time to when the defence is no longer able to achieve minimum acceptable values of defined performance indicators (see below) in terms of its serviceability function or structural strength.

Residual risk - The risk that remains after risk management and mitigation measures have been implemented. May include, for example, damage predicted to continue to occur during flood events of greater severity that the 100 to 1 annual probability event.

Resilience - The ability of a system/community/society/defence to react to and recover from the damaging effect of realised hazards.

Resistance - The ability of a system to remain unchanged by external events.

Response (in context) - The reaction of a defence or system to environmental loading or changed policy.

Response function - Equation linking the reaction of a defence or system to the environmental loading conditions (e.g. overtopping formula) or changed policy.

Return period - The expected (mean) time (usually in years) between the exceedence of a particular extreme threshold. Return period is traditionally used to express the frequency of occurrence of an event, although it is often misunderstood as being a probability of occurrence.

Risk - Risk is a function of probability, exposure and vulnerability. Often, in practice, exposure is incorporated in the assessment of consequences, therefore risk can be considered as having two components . the probability that an event will occur and the impact (or consequence) associated with that event. Risk = Probability multiplied by consequence

Risk analysis - A methodology to objectively determine risk by analysing and combining probabilities and consequences.

Risk assessment - Comprises understanding, evaluating and interpreting the perceptions of risk and societal tolerances of risk to inform decisions and actions in the flood risk management process.

Risk communication (in context) - Any intentional exchange of information on environmental and/or health risks between interested parties.

Risk management - The complete process of risk analysis, risk assessment, options appraisal and implementation of risk management measures.

Risk management measure - An action that is taken to reduce either the probability of flooding or the consequences of flooding or some combination of the two.

Risk mapping - The process of establishing the spatial extent of risk (combining information on probability and consequences). Risk mapping requires combining maps of hazards and vulnerabilities. The results of these analyses are usually presented in the form of maps that show the magnitude and nature of the risk.

Risk mitigation - See Risk reduction.

Risk perception - Risk perception is the view of risk held by a person or group and reflects cultural and personal values, as well as experience.

Risk reduction - The reduction of the likelihood of harm, by either reduction in the probability of a flood occurring or a reduction in the exposure or vulnerability of the receptors.

Risk profile - The change in performance, and significance of the resulting consequences, under a range of loading conditions. In particular the sensitivity to extreme loads and degree of uncertainty about future performance.

Risk register - An auditable record of the project risks, their consequences and significance, and proposed mitigation and management measures.

Risk significance (in context) - The separate consideration of the magnitude of consequences and the frequency of occurrence.

Robustness - Capability to cope with external stress. A decision is robust if the choice between the alternatives is unaffected by a wide range of possible future states of nature. Robust statistics are those whose validity does not depend on close approximation to a particular distribution function and/or the level of measurement achieved.

Scale - Difference in spatial extent or over time or in magnitude; critical determinant of vulnerability, resilience etc.

Scenario - A plausible description of a situation, based on a coherent and internally consistent set of assumptions. Scenarios are neither predictions nor forecasts. The results of scenarios (unlike forecasts) depend on the boundary conditions of the scenario.

Sensitivity - Refers to either: the resilience of a particular receptor to a given hazard. For example, frequent sea water flooding may have considerably greater impact on a fresh water habitat, than a brackish lagoon; or: the change in a result or conclusion arising from a specific perturbation in input values or assumptions.

Sensitivity Analysis - The identification at the beginning of the appraisal of those parameters which critically affect the choice between the identified alternative courses of action.

Social learning - Processes through which the stakeholders learn from each other and, as a result, how to better manage the system in question.

Social resilience - The capacity of a community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organising itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Spatial planning - Public policy and actions intended to influence the distribution of activities in space and the linkages between them. It will operate at EU, national and local levels and embraces land use planning and regional policy.

Standard of service - The measured performance of a defined performance indicator.

Severity - The degree of harm caused by a given flood event.

Source - The origin of a hazard (for example, heavy rainfall, strong winds, surge etc).

Stakeholders - Parties/persons with a direct interest (stake) in an issue, also Stakeowners.

Stakeholder Engagement - Process through which the stakeholders have power to influence the outcome of the decision. Critically, the extent and nature of the power given to the stakeholders varies between different forms of stakeholder engagement.

Statistic - A measurement of a variable of interest which is subject to random variation.

Strategy (flood risk management-) . A strategy is a combination of long-term goals, aims, specific targets, technical measures, policy instruments, and process which are continuously aligned with the societal context.

Strategic spatial planning - Process for developing plans explicitly containing strategic intentions referring to spatial development. Strategic plans typically exist at different spatial levels (local, regional etc).

Statistical inference uncertainty - See Knowledge uncertainty

Statistical model uncertainty - See Knowledge uncertainty

Sustainable Development - is development that meets the needs of the present without compromising the ability of future generations to meet their own needs

Sustainable flood risk management - involves:

- ensuring quality of life by reducing flood damages but being prepared for floods
- mitigating the impact of risk management measures on ecological systems at a variety of spatial and temporal scales
- the wise use of resources in providing, maintaining and operating infrastructure and risk management measures
- maintaining appropriate economic activity (agricultural, industrial, commercial, residential) on the flood plain

Sustainable flood risk management strategy - An approach which

- aims to be effective in the long term, and
- can be combined ('integrated') with other international, national and regional activities (transport, environment, conservation etc.)

Susceptibility - The propensity of a particular receptor to experience harm.

System - An assembly of elements, and the interconnections between them, constituting a whole and generally characterised by its behaviour. Applied also for social and human systems.

System state - The condition of a system at a point in time.

Tolerability - Refers to willingness to live with a risk to secure certain benefits and in the confidence that it is being properly controlled. To tolerate a risk means that we do not regard it as negligible, or something we might ignore, but rather as something we need to keep under review, and reduce still further if and as we can. Tolerability does not mean acceptability.

Ultimate limit state - Limiting condition beyond which a structure or element no longer fulfils any measurable function in reducing flooding.

Uncertainty - A general concept that reflects our lack of sureness about someone or something, ranging from just short of complete sureness to an almost complete lack of conviction about an outcome.

Validation - is the process of comparing model output with observations of the 'real world'.

Variability - The change over time of the value or state of some parameter or system or element where this change may be systemic, cyclical or exhibit no apparent pattern.

Variable - A quantity which can be measured, predicted or forecast which is relevant to describing the state of the flooding system e.g. water level, discharge, velocity, wave height, distance, or time. A prediction or forecast of a variable will often rely on a simulation model which incorporates a set of parameters.

Voluntariness - The degree to which an individual understands and knowingly accepts the risk to which they are exposed in return for experiencing a perceived benefit. For an individual may preferentially choose to live in the flood plain to experience its beauty and tranquillity.

Vulnerability - Characteristic of a system that describes its potential to be harmed. This can be considered as a combination of susceptibility and value.considered as a combination of susceptibility and value.

Flood Risk in the North Sea coastal region

CHAIN OF SAFETY

covering the whole north sea region

Flood Risk in the North Sea coastal region

CHAIN OF SAFETY
covering the whole north sea region

Author: Evelien van Eijsbergen & Jos van Alphen
(Ministry of Transport, Public Works and Water Management)
Date: February 2008

Storm surges represent a major natural hazard in the North Sea region, with around 40,000 km_ of low-lying land at coastal flood risk in the Netherlands, Germany, Belgium, Denmark and the UK. If during a major storm the flood defence measures cannot resist the pressure of a large storm, large areas are at risk to flooding.
Since flooding disasters and their effects do not stop at local, regional or even national borders, transnational cooperation in contingency planning is very important.

To make good preparation on flood disasters, it is important to get insight in the potential scale of a coastal flooding. This memo will present the threatened areas of a 'worst credible flood' in the North Sea Region. A 'worst credible flood' is a flood, which occurs during a very extreme, however still possible situation.
Contingency planners can base their preparations on the 'worst credible flood' scenarios.

In the framework of the Dutch 'National Strategy for High Water and Storm Surge Crisis' flood defence experts have developed the 'worst credible flood' scenarios and translated them to zones in which different areas maybe flooded simultaneously (figure 1). The scenarios are based on situations that exceed the level of protection.
The main threats from sea are storm surges caused by winds with hurricane-like force. The Worst Credible Flood will occur when a depression with hurricane winds crosses the North Sea towards Denmark and lasts for one-and-a-half day. This situation occurs ones in the hundred-thousand year.
A storm surge can only be predicted one-and-a-half day in advance. This short time notice and the weather circumstances during a hurricane, makes evacuation of the threatened area very hard. The storm surge predictions will be more accurate as the peek of the storm comes closer.
The damage caused by a flooding from sea mainly depends on the duration of the storm and the amount of breaches in the sea defences.

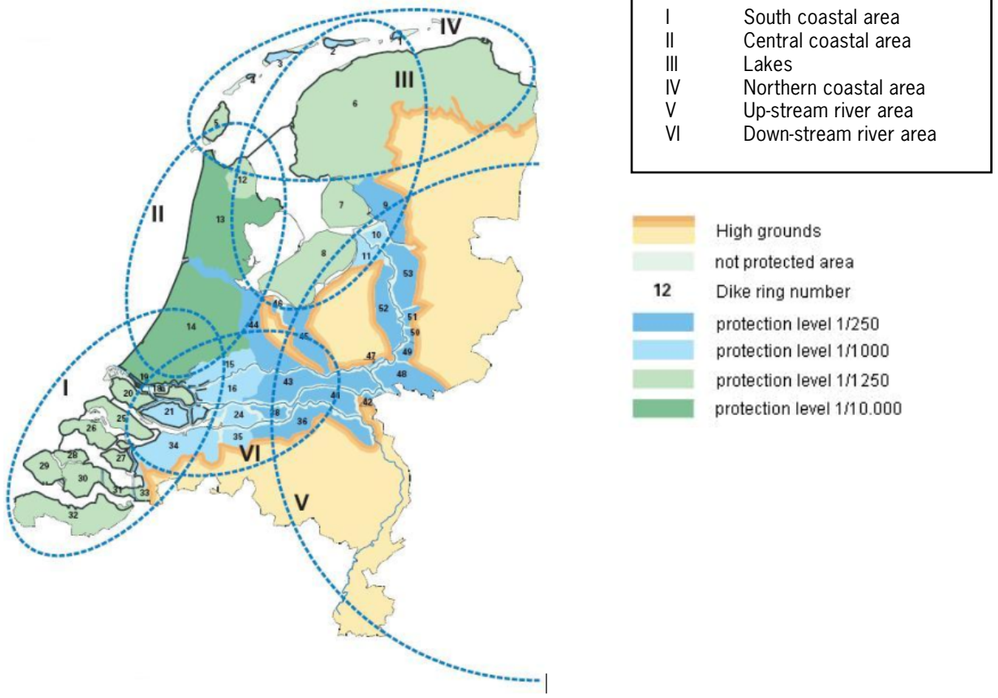
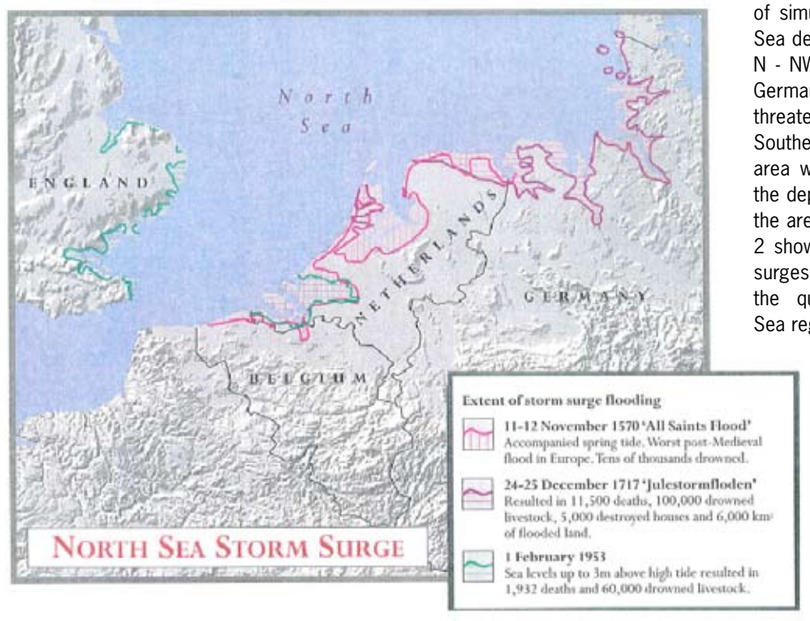


Figure 1, 'Worst credible flood' areas in the Netherlands (Kolen & Geerts, 2006)

Figure 2. Three mayor storm surges in the North Sea (RMS Solutions)



Based on these insights and on historical date of storms occurred in the past, a qualitative extrapolation into the North Sea has been made (figure 3). It has been assumed that the location of simultaneous flooded areas along the North Sea depends on the direction of the depression: N - NW storms will mainly threaten the Dutch, German and Danish coast, N- NE will mainly threaten the Dutch and Belgian coast and the Southeast coast of the United Kingdom. Which area will threaten depends on the direction of the depression. It is likely that more than one of the areas will be flooded simultaneously. Figure 2 shows areas affected by some mayor storm surges flooding in the past. Figure 3 shows the qualitative extrapolation into the North Sea region.

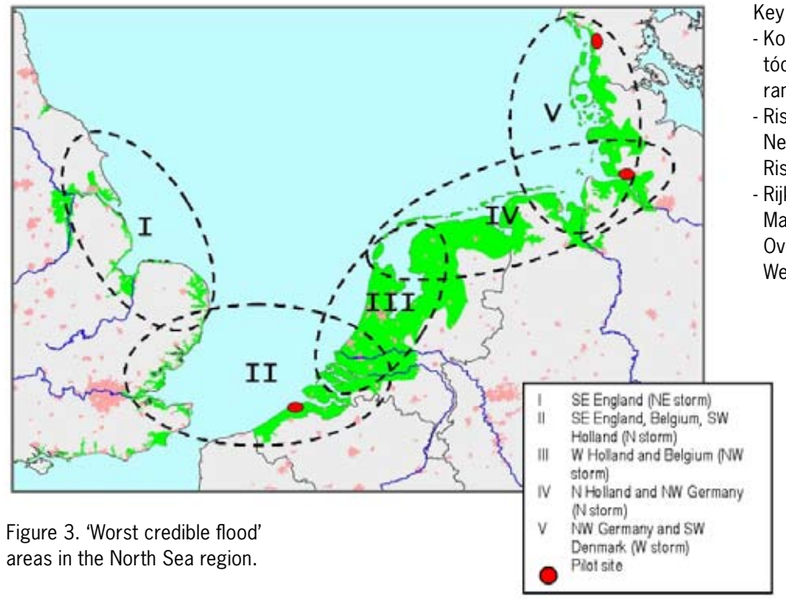


Figure 3. 'Worst credible flood' areas in the North Sea region.

Key documents

- Kolen, B. & Wouters, C.A.H.., 2007. Als het tóch misgaat: Overstromingsscenario's voor rampenplannen. Betooglijn. PR1213.12.
- Risk Management Solutions, A Worldwide Network & reactions, 2000. European Flood Risk.
- Rijkswaterstaat Waterdienst, Taskforce Management Overstromingen, 2008. Brochure: Overstromingsscenario voor rampenplannen, Westelijke kust.

Flooding maps for evacuation planning (report IMDC)

CHAIN OF SAFETY

covering the whole north sea region

MEMO

Date :	204/04/2008
To:	Afdeling Kust- Tina Mertens
From:	Chantal Martens/Koen Trouw/ Evelien van Eijsbergen /Jos van Alphen
Document ref.:	I/NO/11310/07.130/cma
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Subject: 11310 Evacuation planning Chain of Safety: flooding maps

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IMDC nv, Wilrijkstraat 37 Bus 4, B 2140 Antwerpen tel. +32 3 270 92 95 fax +32 3 235 67 11

1. INTRODUCTION

The following study was carried out in the framework of the EU Chain of Safety project. The aim of the project Chain of Safety is to facilitate cooperation, exchange of experience and mutual assistance between North Sea Regions in the event of coastal flooding. The overall objective of the project is to initiate a contingency plan for flooding covering the whole North Sea Area. This would be in cooperation with all relevant stakeholders, in order to combine best practices and experiences. The project is closely related to the EU Safecoast project, which will provide a sound theoretical basis and a good understanding of the flooding results that will be used in the Chain of Safety project. Chain of Safety will then focus on the results and use those to better understand and plan for the effects of flooding.

The European Lead Partner of the project, which is co-financed by the INTERREG-funds, is the Province of Zeeland (the Netherlands).

Other partners are the Ministry of Transport, Public Works and Water Management (the Netherlands), the Ministry of the Interior and Kingdom Relations (the Netherlands), the Essex County Council (UK), the Danish Coastal Authority (Denmark), the Ministry of the Interior of the Land Schleswig-Holstein (Germany) and the Flemish Ministry of Transport and Public Works (Belgium).

Sub-partners of Chain of Safety are the Province of East-Flanders (Belgium), the Province of West-Flanders (Belgium) and the Municipality of Schouwen-Duiveland (the Netherlands).

Associated partner of Chain of Safety is the Province of Antwerp (Belgium).

The project consists of the following actions

- Action 1 : A comprehensive analysis of the existing local, regional and national flood plans in the North Sea Regions
- Action 2 : Defining a contingency plan for flooding for the North Sea Region based on a common approach towards the Chain of Safety in the North Sea Area
- Action 3 : Inventory into the research to implement the chain of safety and of the available equipment for implementing the chain of safety for the North Sea Region into practise.
- Action 4 : Dutch-Belgian coastal regions example to be used for further implementation

In this note, a series of break through scenarios will be studied, as a basis for the case studies and as input for the actions 1-4.

For designated locations along the North Sea coast, the following scenarios will be looked at

- Serious threat that a break-through will occur the coming days, because of longduring heavy storms
- A break-through in one or several areas (as a basis for the case studies)

2. FLOOD RISK IN THE NORTH SEA COASTAL REGION

Storm surges represent a major natural hazard in the North Sea region, with around 40,000 km² of low-lying land at coastal flood risk in the Netherlands, Germany, Belgium, Denmark and the UK.

If during a major storm the flood defence measures cannot resist the pressure of a large storm, large areas are at risk to flooding.

Since flooding disasters and their effects do not stop at local, regional or even national borders, transnational cooperation in contingency planning is very important.

To make good preparation on flood disasters, it is important to get insight in the potential scale of a coastal flooding. This memo will present the threatened areas of a 'worst credible flood' in the North Sea Region. A 'worst credible flood' is a flood, which occurs during a very extreme, however still possible situation.

Contingency planners can base their preparations on the 'worst credible flood' scenarios.

In the framework of the Dutch 'National Strategy for High Water and Storm Surge Crisis' flood defence experts have developed the 'worst credible flood' scenarios and translated them to zones in which different areas maybe flooded simultaneously. The scenarios are based on situation that exceed the level of protection.

In this case only area I, II and IV are relevant. These storm surges occur with wind speeds of 12 Bft or more. The duration of storm surges depends on the tide and the duration of the storm. In these scenarios the duration is set on 45 hours. The average prediction time is 15 hours.

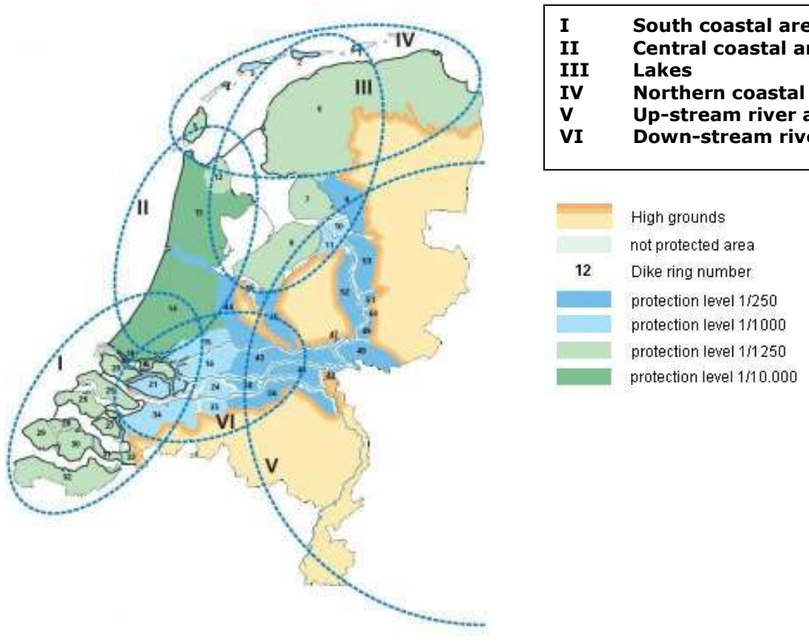

Figure 2-1 : Worst credible flood' areas in the Netherlands (Kolen & Geerts, 2006)

Based on these insights and on historical date of storms occurred in the past, a qualitative extrapolation into the North Sea has been made (Figure 2-3). It has been assumed that the location of simultaneous flooded areas along the North Sea depends on the wind pattern

direction of the storm: NW storms threaten the Dutch coast, N storms threaten the German bight and North Holland and when a N storm runs more to the southern part of the North Sea, Southeast England, Belgium, South West Holland are threatened. NE storms threaten the Southeast coast of the United Kingdom and a W storm will threaten the coast of the Germany and Denmark.

Figure 2-2 shows areas affected by some mayor storm surges flooding in the past. Figure 2-3 shows the qualitative extrapolation into the North Sea region.

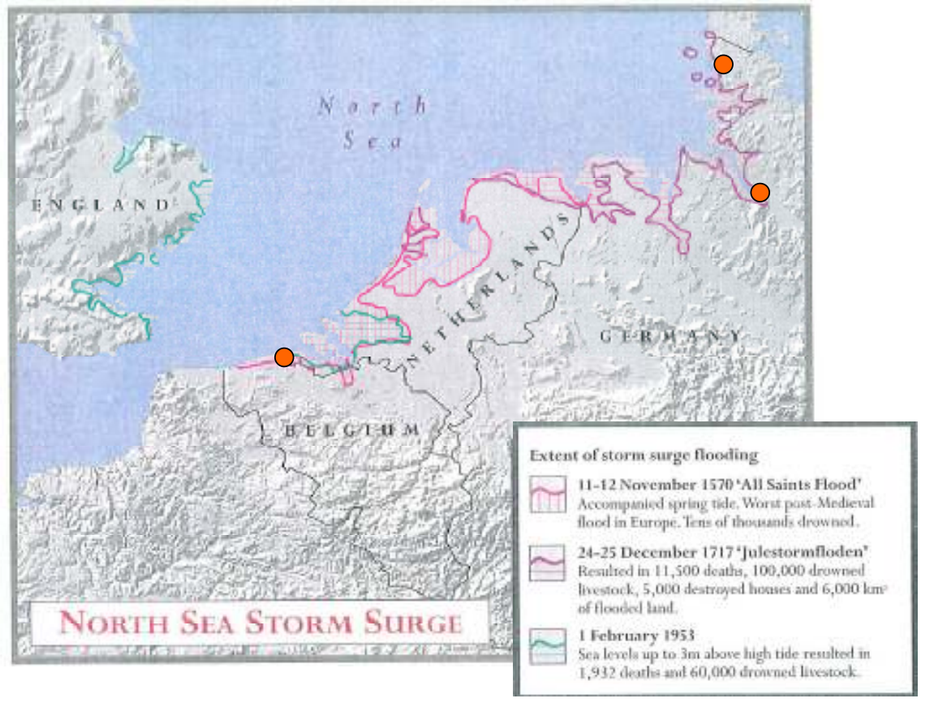

Figure 2-2 : Three mayor storm surges in the North Sea (RMS Solutions)

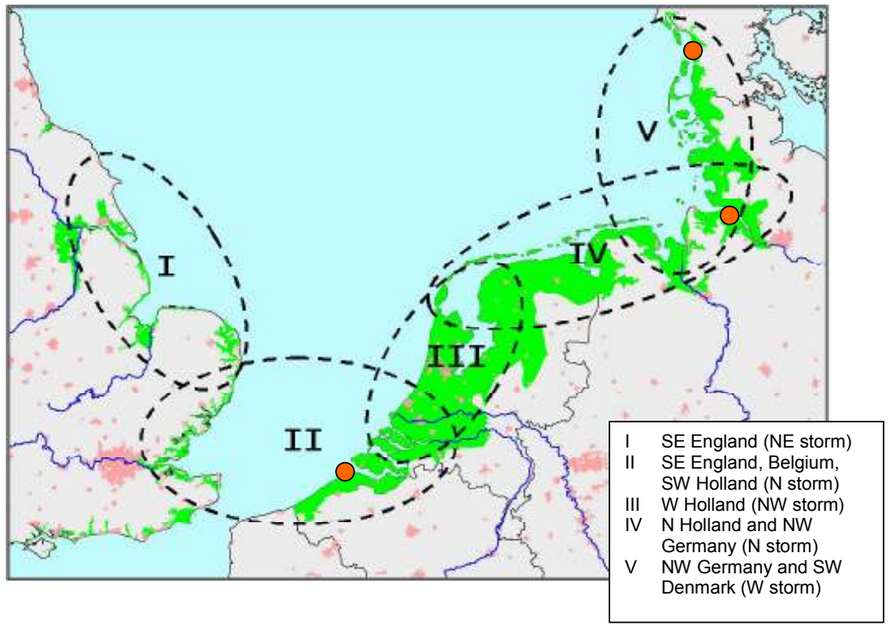

Figure 2-3 : Worst credible flood areas in the North Sea region.

3. CASE STUDIES

3.1. Method used

Breaching of a dike was considered for a storm with a retour period of 10000 years for Belgiun/Netherlands, Germany and Denmark. Additionally a storm with retour period of 40000 years was considered for Belgium/Netherlands. For Belgium/the Netherlands detailed flooding data was available and the scenario results were based on the Mike21 flooding simulations carried out in the framework of the Comrisk programme. Breaching of the dike takes place at HW, and the breach growth is estimated at 30 m/hour (Comrisk sp6).

For the other countries a flooding routine as described hereunder was developed.

For both Denmark and Germany the following scenario has been calculated: the breaching of a dike, during a 60- hour storm. The breaching of the dike takes place at HW-3 h, and water continues to flow inland until the water level inside equals the water level at sea.

If multiple dike breaches would occur, the flooding volume would increase, but the general order of magnitude will remain comparable.

An iteration was set up with a time step of one hour. For every timestep the inflow volume was calculated and the resulting flooded area and water level were derived. The inflow volume for the next timestep was then calculated from the resulting water level, using the following formula (Comrisk, sp7)

$$Q = b\sqrt{g\frac{8}{27}}h^{\frac{3}{2}}$$

Where b= width of gap

g=gravity

h= height of hydraulic fall

The width of the gap is described as a function of time only and is calculated using the following formula (Comrisk, sp7), based on the recorded growth of the dike breach at the Ijssel dike in 1926. For an in-depth explanation reference is made to chapter 6.

$$b = 67t^{\frac{1}{4}}$$

Where

b= width of gap

t= time

For each case study location, the submerged area was calculated for different phases of the flooding. The phased approach allows for a better understanding of the spatial distribution of the flooding impact during the different stages of the storm. This allows for a more detailed planning and a more efficient use of the available resources. The decisions to be taken during the storm and the course of action to be followed will be further examined in the actions 2 (“plan”), 3(“equipment”) and 4 (“pilot”)

- 3 hours before the highest water level
- At the time of the highest water level
- 3 hours after highest water level
- 6 hours after highest water level
- 12 hours after highest water level
- At the end of the storm

3.2. Countries

3.2.1. Belgium-The Netherlands

In Belgium-The Netherlands the border zone between the two countries was chosen as the site for the case study. This area belongs to zone nr II, as defined in Figure 2-3. Breaches were supposed near Knokke (B) and Cadzand (NL). The flooded areas were defined using a Mike21 flooding model, which was set up in the framework of the Comrisk programme. Breach locations for a 10000 year and 40000 year storm are given in Figure 3-1 and Figure 3-2, respectively.

All water level and topographical data are given in mTAW, which corresponds with the average sea level at Ostend (Belgium).

As the first breaching for the 40000 year storm occurs during the first HW peak , the first output figure is given at that time.

Figure 3-1 : Dtm of the area around the Belgian-Dutch border, with indication of the breach locations for a 10000 year storm

Figure 3-2 Dtm of the area around the Belgian-Dutch border, with indication of the breach locations for a 40000 year storm

3.2.1.1. Hydrographic data

A storm hydrograph was derived for a 60 hours storm. The set up for a10000 and 40000 year storm was taken from the “Hydraulisch randvoorwaardenboek Vlaamse Kust” (IMDC, 2004). The wind velocity corresponding with such a storm is 35m/s.

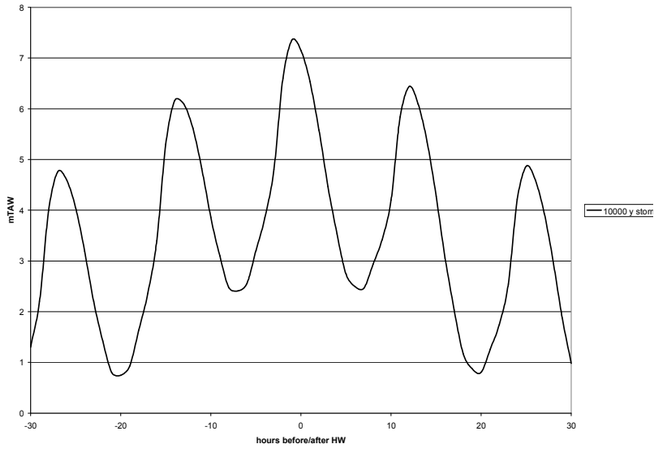

Figure 3-3 : storm water level for 60-hour storm (Belgium/Netherlands), with a return period of 10000 years

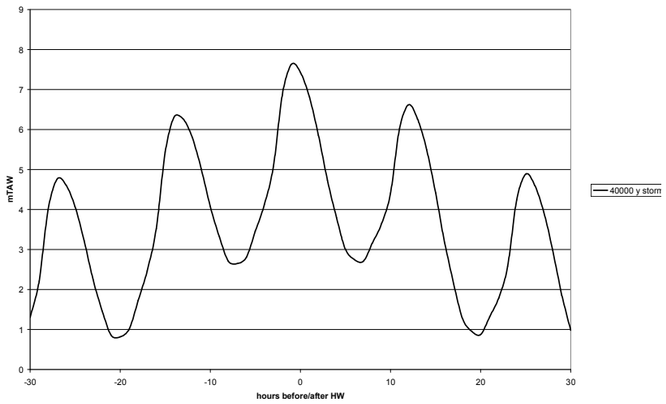

Figure 3-4 : storm water level for 60-hour storm (Belgium/Netherlands), with a return period of 40000 years

3.2.1.2. Flooded areas for a 10000 year storm

Figure 3-5 : submerged area at HW (time of breaching)

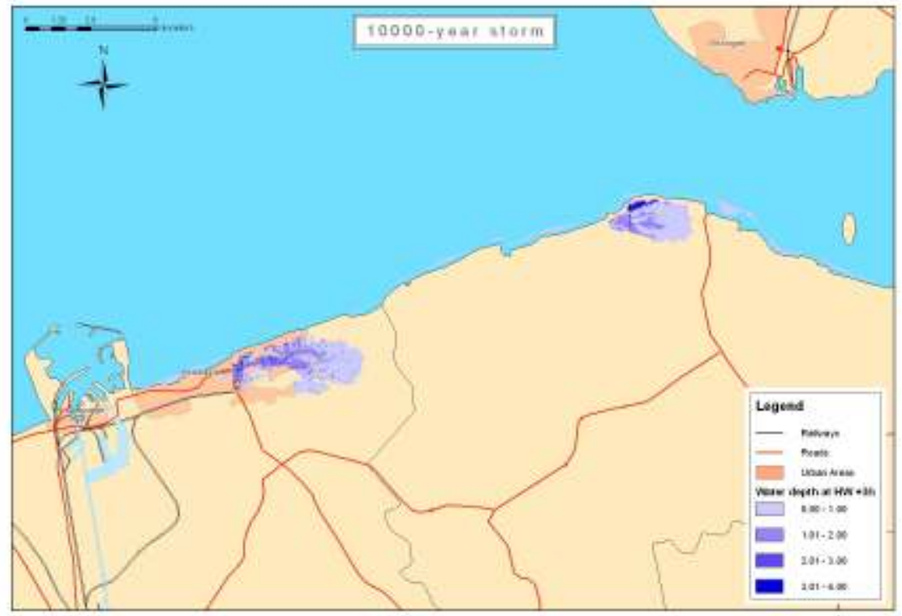

Figure 3-6 : submerged area at HW+3 hours

Figure 3-7 : submerged area at HW+6 hours

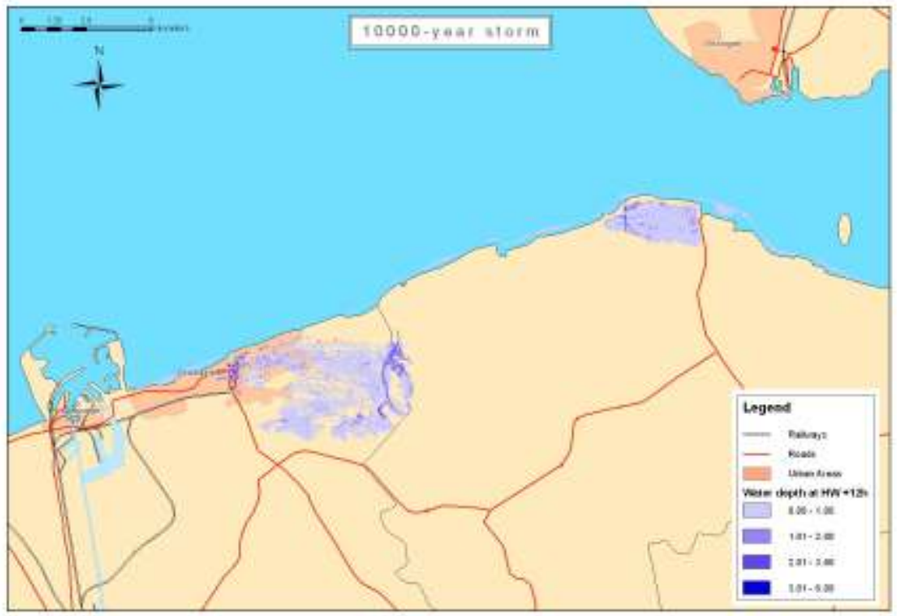

Figure 3-8 : submerged area at the end of the storm

3.2.1.3. Flooded areas for a 40000 year storm

Figure 3-9 submerged area at first HW (1 hours before first breach)

Figure 3-10 submerged area at highest water level

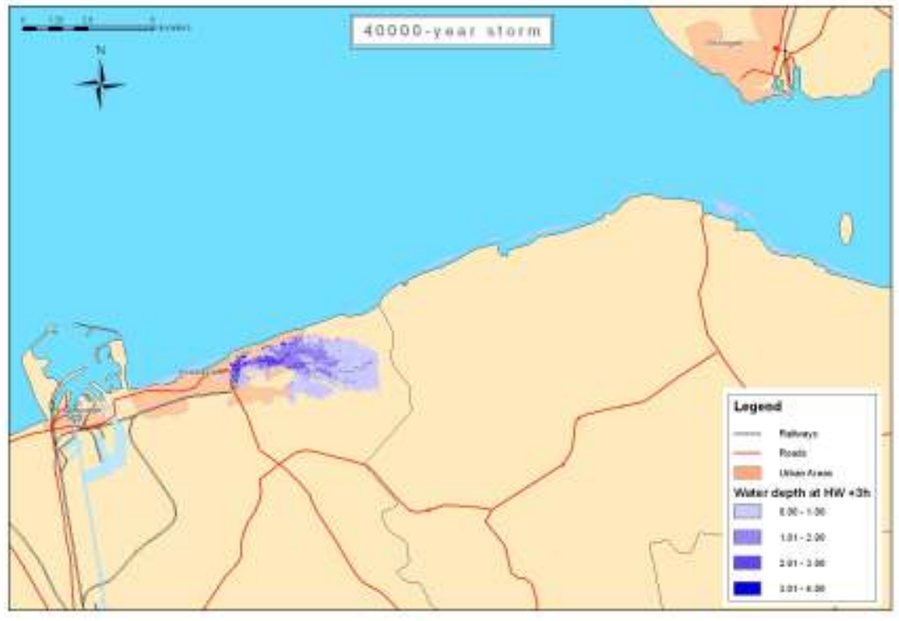

Figure 3-11 submerged area , three hours after highest water level

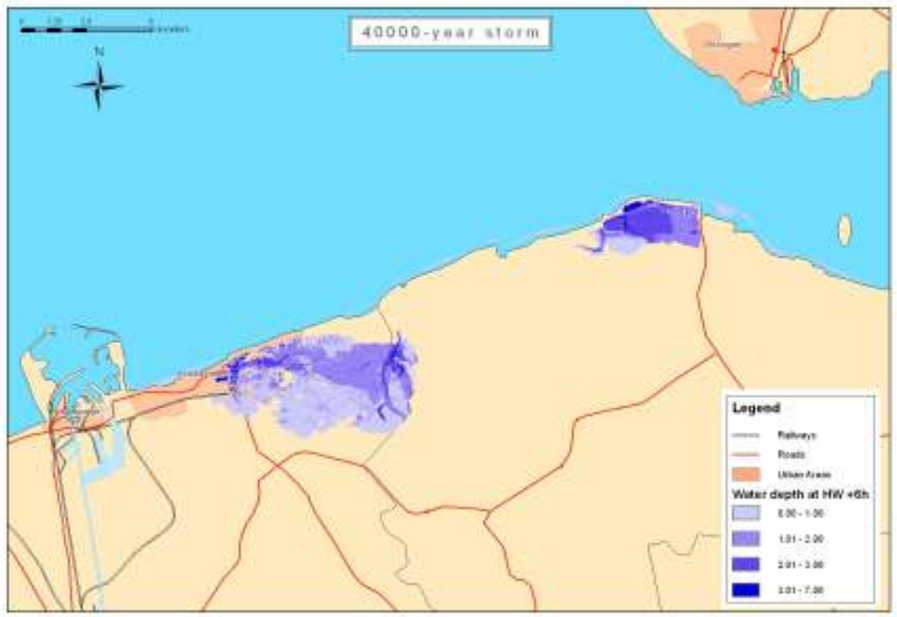

Figure 3-12 submerged area , six hours after highest water level

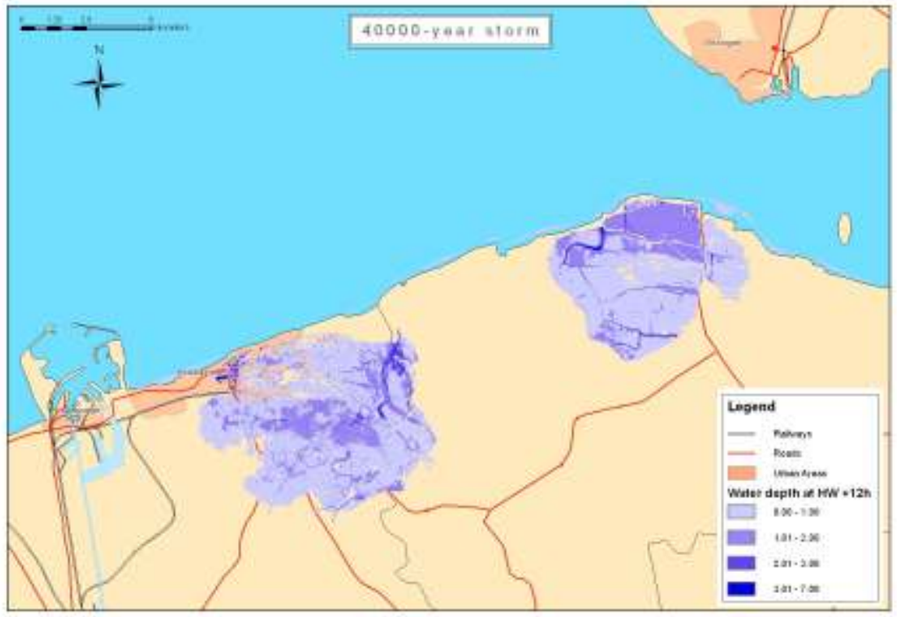

Figure 3-13 submerged area twelve hours after highest water level

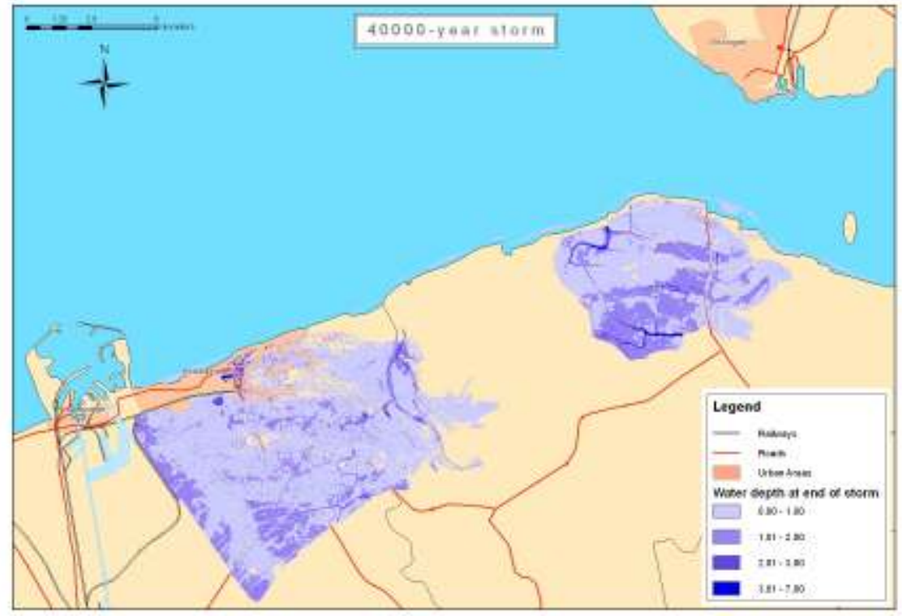

Figure 3-14 submerged area , at the end of the storm

3.2.2. Denmark Ribe

In Denmark the area around the town of Ribe was chosen as the site for the case study. This area belongs to zone nr IV-V, as defined in Figure 2-3. A breach was made in the dike around the location of the Ribe Sluice, which is a weak point in the sea defence.

The additional flooding caused by the closing of the sluices is not taken into account; this would amount to an additional volume of around 6 Mio m3 (Comrisk sp7).

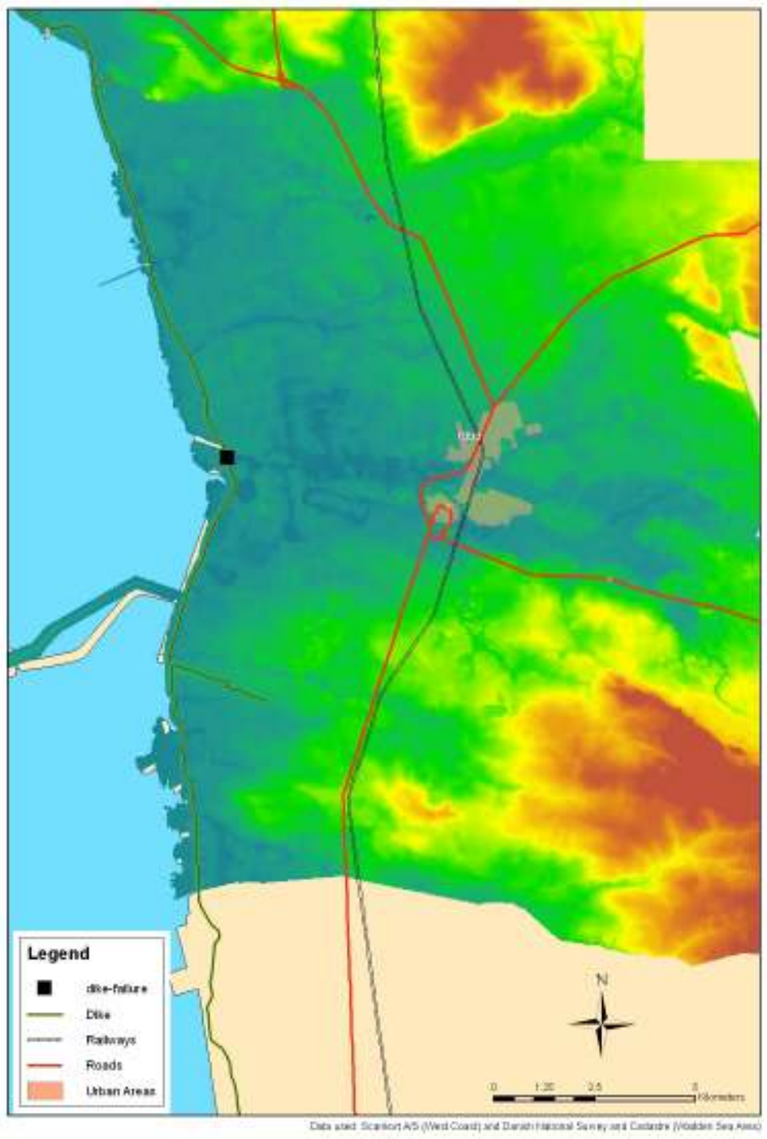

Figure 3-15 : Dtm of the area around Ribe, with indication of the breach location

3.2.2.1. Hydrographic data

A storm hydrograph was derived for an average spring tide, with a tidal range of 1.8 meters. As no extreme waterlevels were available for Ribe, the set up for a 1000 and 10000 year storm were derived from the setups calculated for the Langeoog (comrisk, sp9), taking into account that the maximal water level for a 200- year storm is 5.22 dvr90-dansk vertical reference level (comrisk, sp7). Dvr90 replaces the older DNN reference system and the transition between dvr90 en dnn is made using the following formula dnn-0.106=dvr90. The resulting water levels are shown in Figure 3-15.

The wind velocity corresponding with a 10000-year storm is 35m/s.

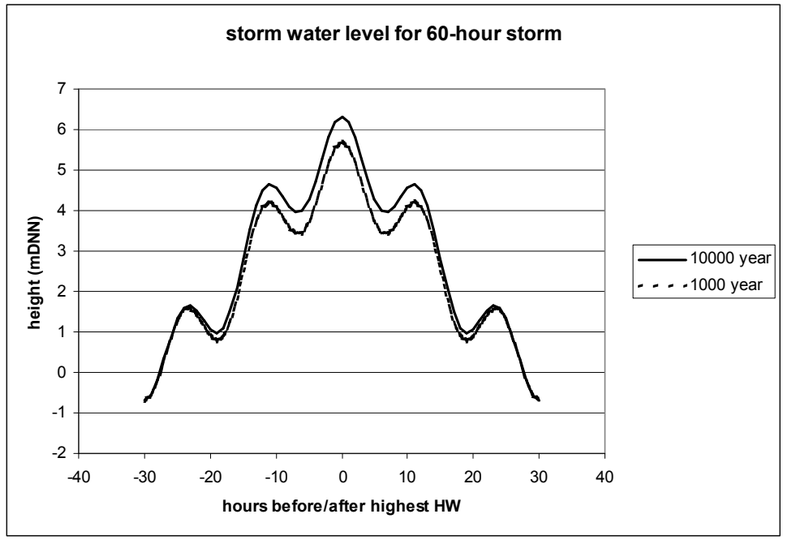

Figure 3-16 : storm water level for 60-hour storm (Denmark)

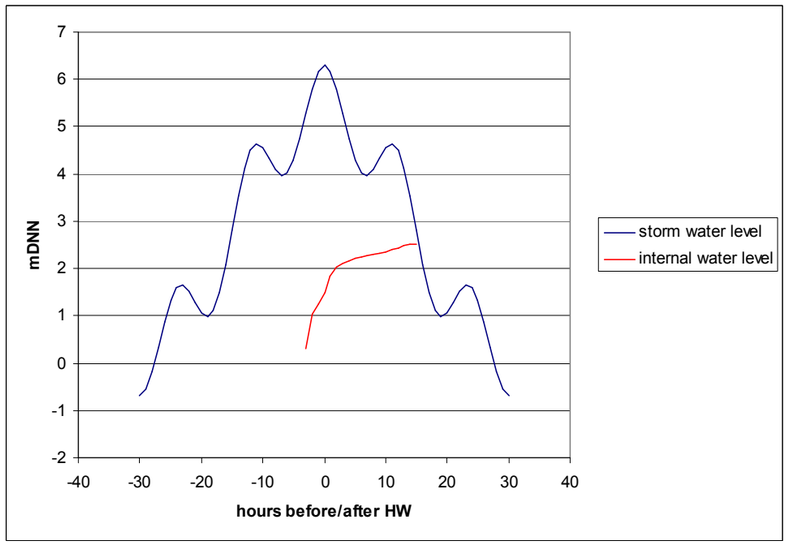

Figure 3-17 : Storm water level and water level in the flooded areas for a 10000-year storm in Ribe

3.2.2.2. Flooded areas

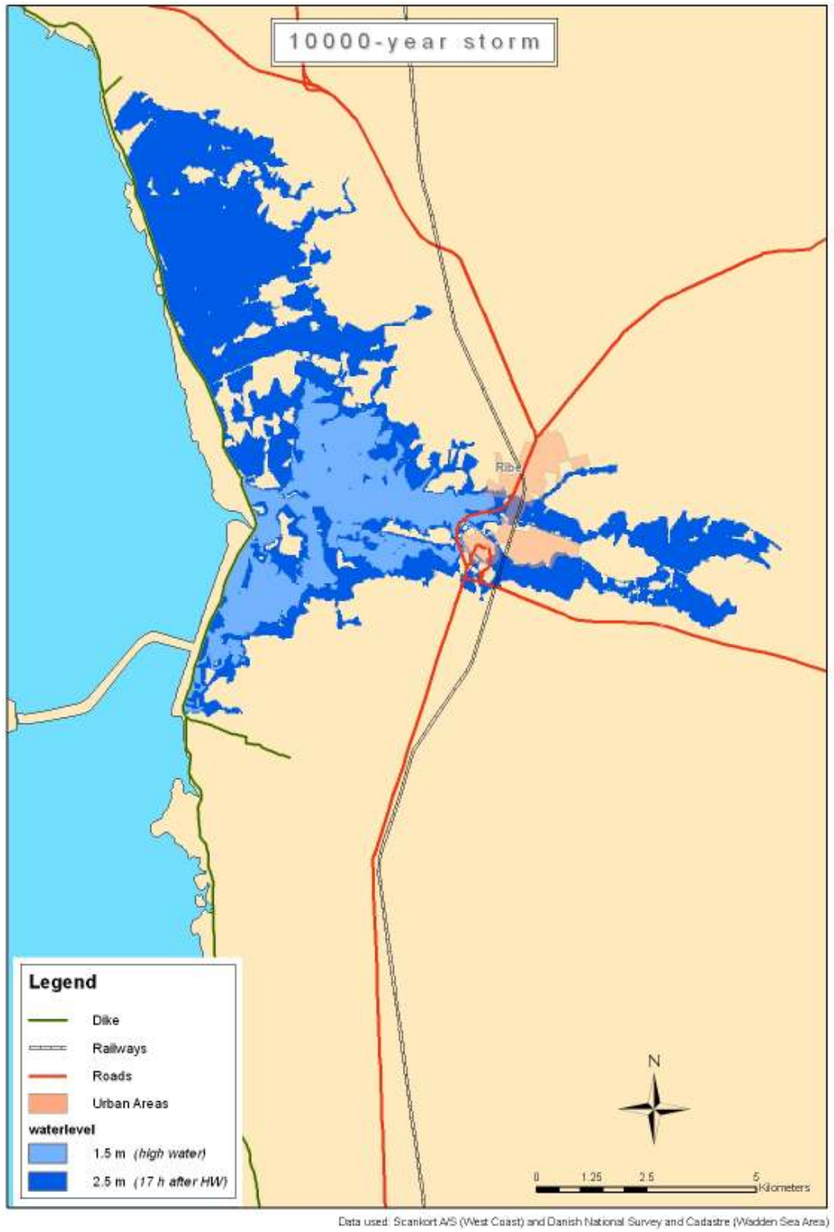

Figure 3-18 : submerged area for 10000-year storm, storm at highest water level and at end of inflow

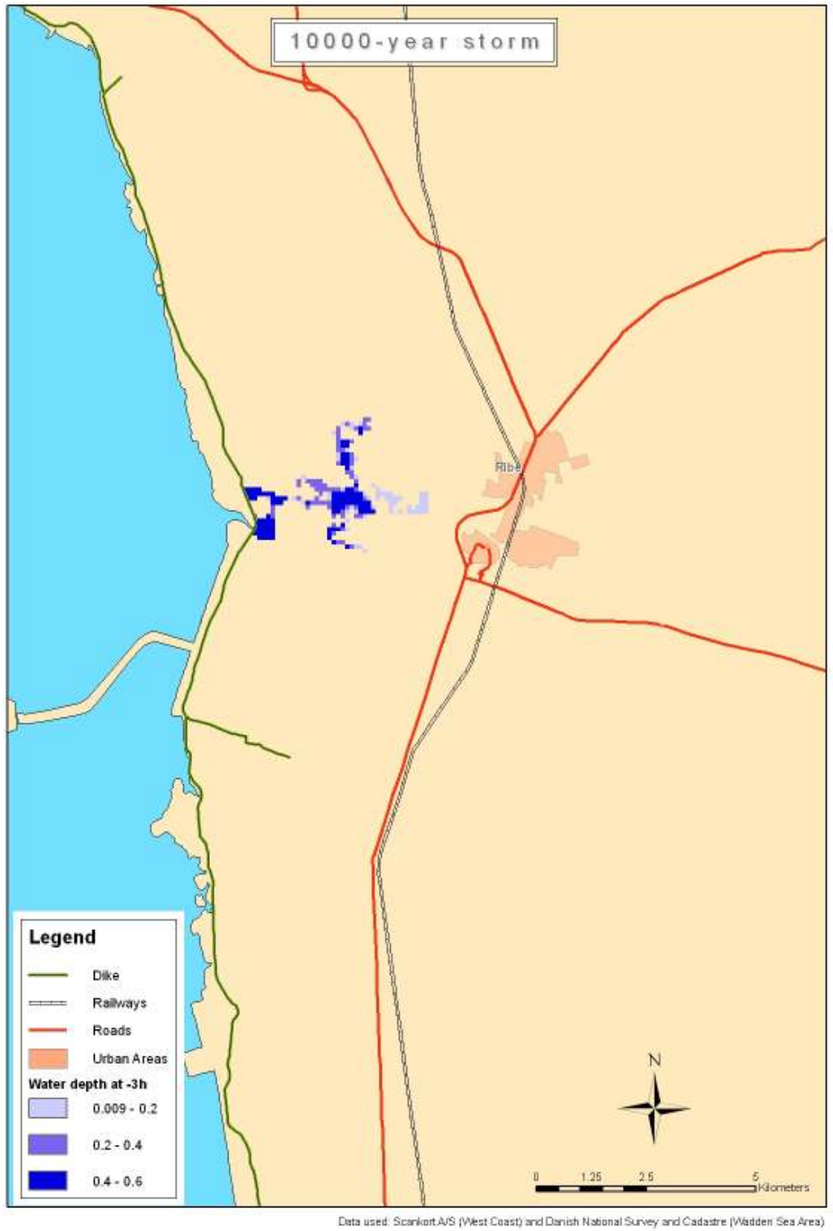

Figure 3-19 : submerged area 3 hours before the highest water level

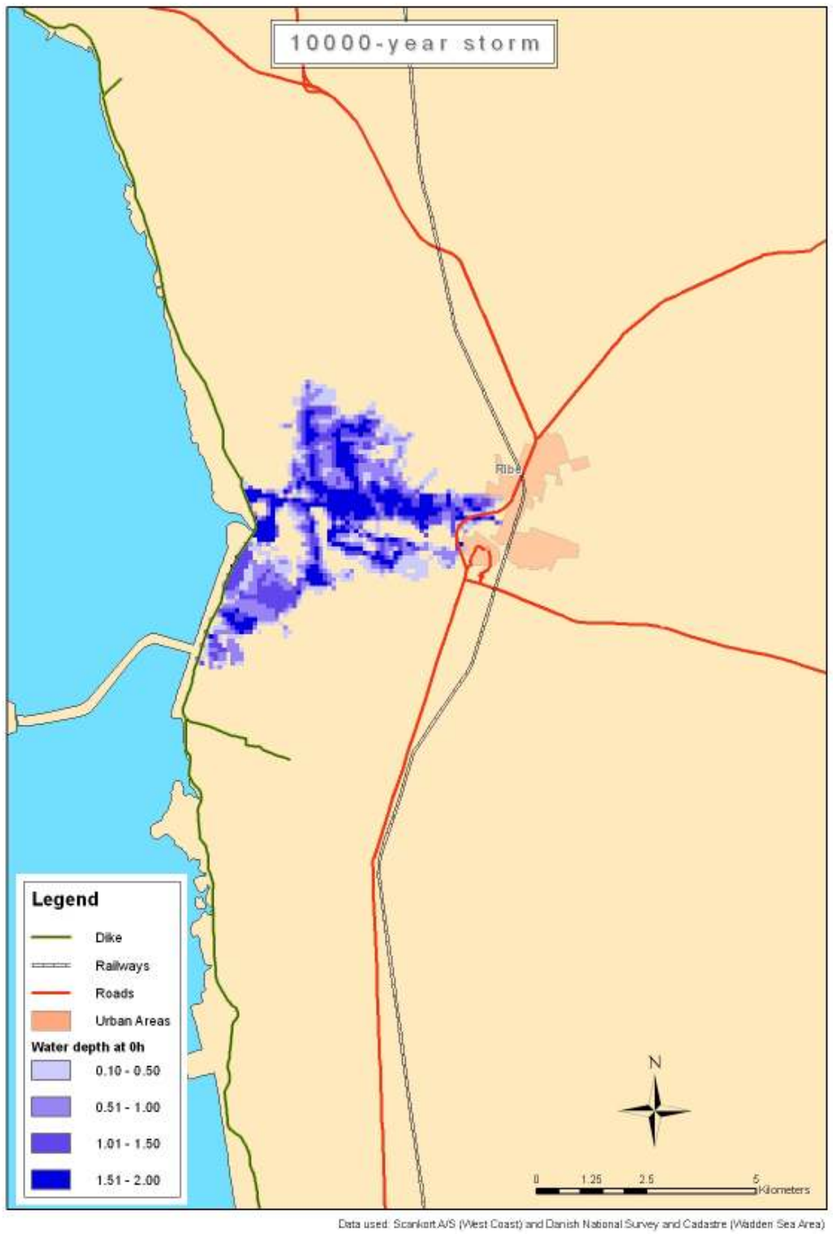

Figure 3-20 : submerged area at the highest water level

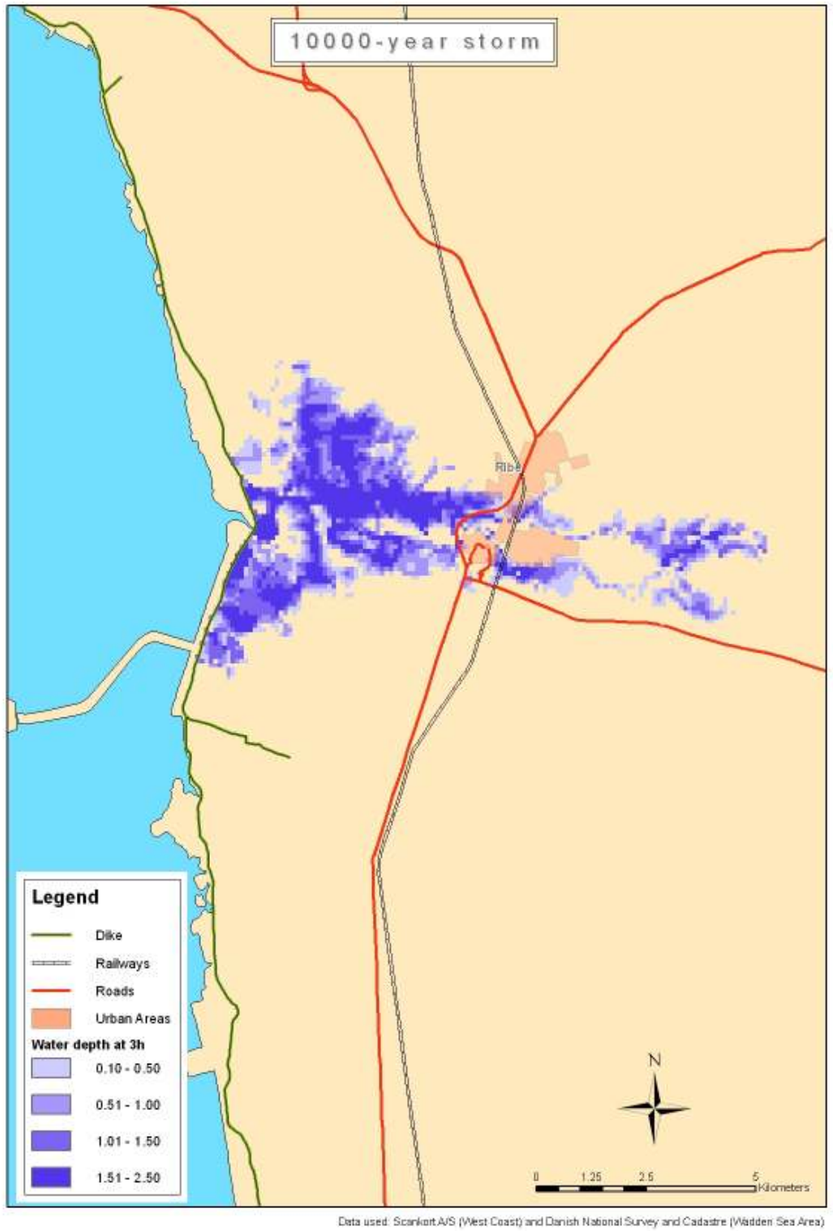

Figure 3-21 : 6 submerged area 3 hours after the highest water level

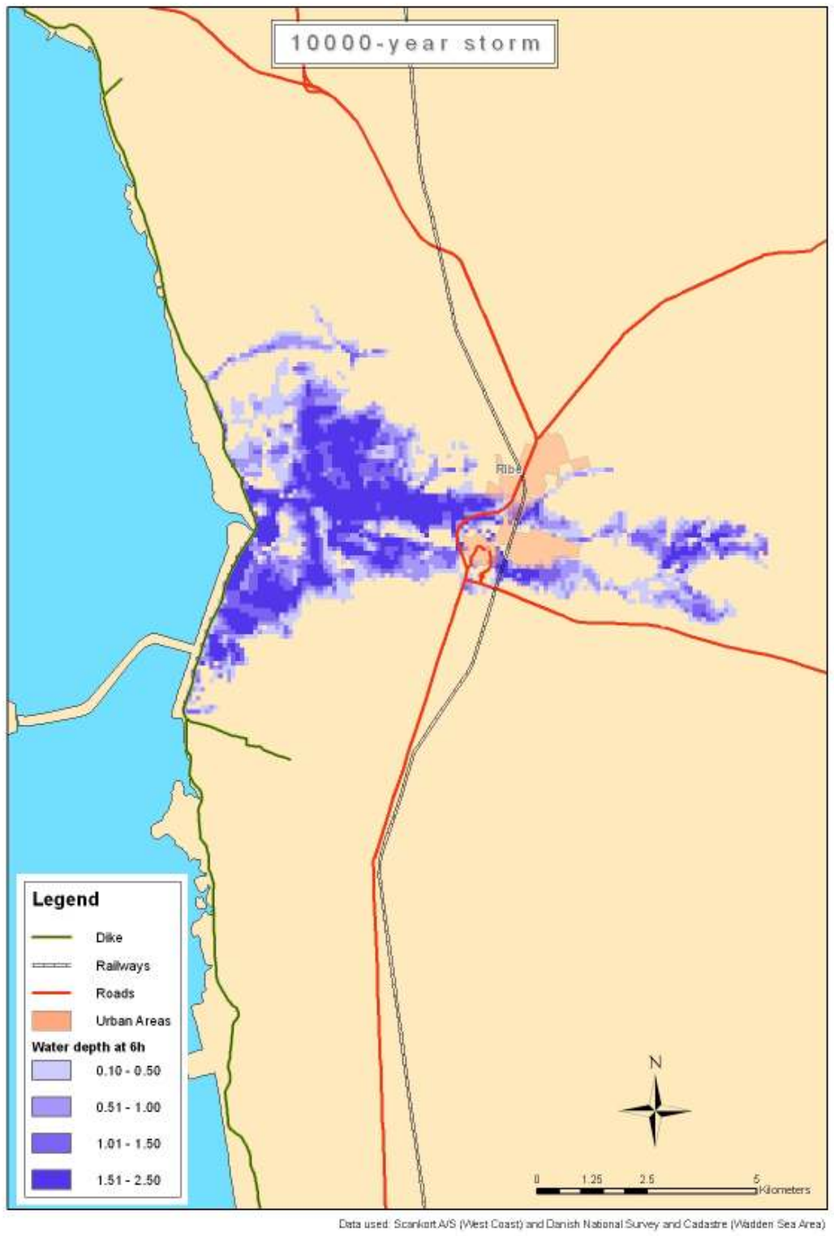

Figure 3-22 : 6 submerged area 6 hours after the highest water level

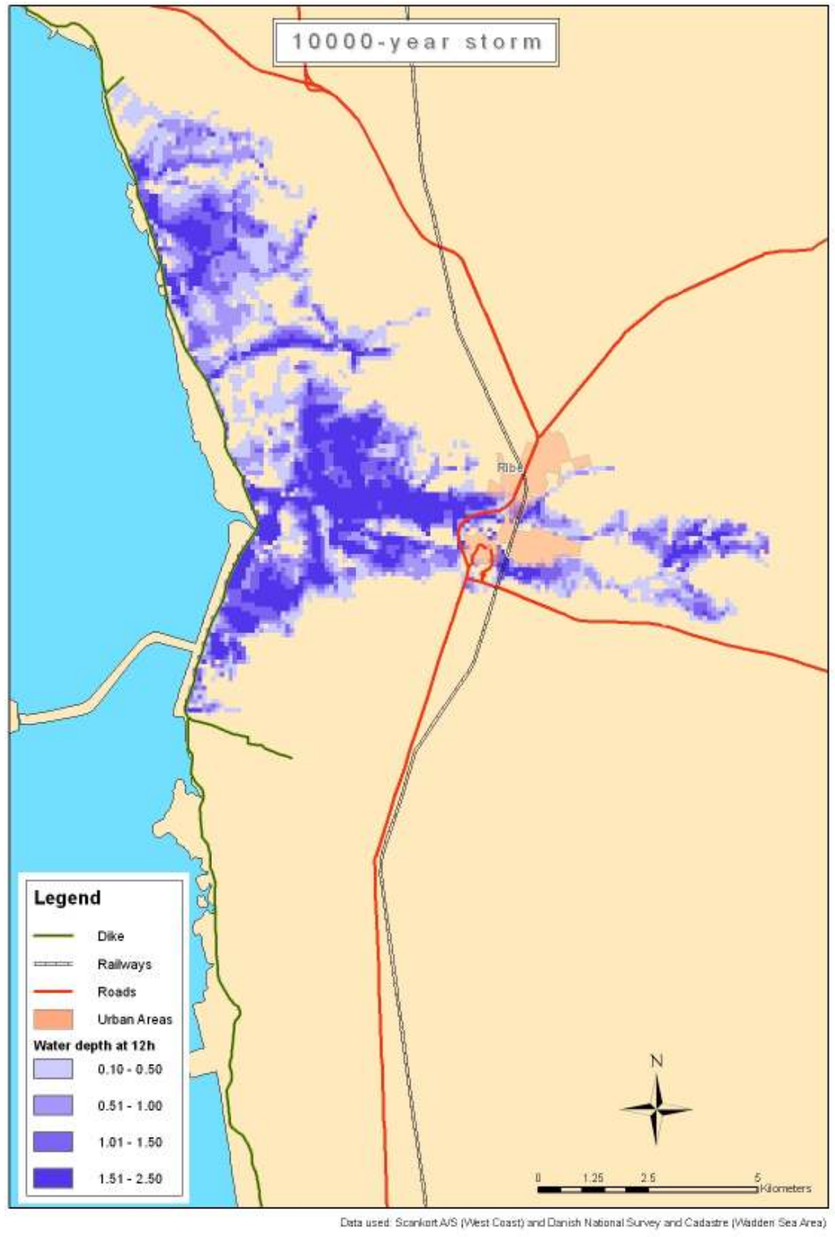

Figure 3-23 : submerged area 12 hours after the highest water level

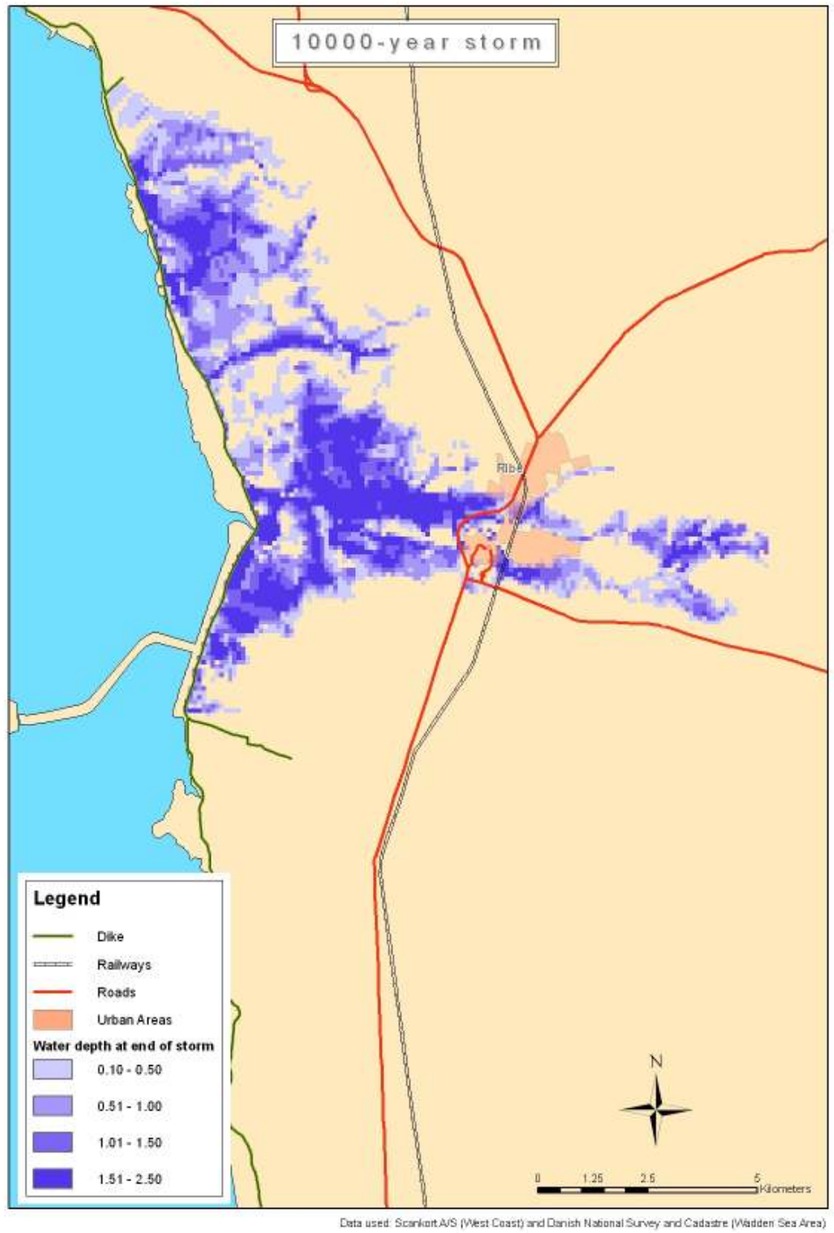

Figure 3-24 : submerged area at the end of the storm

3.2.3. Germany Elbe Estuary

In Germany the area around the Elbe mouth was chosen as the site for the case study. This area belongs to zone nr IV, as defined in Figure 2-3. A breach was made in the dike around the division between Kempner Marsch and Wilstermarch, at an area where the hinterland was relatively low.

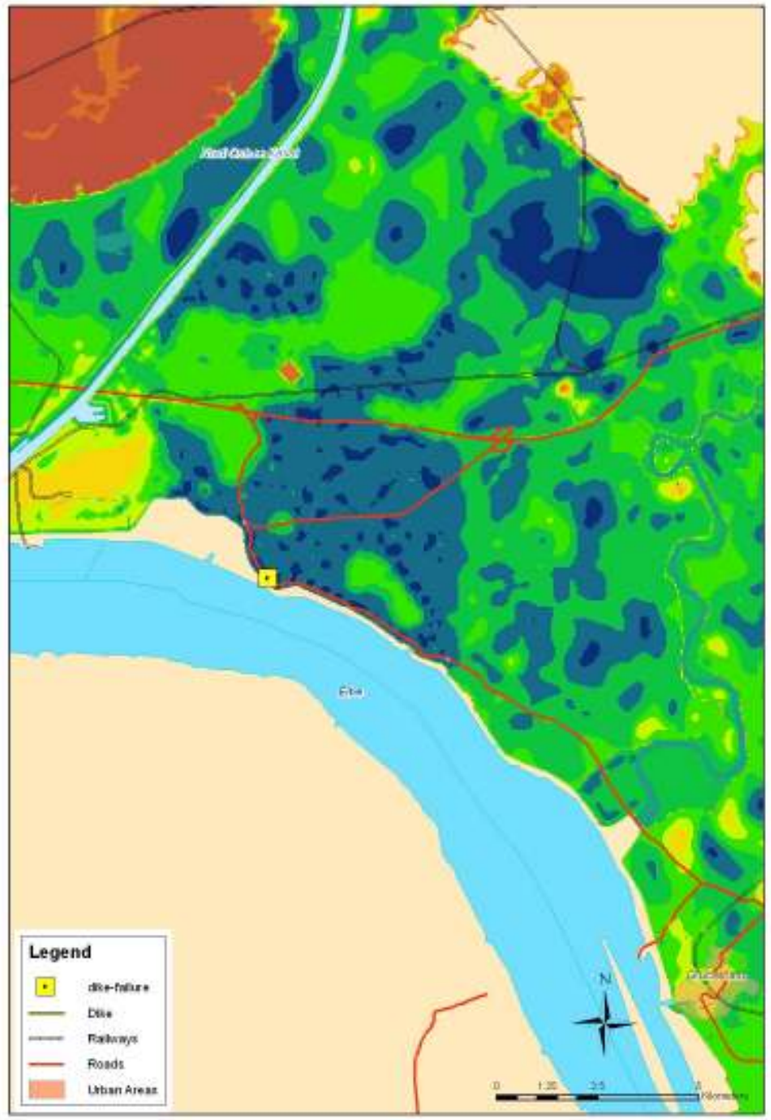

Figure 3-25 : Dtm of the study, with indication of the breach location

3.2.3.1. *Hydrographic data*

A storm hydrograph curve was derived for an average spring tide (Cuxhaven gauge), with a tidal range of 3.5 meters. As no extreme waterlevels were available for the area, the setup for a 1000 and 10000-year storm were derived from the setups calculated for the Langeoog study (Comrisk, sp9). All waterlevel data are given in NN, which corresponds with the mean sea level.

The wind velocity corresponding with a 10000-year storm is 35m/s.

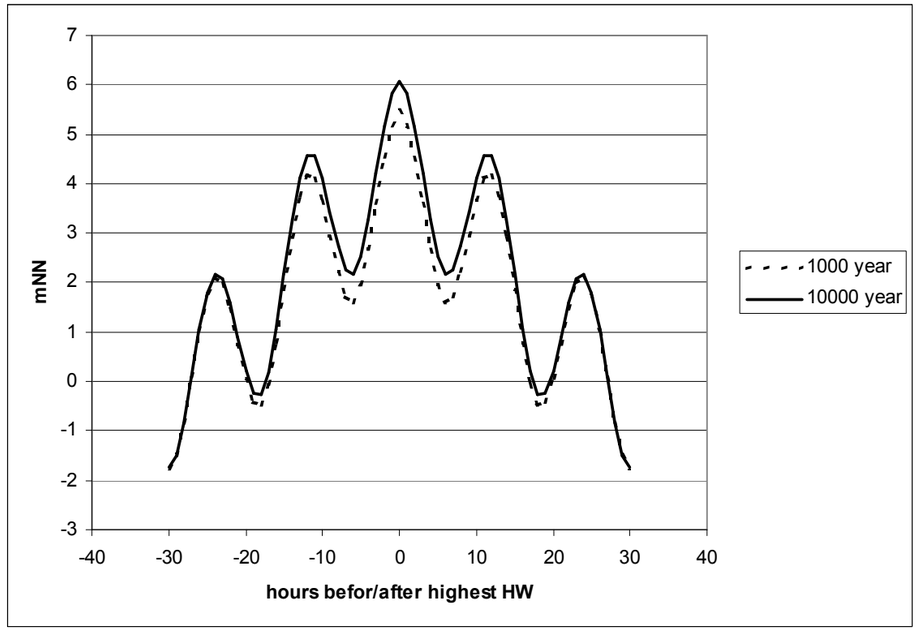

Figure 3-26 : storm water level for 60-hour storm (Germany)

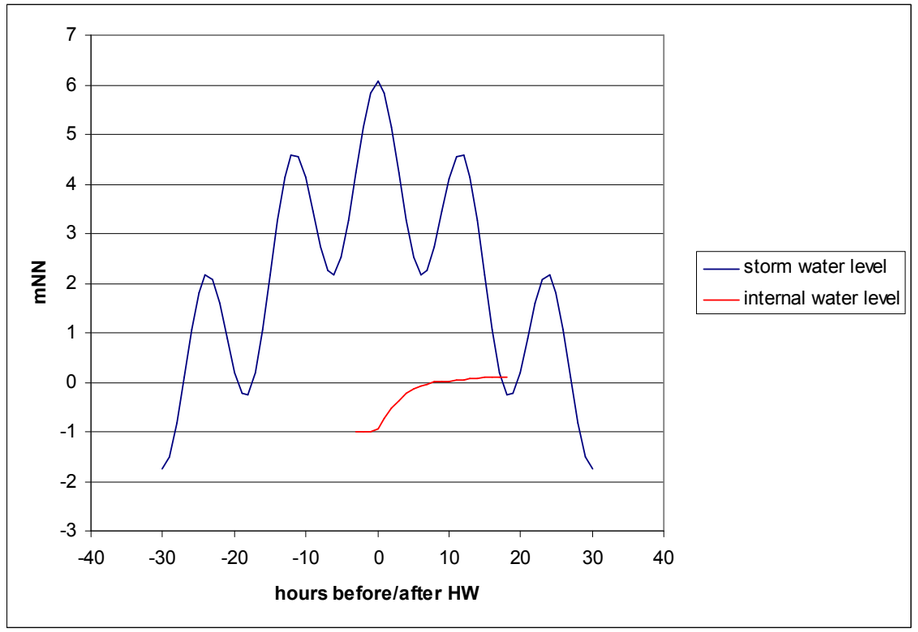

Figure 3-27 : Storm water level and water level in the flooded areas for a 1000-year storm in Germany

3.2.3.2. *Flooded areas*

The dtm for Germany consists of a series of shapes, with a uniform height value. This causes an overprediction of the water volume that can be accommodated, as the volumes and the resulting flooded area cannot be calculated very accurately. For this reason the maps for the different time steps are very similar and differentiation of the water height over the submerged area is not possible.

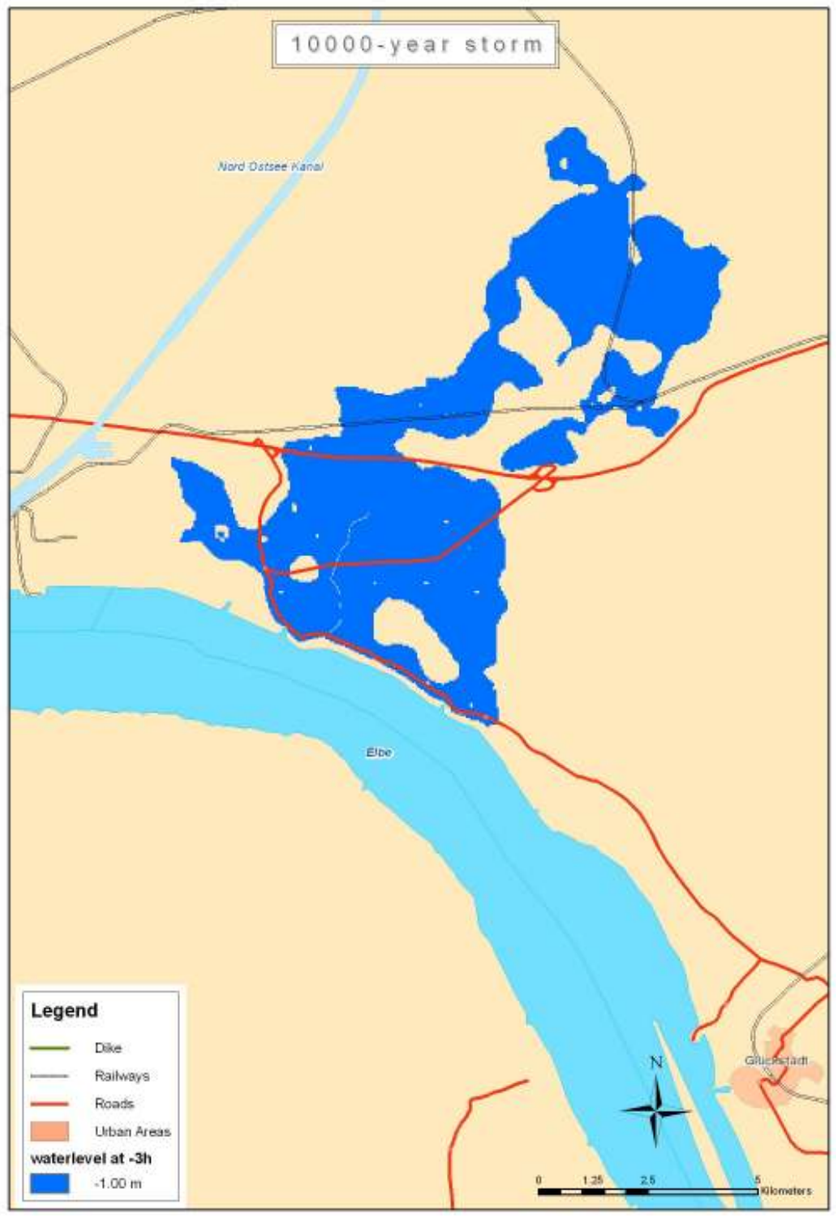

Figure 3-29 : submerged area 3 hours before the highest water level

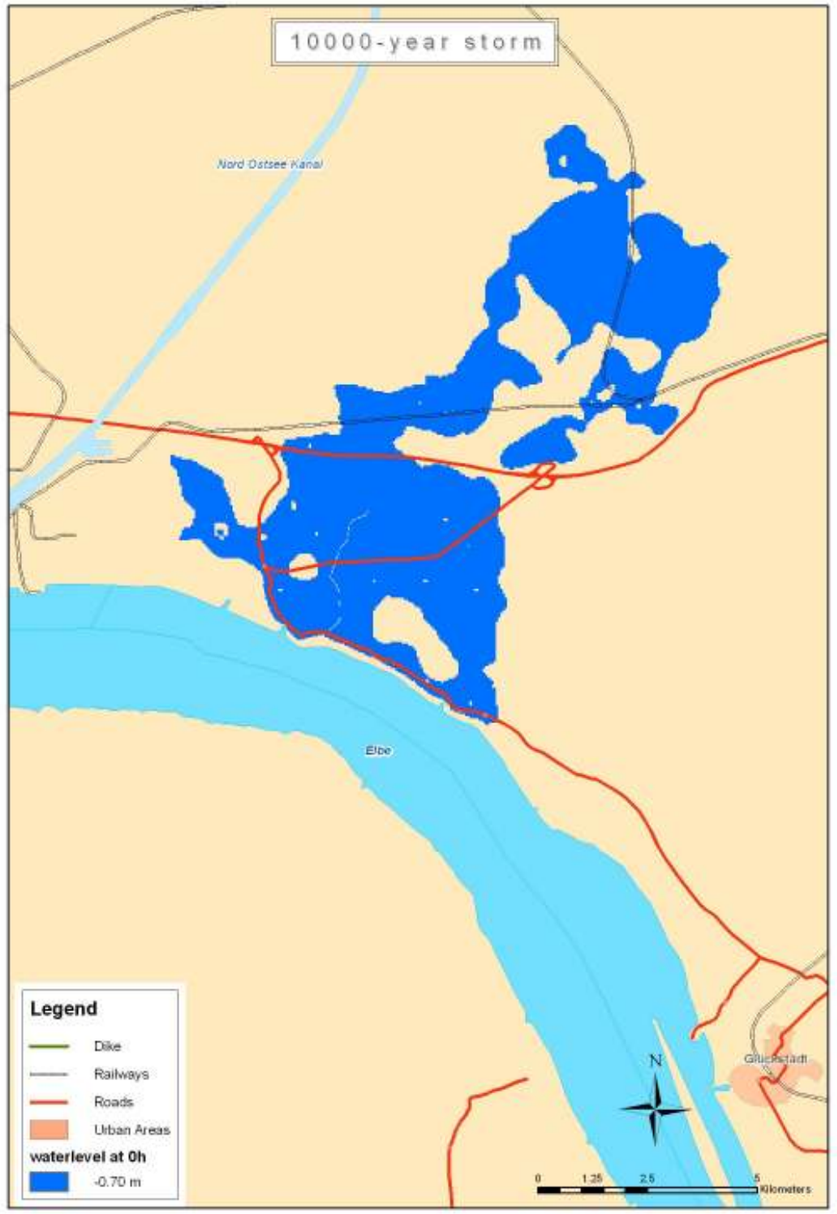

Figure 3-30 : submerged area at the highest water level

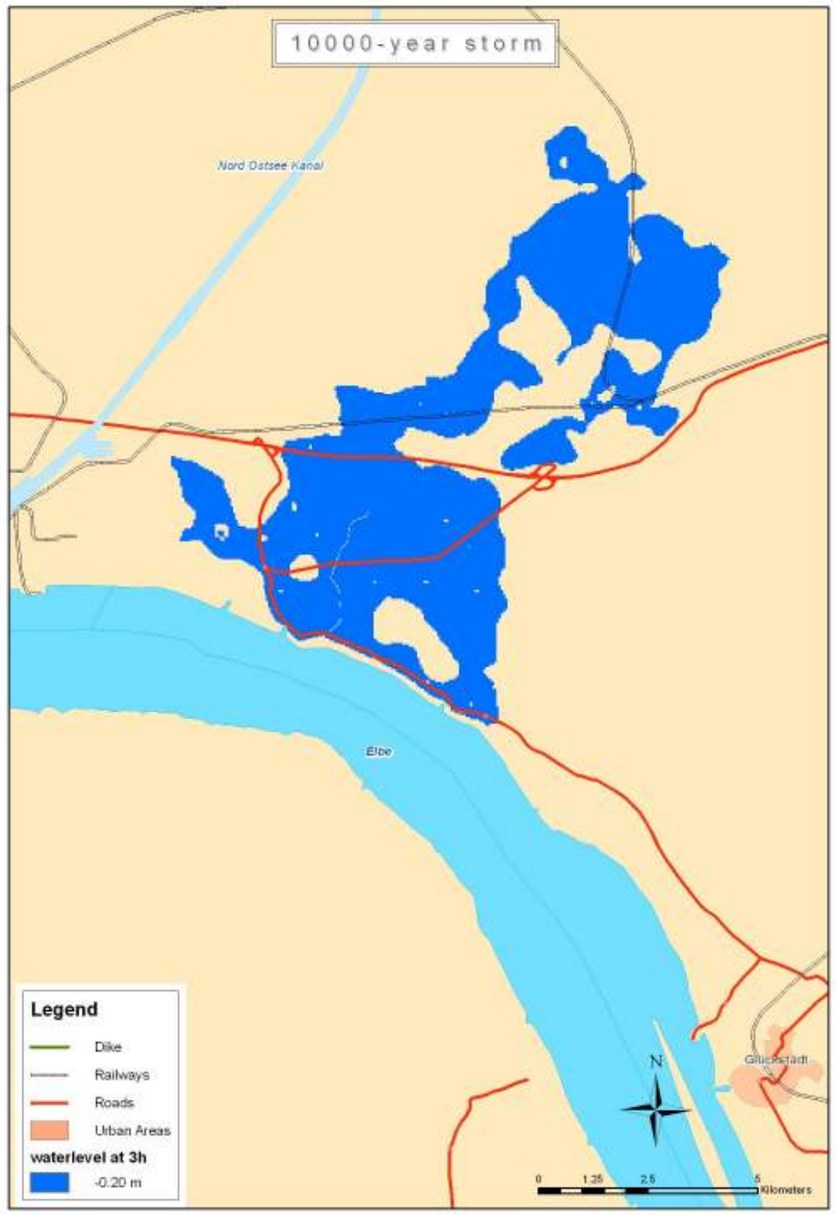

Figure 3-31 : 3 submerged area 3 hours after the highest water level

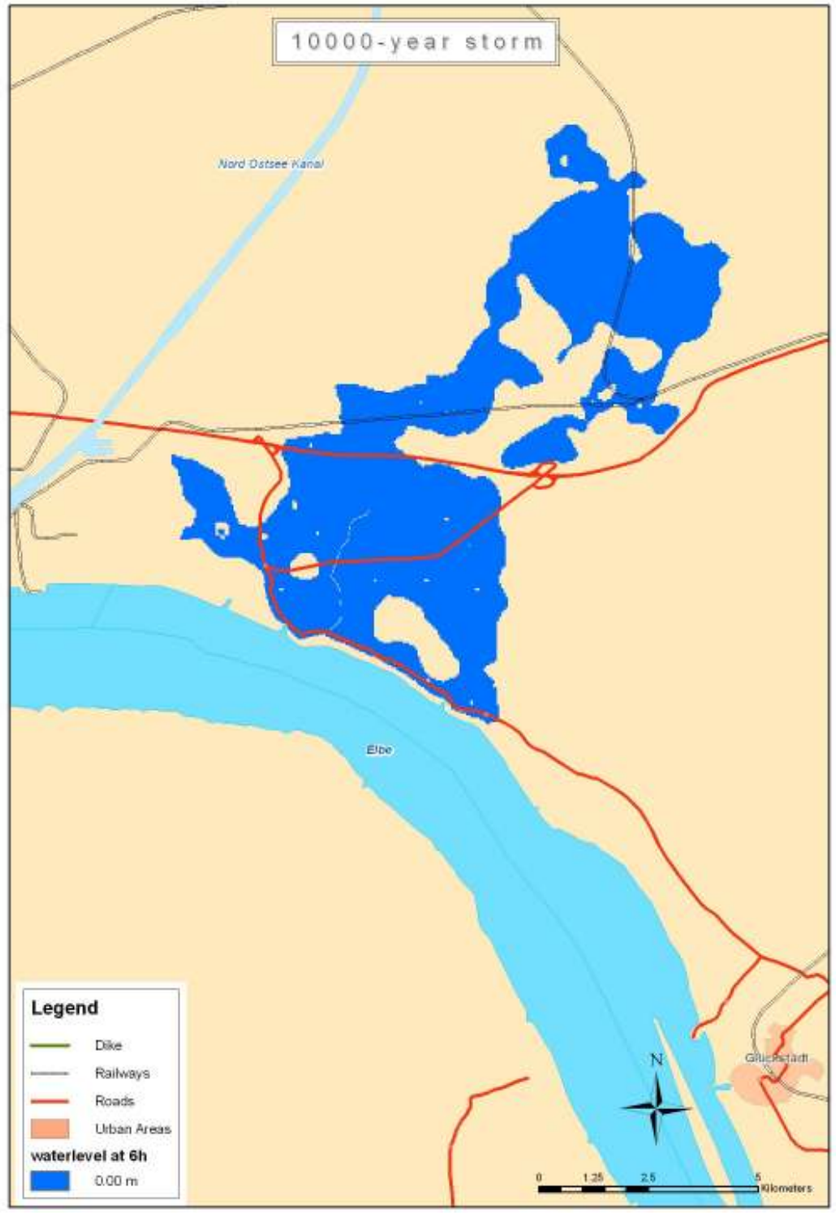

Figure 3-32 : 6 submerged area 6 hours after the highest water level

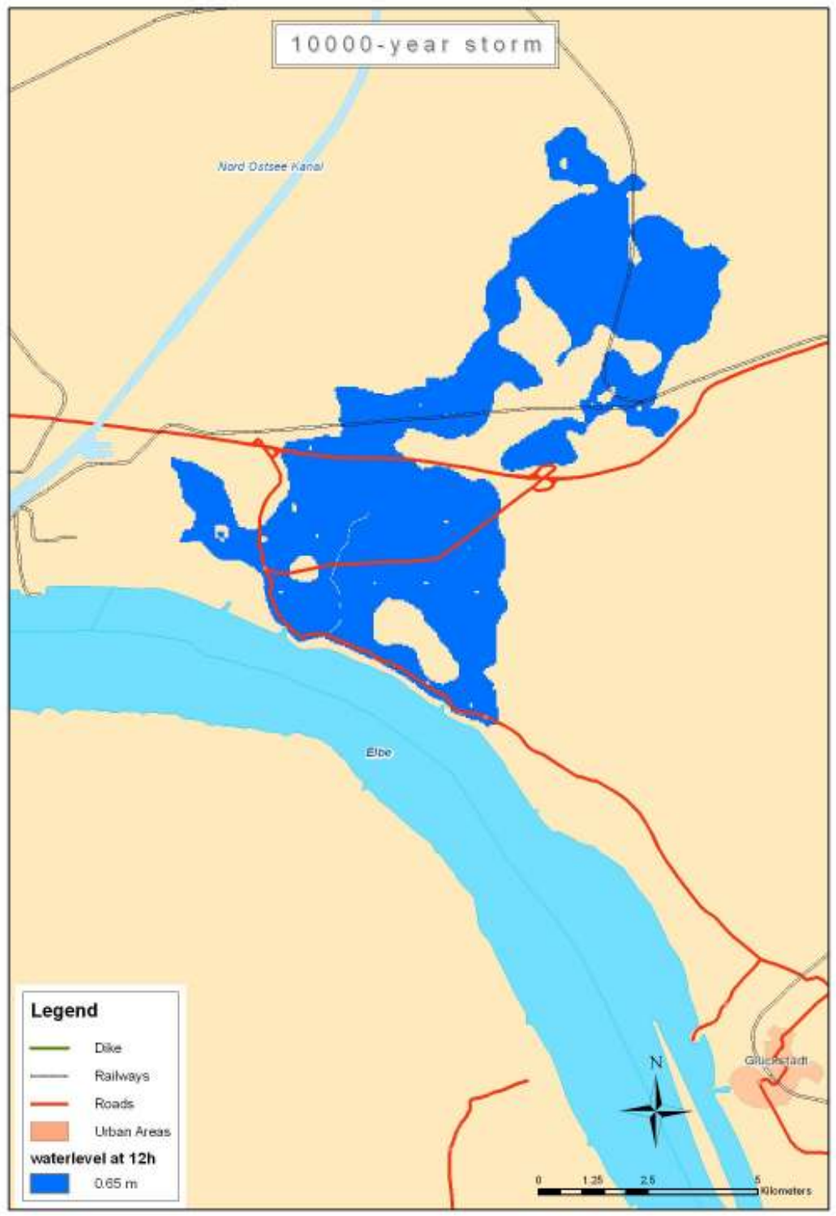

Figure 3-33 : submerged area 12 hours after the highest water level

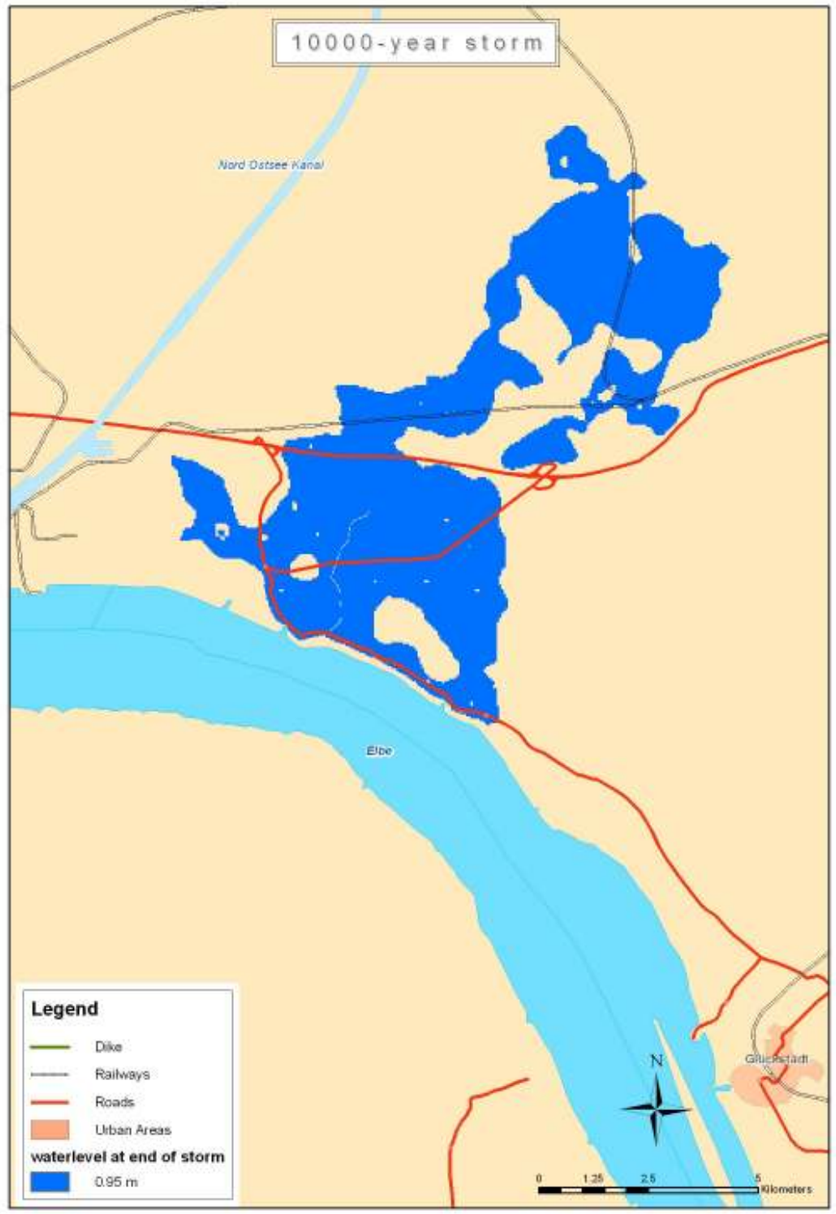

Figure 3-34 : submerged area at the end of the storm

For a more accurate calculation, the original data (containing the entire range in heights) should be used.

3.2.4. U.K.

At the moment of writing, no dtm information was available for this region. Due to this no flooding maps could be made.

4. ALTERNATIVE REPRESENTATION OF THE DATA

A possibility also exists to incorporate the results into Google Earth. The calculated data can be saved into a *.kml file which can be opened on any computer on which Google Earth has been installed. In addition to this, the data can be easily linked to a website.

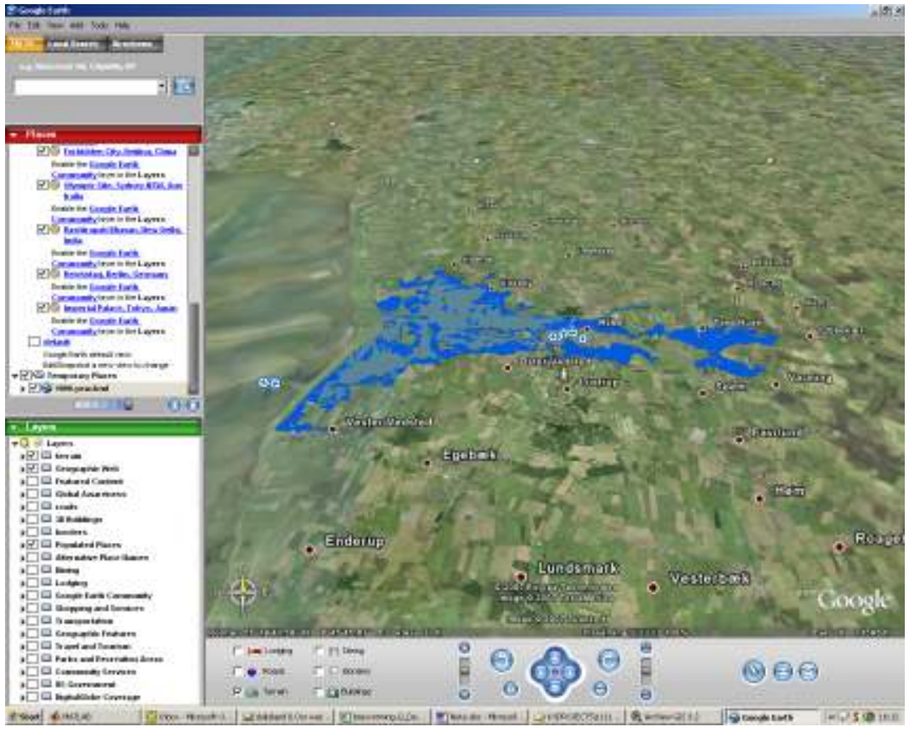

Figure 4-1 : representation of flooded area for 1000-year an 10000 year storm for Ribe

5. REFERENCES

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Chain Of Safety website http://www.chainofsafety.com/

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Comrisk sp9 Pilot study Langeoog

Comrisk sp6, Flanders/Zeeuws-Vlaanderen Case study , february 2005

Kolen, B. & Geerst, R., 2006. Als het tóch misgaat: Overstromingsscenario's voor rampenplannen. Betooglijn. PR1216.10.

Risk Management Solutions, Aon Worldwide Network & reactions, 2000. European Flood Risk.

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6. TIME DEPENDENT DEVELOPMENT OF DIKE GAP (FROM COMRISK REPORT SP7)

In case of a dike breach, the time-dependent development of the gap has to be considered. The width of the gap through which water fl ows into the hinterland depends on the time-dependent gradient between outer and inner water levels as well as the geotechnical features of the dike. Up to now, only the method of Visser (1998) has described the time-dependent breach development of a sand dike. According to Visser (1998) five stages can be distinguished in the process of a breach at a sand dike.The breach erosion starts with the flow of water through a small initial breach at the top of the dike with a trapezoidal cross-section. Within thefi rst three stages, the fl ow of water increases the cross-section of thechannel on the inner slope of the dike. The slope angle of the channelgets steeper and retrograde erosion decreases the width of the dike crest.After the vanishing of the crest, the infl ow increases which results in increasederosion of the dike core. At the same time the gap width increases.At the end of the third stage, the dike core in the breach is completelywashed out down to the dike base at polder level. At the fourth stage,the breach continues to grow laterally. At the fi fth stage, the breach continuesto grow until the point of time where the fl ow velocity becomesso small that the breach erosion stops. This point of time depends on thegradient between the outer and inner water levels. At the time where theinner water level reaches approximately 0,7 times the height of the outerwater level, the fl ow velocity through the gap will start decrease, which results in a decreased erosion rate on the breach sides. The flow throughthe breach stops when the water level in the flooded hinterland equals the outside water level. At that time, the final breach width is reached.The inner water level, however, depends on the storage capacity of the flood-prone area. In order to simplify the calculation of the inflow volume and the simulation of the inundation behaviour, two assumptions have been made:

The time at the end of the third stage has been chosen as the starting time for calculations of the breach development and the inflow volume. At that time, the vertical erosion is ended and the dike core inthe breach is completely washed out. The previous breach stages are thus not considered in the inundation scenarios within this study.

The model by Visser (1998) only applies to a sand dike. Models on the growth of a gap at a clay-covered dike could not be found in the literature. Hence, it has been necessary to apply information about arecorded dike breach for the scenarios at the Ribe defence system. In CUR (1990) it is stated that only a few cases have been recorded in which the growth of the gap width as a function of time is tolerably known. Two cases are represented in CUR (1990), of which the breach at the IJssel dike on January 8th, 1926 has been chosen as an assumed scenario for the growth of a possible breach at Ribe dike.

This scenario has been selected due to missing data and models for a time-dependent modelling of a dike breach at Ribe dike. By performing a curve-fitting, the following function for the gap growth based on the recorded breach at the IJssel dike could be derived:

$$b = 67 \cdot t^{\frac{1}{4}}$$

where: b = gap width [m]

t = time [h]

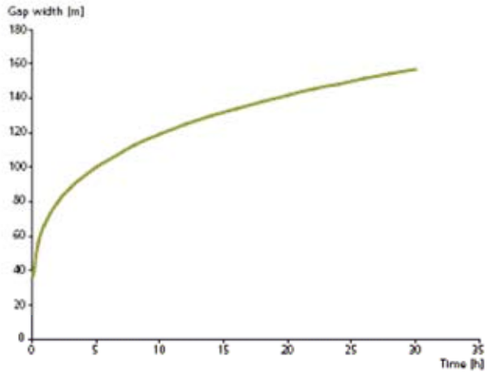


Figure 6-1 : assumed growth of a dike breach at Ribe Dike

Inventory schemes Capacities and Capabilities

CHAIN OF SAFETY

covering the whole north sea region

***Pro-action**: the elimination of structural causes of danger, thereby preventing the development of dangerous situations.*

CAPABILITY/CAPACITY	LOCAL					REGIONAL					(INTER) NATIONAL				
	DK	SH	NL	BE	UK	DK	SH	NL	BE	UK	DK	SH	NL	BE	UK
Inundation scenario's								X	X		X		X		
Studies and formulating research (climate change & land use)					X			X	X		X	X	X	X	X
Legislation for crisis or disaster management	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Agreed crisis coordination structures between (governmental) levels	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Special analysis unit for judgement of security/threat of floods							X	X			X	X	X		X
Risk assessment/risk analysis	X				X		X	X	X	X			X		X
Risk mapping					X			X	X	X			X		X
Vulnerability information of (critical) infrastructure (water defence works)					X			X	X	X			X	X	X
Modelling strength (material, height, width) water defence (dikes, locks etc)					X		X	X		X			X		X
Combination spatial planning and protection against flood					X		X		X	X			X		X
'Legal' safety standards/norms of dikes breaking once in X-year					X	X	X		X	X			X		
	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom

***Prevention**: the minimization of risks and the restriction of the consequences of any accidents that occur.*
***Preparation**: the preparations for the control of accidents, disasters and crises.*

CAPABILITY/CAPACITY	LOCAL					REGIONAL					(INTER) NATIONAL				
	DK	SH	NL	BE	UK	DK	SH	NL	BE	UK	DK	SH	NL	BE	UK
Early warning and/or alarm system			X		X		X	X	X	X	X	X	X		X
Evacuation criteria and/or system						X									
(Monitoring) system of indicators (predicting water heights storm force)					X		X	X	X		X	X	X		X
Measuring checking waterworks according to standards/norms					X		X	X	X				X		X
Strengthening existing water defence works	X	X			X		X		X				X		X
Interoperable communication systems between relief services, water management +other flood related organisations		X		X					X				X	X	
Agreements about the flow capacity in a river basin					X					X			X		X
Governmental information system (radio, sirens etc.)	X	X			X		X			X	X	X	X	X	X
Risk communication/public awareness raising					X		X		X	X			X		
	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom

***Response**: operational control of dangerous situations that have occurred, inclusive of the provision of the necessary assistance*

CAPABILITY/CAPACITY	LOCAL					REGIONAL					(INTER) NATIONAL				
	DK	SH	NL	BE	UK	DK	SH	NL	BE	UK	DK	SH	NL	BE	UK
Alarming operational services	X	X	X	X	X		X	X	X		X		X	X	
Coordination centre	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Agreements government, water management & other flood related organisations	X	X			X					X	X		X	X	X
Information to the relief organisations	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Information to the public - crisis communication			X	X	X	X	X	X	X	X	X	X	X	X	X
Information to the government		X	X	X	X	X	X	X	X	X	X		X	X	X
Geographical information (systems)	X		X		X			X	X	X				X	X
Critical infrastructure	X	X	X	X	X	X	X	X		X		X	X		X
Information about availability of medical capacity		X	X	X	X	X	X	X	X			X	X	X	
Information about availability of relief capacity	X	X	X	X	X		X	X	X			X	X	X	
Information about availability of shelter capacity people	X	X	X	X	X		X	X	X			X		X	
Information about availability of shelter capacity cattle				X	X										
Information about availability of burial capacity				X	X										
Demographic information	X	X	X	X	X		X	X	X	X		X	X	X	X
Assistance neighbour country	X			X	X		X	X	X	X	X	X	X	X	X
Assistance from private companies	X	X	X	X	X		X	X	X	X		X	X	X	X
Assistance from defence forces			X		X		X	X	X	X	X	X	X	X	X
Information about actual water heights and winds	X		X		X		X	X		X	X	X	X		X
Evacuation plan	X	X	X	X	?	X	X	X	X	?			X	X	?
Victim registration	X		X	X	X	X	X	X		X		X	X		
Traffic-control systems	X	X			X	X	X						X		
Life saving (rescue service)	X	X	X	X	X		X	X	X	X		X	X	X	X
	Denmark	Schles.-Holst. (DE)	Netherlands	Belgium	United Kingdom	Denmark	Schles.-Holst. (DE)	Netherlands	Belgium	United Kingdom	Denmark	Schles.-Holst. (DE)	Netherlands	Belgium	United Kingdom

***Recovery**: the concluding link in the safety chain. Recovery focuses on the return to the normal situation, together with evaluations that result in procedural improvements.*

CAPABILITY/CAPACITY	LOCAL					REGIONAL					(INTER) NATIONAL				
	DK	SH	NL	BE	UK	DK	SH	NL	BE	UK	DK	SH	NL	BE	UK
Recovery/repair	X	X	X	X	X		X		X		X	X	X	X	X
Restoration infrastructure	X	X		X	X		X		X		X	X	X	X	X
Psycho-social care	X	X	X	X	X	X	X		X	X			X	X	
Evaluation of the event	X		X	X	X	X		X	X	X	X		X	X	X
Insurances			X	X	X				X	X			X	X	X
Legislation financial support citizens and businesses			X		X					X	X		X	X	X
	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom	Denmark	Schleswig-Holstein (DE)	Netherlands	Belgium	United Kingdom

Client: Living with Water

Aftercare

Checklist Recovery

Authors: Elmi van den Braak (HKV)
Bas Kolen (HKV)
Rolf van Toorn (HKV)
Geesje Saeijs (COT)
Afke Besselink (COT)
Magda Rooze (Stichting Impact)
Maaike de Vries (Stichting Impact)

CHAIN OF SAFETY
covering the whole north sea region

1 Introduction

This concept checklist is intended to create insight into the aftercare phase by illustrating issues and actions that need to be taken by crisis teams. Other goals of the checklist include improving the care given to victims and the acceleration of reconstruction in flooded areas. In addition to this concept checklist, a handout for the aftercare phase will be distributed.

A case study is being performed at the Province North-Holland, as part of the project 'Scenario analysis and planning: from threat of flooding until evacuation'. This checklist is being used to assist the writing of repair and reconstruction plans.

The described aftercare activities are sub-divided in four groups:

I Reconstruction
II Temporary services
III Shelter of victims
IV Remediation management

Activities related to the psychosocial aftercare are shown in coloured boxes.

2 Checklists

2.1 Reconstruction

Trajectory and Category	Measures and activities
	I Reconstruction
Housing	
	Reconstruct housing
	Clean and repair
	Demolish and rebuild
	Flood-resistant building (yes/no)
	Building material availability (hardware store for individuals)
	Organise waste disposal systems
	Utilise heavy equipment (e.g. front loader, excavator)
	Utilise light equipment (e.g. spade, pickaxe)
	Allow residents to enter the area and observe the damage and (where possible) secure private belongings
	Work to keep existing social structures intact during re-distribution of lots
	Involve residents in the planning of new neighbourhoods
Companies and industries	
	Reconstruct general companies and industries
	Clean and repair
	Demolish and rebuild
	Repair production resources
	Repair production process
	Repair supply and distribution
	Clean and repair (special attention to manure, insecticides, milk storage reservoirs)
	Destroy decaying harvest and contaminated food products
	Repair equipment and gear
	Plough/sow clean earth
	Arrange temporary use of equipment
	Reconstruct companies that use chemicals and fuels
	Clean and repair
	Demolish and rebuild
	Isolate and clean pollution from chemical industry (e.g. soil remediation)
	Repair storage of chemical substances
	Repair production facilities
	Review whether companies have the needed recuperative abilities and financial support
	Focus on small and medium companies
Special objects	
	Functioning of strategic objects/junctions vital infrastructure
	Clean and repair

Trajectory and Category	Measures and activities
	I Reconstruction
	Demolish and rebuild
	Guard
	Arrange continuity in functionality
	Reconstruct fragile/valuable objects
	Clean and repair
	Demolish and rebuild
	Secure and guard
	Arrange continuity in functionality
	Utilize public information points or places that are of importance for social networks
	Arrange monument/ memorial
Environment	
	Clean public spaces
	Clean debris (categorise as household, rubble, greens, appliances, chemical and others)
	Clean (possibly contaminated) deposits
	Remove cadavers
	Disinfect areas
	Pest control
	Communicate damage, danger, environmental consequences and exposure to hazardous materials (what are health issues – now and in the future – for victims?) Provide the opportunity to ask questions (hotline, information sessions)
Flood defences	
	Reconstruct water related structures
	Repair and strengthen flood defences
	Repair civil infrastructure
	Repair pumping stations
	Inform why new structures ensure the areas safety. Provide the opportunity to ask questions (hotline, information sessions)
Power supply	
	Reconstruct power supply
	Repair electrical power plants
	Repair large scale distribution network (e.g. cables, distribution points)
	Repair small scale distribution network (e.g. transformer stations, area connections)
	Keep emergency electrical generators available for extended period
	Clean and test flooded transformer stations
	Repair and inspect transformer stations
	Inspect connections per household/company/organisation
	Reconstruct permanent communication infrastructure
	Repair network
	Connect users to network
	Reconstruct gas supply
	Inspect and repair pressure regulating stations

Trajectory and Category	Measures and activities
	I Reconstruction
	Repair gas supply to and into housing
	Inspect connections at the household level
	Reconstruct municipal waste disposal
	Repair incinerators
	Restore old landfill sites or open new landfill sites
	Re-establish waste collection service (vehicles, installations)
	Reconstruct potable water supply
	Arrange temporary waste treatment facilities (collection, inspection, recycling, discharge of waste)
	Clean water intake points
	Arrange alternative sources of potable water
	Inspect and clean pumping stations
	Repair network (water pipes and mains)
	Connect users to the network
	Reconstruct sewer system
	Repair main discharge system
	Clean sewer system of deposits
	Repair sewer system (network, control panels)
	Repair sewage treatment installations
	Connect users to the network
Infrastructure	
	Reconstruct roads
	Clean main roads at local community level
	Repair main roads at local community level
	Repair infrastructural objects such as bridges, overpasses, tunnels
	Repair junctions in infrastructure
	Set up fuel distribution points: repair fuel stations or arrange temporary fuel depots
	Repair secondary roads
	Reconstruct underground infrastructure
	Reconstruct tunnels & metro
	Reconstruct public transport (bus)
	Arrange busses
	Plan interim routes and bus stops
	Reconstruct harbours
	Repair quay facilities
	Set up storage and distribution facilities
	Arrange access from land and water
	Reconstruct waterways
	Clear wrecks and rubbish
	Organise dredging & repair embankments
	Reconstruct railroads
	Communicate timing of railroad remediation, including: inspection, repair, testing
	Build ballast foundation, sleepers, rails, cabling, communication etc.

Trajectory and Category	Measures and activities
	I Reconstruction
	Repair stations
	Communicate necessary renewing works to prevent disputes about wasting money and lack of attention to the 'general public'

2.2 Temporary services

Trajectory and Category	Measures and activities
	II Temporary services
Temporary utilities	
	Realise temporary utilities
	Temporary (potable) water supply (water storage, distribution, allocation points)
	Temporary electricity supply (electrical generators)
	Temporary gas supply
	Realise temporary infrastructure for communication
	Arrange information points (e.g. computer connections, flyers/posters with information)
	Arrange press centre
	Set up temporary communication network (phone booths, phone exchange, aerial tower, e-mail, text messaging)
	Arrange equipment for public announcements
	Make available cheap emergency mobile phones (HUGE assumption that cellphone towers still operational…)
	Arrange cell-broadcast
	Set up website, radio station, phone and digital helpdesks focussing on reconstruction
Temporary infrastructure	
	Realisation temporary infrastructure
	Repair inaccessible roads (from large to small) (e.g. concrete slabs, asphalt, sand)
	Temporary traffic plan: detour (emergency) infrastructure
	Temporary transfer points for emergency supplies, including cranes, loading bays
Emergency repair flood protection system	
	Emergency repair flood protection system
	Repair primary flood defences (before the next storm season)
	Repair civil infrastructure
Psychosocial care	
	Set up information and advice centres. Provide the opportunity to ask questions (hotlines, information sessions)
	Communicate intended duration of temporary facilities and what the occupants can expect (e.g. related to safety)

2.3 Shelter of victims

Trajectory and Category	Measures and activities
	III Shelter of victims
Temporary housing evacuees	
	Organise emergency housing (inside and outside the flooded area)
	Make available holiday homes, old military barracks, hotels, camp grounds, ships etc.
	Set up new tent camps/prefab emergency housing/container camps
	Store and register property originating from the affected area
	Set up sanitary facilities, aggregators, beds, shelter, shops etc.
	Afterwards dismantle temporary housing
	Clean and dismantle emergency facilities
	Inform about duration of temporary housing and reconstruction of own housing
	Where are livestock (e.g. cows, pigs, horses, poultry) located?
Organised return of evacuees	
	Organise return of evacuees
	Organise evacuees returning by car
	Organise evacuees returning by public transport or special transport
	Organise return of livestock
Public services	
	Organise health care system
	Emergency hospitals
	Mobile first-aid posts (containers)
	Psychological care
	Vaccination materials
	Care of food supply
	Establish shops
	Provide products to shops
	Support of existing formal and informal social networks
	Function of information and advise centres
	Portray clear message about financial compensation, prepayment, insurance, legal assistance etc. as soon as possible.
Employment	
	Arrange employment opportunities
	Arrange temporary office space (containers, wood, prefab, hard-body tents)
	Employ local affected workers and (disadvantaged) groups during reconstruction work Disadvantages?
	Continue salary payment
	Involve workers during rebuilding of the affected area
	Take care of financial security
Care for livestock	
	Care for livestock
	Arrange stables for livestock (e.g. horses, poultry, cattle)
	Set up animal shelters for pets
	Arrange livestock food, water, medication

Trajectory and Category	Measures and activities
	III Shelter of victims
Psychosocial care	
	Early stage psychosocial intervention: supporting context (practical, emotional and social support); short instructions; psychological triage
	Examine per individual: recuperative abilities, assignation of blame and participation in social networks
	Special attention to elderly and (ex-)psychiatric patients

2.4 Remediation management

Trajectory and Category	Measures and activities
	IV Remediation management
Remediation management	
	Establish remediation management
	Assemble remediation management framework
	Political decisions, priorities
	Make use of experiences from past disasters
Public order and safety	
	Maintain order in disaster area
	Command centres in/near affected area
	Arrange local/regional (military/police) stations
	Enclose and guard disaster area
	Secure convoys of reconstruction/aide workers
	Administration (registration) and identification
	Remove stray/wild animals (spreading of disease, aggressive behaviour)
	Inform populace about danger and threat in the area
Maintain continuous reconstruction activities	
	Care for reconstruction/aide/service workers
	Accommodate and provide food to aide workers
	Make available logistic material for aide workers (transport)
	Set up disinfection stations for workers in the area in case of chemical or biological pollution
	Arrange equipment for individuals
	Contact with and care for relatives of care/service workers
	Maintain equipment used during reconstruction
	Available equipment from government, rebuilding- and care services
	Use low cost equipment
	Set up equipment depots
Information & advice centre	
	Set up walk-in centre where victims can reach all supporting/aid organisations
	Important role in providing instructions, risk- and crisis-communication ???
	Determine and communicate end of aftercare phase

Trajectory and Category	Measures and activities
	IV Remediation management
Stabilise the process of reconstruction activities	
	Spatial planning
	Spatial planning of the area
	City planning and design
	Appoint contractors
	Allocate permits
	Allocate permits
Financial security of reconstruction work	
	Organise finances
	Keep personnel employed
	Increase (government) investments
	Ensure sufficient financial support of local governments
	Appeal to gain sufficient funds and means
	Organise financial efficiency
	Integrity
	Fraud prevention reconstruction funds
	Public reporting
	Independent third party audits of reconstruction funds
Finance victims	
	Support local businesses to quickly 'get back to business'
	Loans and financial support
	Stimulate collaboration projects
	Companies using dangerous substances deserve extra attention
	Priority/preferential regulations for local economy
	Financial procedures of damage claims from civilians/companies
	Clarify costs of reconstruction between civilians and government
	Establish what governmental and emergency funding is available
	Obtain expert damage assessment for agriculture/buildings/companies
	Damage compensation by federal government / Insurance
	Announce compensation regulations as soon as possible
	Wait with damage assessment until all damage is accounted for
	Contact public groups that are jointly requesting damage compensation
Administration	
	Organise administration structure
	Construct registration system of victims and companies
	Maintain registration system
	Map high-risk companies
	Organise reporting standards and archive system for future research
Supervise	
	Supervise building
	Building restrictions
	Supervise environment

Trajectory and Category	Measures and activities
	IV Remediation management
	Monitor dangerous substances (silt, air, vegetation, earth, water)
	Supervise safety
	Keep high-risk areas free of building works
	Supervise public health
	Monitor public health
	Psychiatric aftercare
Regime	
	Compose building regime
	Compose rebuilding plans
	Instigate building program
	Maintain a strategic vision
	Direct economical development, e.g. other production, change type of agriculture
	Consider possibility to move companies into or out of flooded area
	Compose regime for water, environment and safety
	Adapt spatial planning regime according to flood risk
	Consider flood resistant buildings
	River management
	Support/follow public initiatives
	Compose regime for public aftercare
Research	
	Research water, space and safety
	Examine care of flood defences
	Indicate clear cause of flooding
	Research river management
	Research prevention of damage and casualties
	Research lay-out or modification of crisis management
	Research into future regional planning
	Research cause and effect of disaster and announce results openly
Inform	
	Inform about factual events
	Inform why certain decisions were (not) made preceding the disaster
	Teach the public a realistic sense of safety
	Reiterate (new) threat
	Acknowledge the fear of the general public and aim to inform about this

Newsletters

CHAIN OF SAFETY

covering the whole north sea region

CHAIN OF SAFETY news
covering the whole north sea region

The project Chain of Safety has made a good start!

The second partnermeeting of Chain of Safety in Husum (Germany) was a succes.
All partners were very committed to the subject and enthusiastic to work together. At the end of this partnermeeting the working committees came up with a plan of action and based on that a timetable was made. Transnational workshops will be held during the projectperiod and a final exercise will be organised to see if all theoretical ideas can be implemented in practice.

The steering committee agreed with the set in direction of the working committees, as well as with their plans of action. The chairman was satisfied with the results of these two days of hard work.

Partners of the Interreg-IIIb Project Chain of Safety

The European Lead Partner of the project, which is co-financed by the INTERREG-funds, is the Province of Zeeland (the Netherlands).
Other partners are:
- the Ministry of Transport, Public Works and Water Management (the Netherlands);
- the Ministry of the Interior and Kingdom Relations (the Netherlands);
- the Essex County Council (UK);
- the Danish Coastal Authority (Denmark)
- the Ministry of the Interior of the Land Schleswig-Holstein (Germany);
- the Flemish Ministry of Transport and Public Works (Belgium).

Sub-partners of Chain of Safety are:
- the Province of East-Flanders (Belgium);
- the Province of West-Flanders (Belgium);
- the Municipality of Schouwen-Duiveland (the Netherlands).

Chain of Safety

The aim of the project Chain of Safety is to facilitate cooperation, exchange of experience and mutual assistance between North Sea Regions in the event of coastal flooding.
Since flooding disasters do not stop at local, regional or even national borders, and neither do the effects of such disasters, transnational cooperation in contingency planning is very important. Although the actual approaches are comparable, different structures and cultural differences make that interregional cooperation on proaction, prevention, preparation, response and aftercare, i.e. the chain of safety is not always uniform.
The European member states and the European Commission are developing initiatives and strategies covering the whole of the chain of safety. One of the objectives of the Chain of Safety project is to provide input and recommendations to the European discussion regarding this field, by exchanging knowledge and experience available within the partnership. This will minimise the casualties and damage caused by coastal flooding.

The overall objective of the project is to initiate a contingency plan for flooding covering the whole North Sea Area. This would be in cooperation with all relevant stakeholders, in order to combine best practices and experiences.

Initiative to a Contingency Plan for flooding

covering the whole north sea region

Interview with chairman Viek Verdult

Joining individual links to forge a strong chain

We are discussing the Chain of Safety project with Viek Verdult (Chairman of the Chain of Safety Steering Committee). Verdult is very pleased with the project's first partner meeting in Husum, Germany. He explains, "Two days of hard work proved that we can forge the chain we desire with which to tackle the problem of flooding in the North Sea area. People got to know each other better, which led to an exchange and a greater clarity of visions, points of view and ideas."

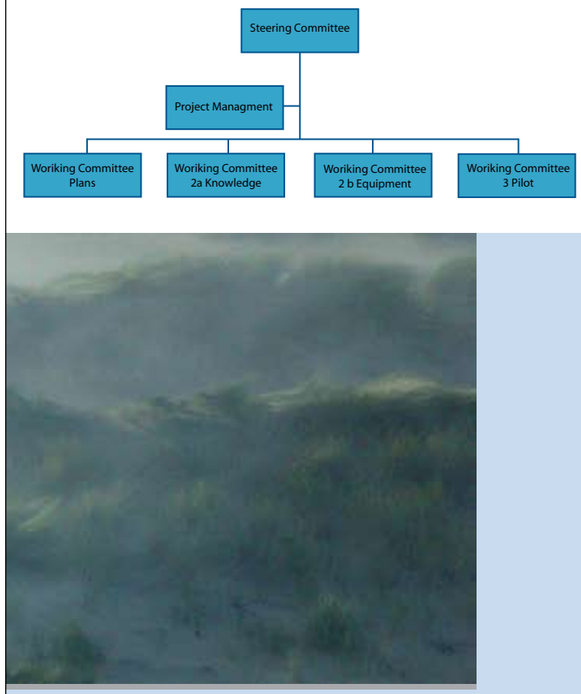
International approach

Last year the European Union asked the Dutch province of Zeeland to start up a project aimed at clustering the initiatives of countries bordering the North Sea, on the theme of flooding caused by the sea. Verdult felt honoured by the request of the secretariat of the Interreg North Sea Region from Viborg in Denmark. He says, "During the international commemoration of the 1953 flooding disaster it became clear that all countries along the North Sea coastline had taken up the theme of the danger of such floods. To develop a clear picture the secretariat asked us to act as leading partner. The project was aimed at mapping what the individual countries have developed over the years. The assignment accordingly focused on gathering all knowledge developed by North Sea countries."

Practical plans, procedures and the means to carry them out

"In addition to gathering this knowledge, our aim was also to unlock and exchange this information. History has taught us that seaborne floods don't stop at a country's borders. As good neighbours it is wise and necessary to know what each other's plans and procedures for calamities are. This is the background to the desire to exchange and coordinate with each other our plans and procedures for dealing with serious floods. This project is also about improving our awareness of the importance of acquiring the means to provide effective aid in a flood's aftermath. We think there is an international trend towards reducing the availability of civil and other equipment for tackling floods. So, all partners in this project will be facing substantial investments, and we think it is better to tackle this problem collectively. That approach will allow us to make internationally efficient use of the investments", according to Verdult.

Verdult realises full well that problems surrounding the required investment needed to develop the means to deal effectively with actual floods will not be solved during this project. That will require international agreements, costing more time to accomplish than is available during the Chain of Safety project, which lasts until 2008.
"In addition, we will be running field tests at the conclusion of our project. Next to sharing knowledge, exchanging and coordinating plans and procedures, and raising awareness of the lack of means with which to supply aid, there is also room in our project for a practical exercise. It will assess whether everything that has been put down on paper also works in practice," explains the chairman.



Organisation

To implement all the necessary activities four Working Committees, a Project Management Team and a Steering Committee is formed.

The structure of the project is such that all partners will be involved in all activities of the project. Therefore, the activities will be carried out in all participating regions. An exception will be made for the pilot action, which will take place in the Belgium-Netherlands costal zone. The results however will be discussed with all partners and the outcomes should be useful for the other coastal regions in the North Sea area.

A responsible partner with recognised expertise will chair each working committee. Detailed organisation of activities within each component will be the responsibility of this chair, but will be discussed in the Steering Committee, to guarantee coherence. The chairmen of the working committees will provide the input for the periodic reports on activities to the Lead Partner.

More information about this? Visit **www.chainofsafety.com**

Events

Meetings of the steering and working committees
- March 21st – 23rd 2007 (Belgium)
- October 3rd – 5th 2007 (UK)

• Transnational workshop 1 “Plans”	March 2007
• Transnational workshop 1 “Knowledge”	October 2007
• Transnational workshop 1 “Equipment”	March 2007

Husum

“The first partner meeting was a huge success. We were for example able to address clearly the international aspect of the issue. We also came to the conclusion that there are several other regions that should be involved in the project. These regions include the Belgian province of Antwerp, and Norfolk in England. And we should also consider neighbouring North Sea countries. The Scandinavian countries do not directly face the danger of flooding, however it would be wise to agree on plans and procedures regarding calamities. We are assessing the possibilities to let other countries take part in this project as observers. We are working out the details. It should be more clear during the next partner meeting in Belgium in March 2007,” Verdult indicates.

Strong chain

He continues, “2007 is the year a lot of the work on the project is to be done. Husum showed us that we all realise that living with a water threat is an important issue that impacts all the countries. The results of the efforts will be seen during the exercises and the final conference in 2008. Then we will be able to show how strong the chain of safety is. Looking at everybody’s intentions and enthusiasm I expect it to be very strong.”

CHAIN OF SAFETY
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CHAIN OF SAFETY
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Contact

Contact information
The Province of Zeeland (The Netherlands) is the project’s Leading Partner.

For questions / remarks please turn to:
Mr. R. de Meyer: r.de.meyer@zeeland.nl
(Project Leader)
Mrs. E.M.M.L. Blok: emml.blok@zeeland.nl
(Secretary Steering Committee)

Address
Interreg IIIb – Chain of Safety
C/o Province of Zeeland
Department KJB
Postbus 6001

4330 LA Middelburg
The Netherlands

Contactpersons of the project partners

- Ministry of Transport, Public Works and Water Management (the Netherlands),
  Mrs. E. van Eijbergen
- Ministry of the Interior and Kingdom Relations the Netherlands)
  Mr. C. Goemans
- Essex County Council (UK)
  Mrs. R. Briggs
- Danish Coastal Authority (Denmark)
  Mr. J. Jensen
- Ministry of the Interior of the Land Schleswig-Holstein (Germany)
  Mr. M. Hamann
- Flemish Ministry of Transport and Public Works (Belgium)
  Mrs. T. Mertens

Contactpersons of the project sub-partners

- Province of East-Flanders (Belgium)
  Mr. L. Bauwens
- Province of West-Flanders (Belgium)
  Mrs. C. Matthijs
- Municipality Schouwen-Duiveland (the Netherlands)
  Mr. E. Caspers

Upper row, left to right:
Ron de Meyer
Ella Teirlinck
John Jensen
Viek Verdult
Eric Caspers
Tina Mertens
Corsmas Goemans
Rosanna Briggs
Martijn Warmerdam
Matthias Hamann

Lower row, left to right:
Elise Blok
Evelien van Eijsbergen
Cathérine Matthijs

C O L O F O N

Production
Province of Zeeland (the Netherlands)
Henk Kramer Communicatie – Lewedorp (the Netherlands)

Design
Photographics – Goes (the Netherlands)

CHAIN OF SAFETY news

covering the whole north sea region

2nd meeting in Blankenberge

In the small Belgium coastal town of Blankenberge the partners of the project Chain of Safety gathered from March 21st to 23rd 2007 for the second time. By means of this project an inventory is drawn up of:
- contingency plans with regard to coastal floodings
- the equipment in the different countries
- the knowledge about coastal floodings and response

The final goal is to make one transnational contingency plan. In May 2008 the framework for this plan will be tested for the first time on the basis of a border crossing incident between Belgium and the Netherlands.

Workshops

The meeting started Wednesday-afternoon with a couple of workshops, where experts from several countries in the field of flooding were invited for. The chairmen of the working committees "Plans" and "Equipment" presented their results up to now to specialists from the Monitoring and Information Center (MIC) of the European Commission, the National Operational Coordination Center (LOCC) of the Dutch Ministry of Interior and Kingdom Relations, the Ministry of Transport, Public Works & Water Management, German and Belgium Ministries and asked them to give feedback. The chairmen of the working committees had prelimanary to this meeting held an inventory amongst the partners of the project. A vivid discussion arose, which led to surprising results for the continuation of the project.

Media invasion

The working committees gathered the second day and during these meetings the progress and the development were discussed. The outcomes of the workshops were involved in this too of course. Apart from that the order was properly disrupted that day by a true media invasion. The West-Flemish television as well as radio and writing press had set out for the hotel for several interviews with the chairman of the steering committee and other partners of the project. At the end of day 2 a visit was paid to the MRCC (Maritime Rescue and Coordination Center) in Ostend, the centre for calamities at sea.

Next time: Essex

The meeting of the steering committee was the order of the last day of the partnermeeting. As a result of all discussions during the past few days, it had became clear that the project would continue from a joint starting point in the form of a couple of scenario's. Decided was to ask an external expert to work out these scenario's, varying from a regional incident with crossborder effects to the worst case scenario. These scenario's don't have to be worked out in detail but have to be able to serve as a basis to make a good risk and result-assessment.
At the end of this meeting all partners got the necessary homework for the next partnermeeting, which will be held in coming October in Essex (UK).

Initiative to a Contingency Plan for flooding

covering the whole north sea region

Flood Contingency Planning and the Safety Chain

Making contingency plans demands working together on various governmental levels and with various operational organisations.
As one of the partners in the Chain of Safety project, the Ministry of the Interior and Kingdom Relations of the Netherlands is a very natural one. In working together for a safe and secure society, the Dutch government has promoted the use of the principle of the chain of safety (pro-action, prevention, preparation, response and recovery) since the early 1990s – within the domain of disaster relief and crisis management (civil protection).
Of great value is how the principle combines the safety efforts of the people in different operational and governmental organisations with the efforts of the public and business. Besides that, a balanced contribution can be made for all the links in that safety chain.

Events

Meetings of the steering committee and the working committees
- October 3rd – 5th 2007 (UK)
- January 23rd – 25th 2008 (Denmark)

Workshops
- Transnational workshop 1 "Knowledge" October 2007
- Transnational workshop 2 "Plans" January 2008
- Transnational workshop 2 "Knowledge" January 2008
- Transnational workshop 2 "Equipment" January 2008
- Exercise "Pilot" May 2008

Final conference
- May 2008 (Netherlands)

Safer society

Knowing that working together along the lines of that principle will help in planning for a safer society, various partners of different member states around the North Sea Region initiated the project. The project partners now find themselves supported in this initiative because the safety chain has become one of the main principles in the EU Flood Directive which has very recently been accepted by the European Parliament.

Why?

Why focus on a flood contingency plan? Don't we have a strong defence against the North Sea? Yes, we have! And we are safer than ever, but there is no 100% guarantee that flooding will never, ever happen again. Following the safety chain, we know that we can perform better, especially regarding response preparedness. So, there is a paradigm shift moving from "defend and manage" to "anticipate and respond". There is also a shift from "the government protects society from floods" to clear choices about living with the risk and the roles of government and those of other actors. Information, communication, awareness-raising and response planning become essential.

Cooperation

Besides the long tradition around the North Sea of flood risk management and preventive measures, flood incident management and flood contingency plan development become essential too, though the latter is underexposed. Regarding these developments, the Chain of Safety project focuses on cross-border cooperation, knowledge exchange, organisational measures and further increase of standards for our initiative towards a flood contingency plan to cover the entire North Sea Region. The spring meetings and workshops in Belgium and the equipment and plans resulted in an awareness of limited available regional and/or national resources and a table of contents for evacuation planning.

With this knowledge, the different flood response procedures and plans can now be further harmonised and integrated in existing emergency response structures and plans. This project - with its focus on the response part of the safety chain and with the initiative towards a flood contingency plan - will herewith become part of the process of implementing the EU Flood Directive.

Corsmas Goemans, MSc; Bed
Chair Working Committee of Plans
Ministry of the Interior and Kingdom Relations of the Netherlands

More information about Chain of Safety?
Visit www.chainofsafety.com

Contact

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For questions / remarks please turn to the Project Leader,

Mr. R. de Meyer
r.de.meyer@zeeland.nl
or
Mrs. E. Blok
emml.blok@zeeland.nl

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COLOFON

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Province of Zeeland (the Netherlands)
Henk Kramer Communicatie – Lewedorp (the Netherlands)
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CHAIN OF SAFETY
covering the whole north sea region
news

State of affairs Chain of Safety

At the beginning of October 2007 in Essex (UK), the partners in the Chain of Safety assessed the project set up in 2006 and which is set to be concluded in the spring of next year. The question that was to be answered in the United Kingdom was which advances had been made in the process of cooperation and exchange of knowledge in case of coastal flooding.

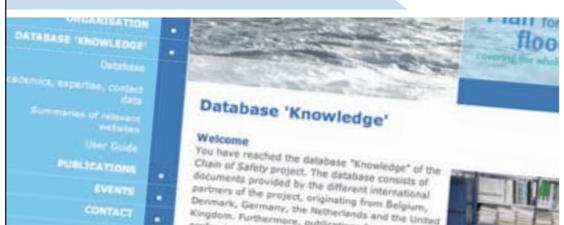
In the meantime, a couple of scenarios, varying from a serious threat of a levee breach in the short term to an actual breach in one or more areas, have been developed. The project's four working groups thus have a common starting point and are able to further conduct their activities.

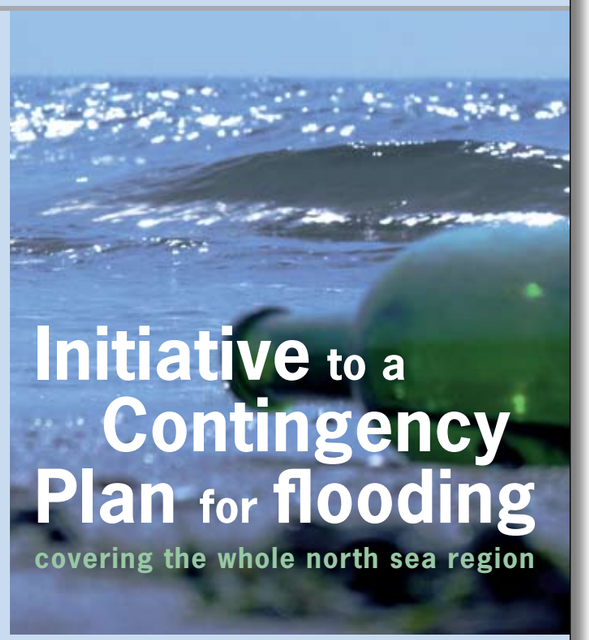
In the working group 'Plans' an inventarisation has taken place of existing plans in the participating countries and how they are related to the links in the chain of safety. An agreement has been made to create a sort of masterplan, taking up the scenarios and the inventarisation. Part of the plan will be a matrix including a timeline and related actions. The working group 'Equipment' will follow up on this by producing a guideline for the deployment of equipment. The guideline seeks to provide an overview of the equipment that is necessary and how its deployment should be prioritized

Database

The working group 'Knowledge' is one step further. With the help of enthousiastic students of the Roosevelt Academy in Middelburg, and with the support of the cluster Digital Media of the province of Zeeland, an online database has been realized. The program constitutes a first step in the direction of a virtual network of coastal floodings which will eventually be housed in a knowledge centre. Further elaboration will be addressed in the next partner-meeting.

Preparations for the cross-border exercise between the Netherlands and Belgium are in full swing in the working group 'Pilot'. A first outline for the cross-border plan has been produced on the basis of the European ESCAPE-project. This outline will be used during the exercise. Further elaboration in the framework for a transnational contigency plan is the responsibility of the 'Plans'-working group.



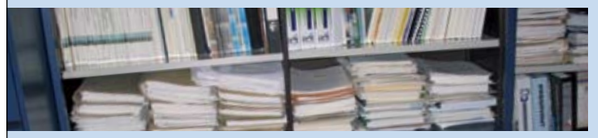


Development of an idea for the set up of a database

The idea of presenting documents in a public accessible database came into existence after an agreement was made on the significance of collecting expertise and knowledge on coastal flooding. The reasoning behind it was that mutual exchange of knowledge would also benefit cooperation, which is also one of the main ideas behind this project. It is important that knowledge is made available for everyone in need for it. Bearing in mind that the information had to be publicly, easily and quickly accessible, it was not that hard to come up with the suggestion to make use of the Internet.
The database primarily focuses on the shackles "preparation" and "response", which are in line with the focus of the project Chain of Safety.
Finally, the description and contact information of relevant websites and academics are an addition to the database.
The preparation for the build-up of the database has been done by means of a questionnaire, where all the partners could add relevant documents by dividing them by shackle of the safety chain.

The analysis and processing of the documents were outsourced. Therefore, two students from the Roosevelt Academy, the university of Middelburg, were hired because of their international focus.

These students, Dorina Damsa and Justin de Jager, were instructed to design and make a start with filling the database. They both were very enthusiastically and worked hard to get this result.



This database should be considered as a first step towards a more comprehensive knowledge database. You can find the database on our website www.chainofsafety.com

Why looking across the borders?

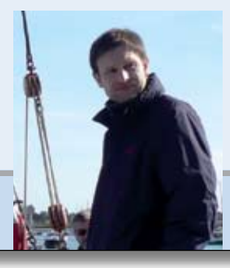
Schleswig-Holstein is the northern most state in Germany. It is the state between the two seas and has as such a natural, vital interest in safeguarding people living at the coast. 25 % of its area is flood prone by both the North Sea and the Baltic Sea, with the North Sea coastal lowlands representing the biggest part. Although there is a long tradition in coastal flood defence and disaster management, for a small state like ours it is essential to look across the borders and work together with our neighbours. However, cooperation and looking across the border should not only be understood in geographic terms but also in the sense of interdisciplinary cooperation. The principle of the chain of safety covers this approach, which has – this evolved in many discussions – to be put into practise much more in the future. The sectoral view still is the usual way of thinking in many operational and governmental organisations.

Projects like "Chain of Safety" are thus - besides their original purpose to facilitate exchange of experience - a good opportunity to get in touch with people of various professions, backgrounds and responsibilities. This helps to get a wider horizon and develop a holistic view, which is essential to solve problems in a world that is getting more and more complex.

Equipment

A policy study showed that the countries around the North Sea all have their own way of prioritising different parts of the safety chain, but in most countries preparation and response play a big role in coastal risk management. Making a plan for a worst case flood that affects more than one region means also to evaluate the existing equipment. A first, very rough assessment showed that in most cases there will be enough equipment to fight a severe food. However, the problem could be to get in time to the place where it is needed. Although the mechanisms and structures to assist with physical equipment and manpower are well developed on the different levels, still these have to be worked out in practise. For instance, if you ask your neighbours for assistance, you should define your needs as precisely as possible. A common checklist or a kind of catalogue is now being worked out and will become a part of an interregional flood contingency plan.

Matthias Hamann
Chain Working Committee of Equipment
Ministry of Interior of the Land Schleswig-Holstein (Germany)



Events

Meetings of the steering committee and the working committees
- January 23rd – 25th 2008 (Denmark)

Workshops
- Transnational workshop 2 "Plans" January 2008
- Transnational workshop 2 "Knowledge" January 2008
- Transnational workshop 2 "Equipment" January 2008
- Exercise "Pilot" May 2008

Final conference
- 21 & 22 May 2008 (Netherlands)

Contact

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Initiative to a Contingency Plan for flooding

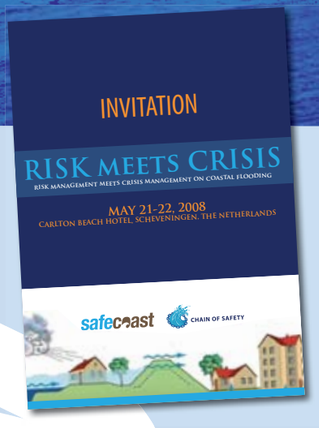
covering the whole north sea region

A lot of experts were present in Denmark

From January 23rd to January 25th the partners of Chain of Safety gathered in Ribe, Denmark.
It was going to be a busy program: 2 workshops and 4 meetings of the working committees and steering committee were scheduled during these 3 days. A lot of experts were present to attend the workshops "Plans & Equipment" and "Knowledge". Good input was given and helped the project partners further with optimizing their final report and formulating the project's recommendations. A combined draft report is currently drawn up which will give a good insight of the framework in which the project operated, the working process of the project as well as the considerations that are behind the recommendations made by the project.
Furthermore the project partners spoke about the proposal to initiate a Knowledge Centre on Crisismanagement of Coastal Flooding and discussed the possibilities of an initiative for a transnational contingency plan on coastal flooding. Related to the latter, also the Pilot-exercise came up. This exercise will be held on May 19 and 20, 2008 to practice cross-border (Belgium and the Netherlands) the arrangements that are made in the initiative for a transnational contingency plan on coastal flooding as mentioned above.

Finally the project partners were informed about the preparations that were already made for the combined final conference. The final conference is organized together with the Interreg project Safecoast and will be held on May 21 and 22, 2008.

Final conference "Risk meets Crisis"



Registration online, go to www.congrespagina.nl/riskmeetscrisis

Mutual cooperation is of the essence for successful transnational contingency planning and implementation.

Cross-border cooperation

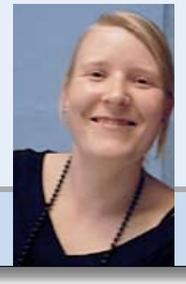
All coastal regions in the North Sea Region have their own knowledge and experience with contingency planning and disaster relief in relation to coastal flooding. Since regional or national borders do not limit the effects of a disaster, risk and crisis management should also be approached from a cross-border viewpoint.
Therefore, some countries have worked out bilateral agreements, for example Belgium and The Netherlands, to guarantee mutual aid in combating accidents and disasters, but these are only the first steps towards cross-border disaster management: there is a need for transnational contingency planning.
Chain of Safety wants to make a contribution by working out a contingency plan structure for flooding which should cover the whole North Sea Region. This structure is to be set up from the North Sea Region perspective and to be based on the Dutch model of the chain of safety. Every plan has to start small, though ...

Pilot area

A transnational framework for contingency planning has already been worked out in the European project ESCAPE and is used as a basis for Chain of Safety. Its main aim is to establish the first steps towards a joint contingency plan for floods in low lying bordering regions. Mutual cooperation is of the essence for successful contingency planning and implementation. Initiating a contingency plan on a common base will heighten its quality and provide the possibility for sharing equipment, resources, knowledge and experience. In the Dutch-Belgian coastal region a pilot site has been designated, being the coastline between Zeebrugge (Belgium) and Breskens (The Netherlands). All knowledge and relevant information for this pilot area is being collected bearing a worst case scenario in mind: affected area, technical information, responsible authorities, available infrastructure, ...

The final product has to be seen as an addition to all existing plans and agreements – rather than a stand-alone document - and will form a practical guideline to use in the case of cross-border coastal flooding.

To test the practical use of this document a virtual exercise will take place on May, 19-20th as a pre-phase of the final conference in Scheveningen. Three teams are going to work separately: a Belgian crisis centre at Oostende, a Dutch crisis centre at Middelburg and the command centre at Zele. The main aim of the exercise is to train the communication between centres, in terms of coordination and the quality of decision-making. All partners will be involved in this exercise and some will act as observers to evaluate its results. Their key findings will be presented at the final conference on May, 21-22nd. The pilot coastal contingency plan will serve as a first step and a learning exercise preparing for a future North Sea contingency plan in cross-border areas.



Tina Mertens
Chair Working Committee Pilot
Flemish Ministry of Transport
and Public Works (Belgium)

Events

Workshops

- Exercise "Pilot" 19 and 20 May 2008 (Belgium/Netherlands)

Final conference

- 21 & 22 May 2008 (Netherlands)

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