4th International Symposium on Flood Defence:
Managing Flood Risk, Reliability and Vulnerability
Toronto, Ontario, Canada, May 6-8, 2008

Institute for Catastrophic Loss Reduction

NOAH, THE RIGHT INFORMATION AT THE RIGHT TIME AT THE RIGHT PLACE

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ABSTRACT*:* In the Interreg IIIb funded project NOAH project partners from the Netherlands, Germany and Ireland joined forces to improve information transfer during high water events along rivers. Main objectives are development and implementation of an automated high water information system called FLIWAS and involving the general public in flood issues by means of High Water Partnerships. FLIWAS has successfully been implemented and tested in Baden Wuerttemberg and the Netherlands. The added value of the project for flood and emergency management is demonstrated during a series of multi-disciplinary full-scale exercises along the rivers Rhine and Maas. For The Netherlands, FLIWAS has been appointed as major communication tool. The project has received positive feedback from the field and is currently looking to broaden the scope, especially in relation to coastal floods.

Key words Emergency Planning, Evacuation, FLIWAS, Flood Information, NOAH

1. BACKGROUND

Along the North West European rivers many organizations are responsible for water management issues. In general, high water management consists of different stages, with different actions and responsibilities involved. In all Western European countries, the same type of hierarchical structure for water management exists. Appointed authorities for water management, such as water boards or municipalities, are in charge during times of normal water levels. They are responsible for day-to-day maintenance of flood defences, for planning and preparation of flood scenarios and measures. During a period of rising water levels, these authorities remain primarily responsible. At the critical level the local authorities take over (part of) the responsibility (figure 1).

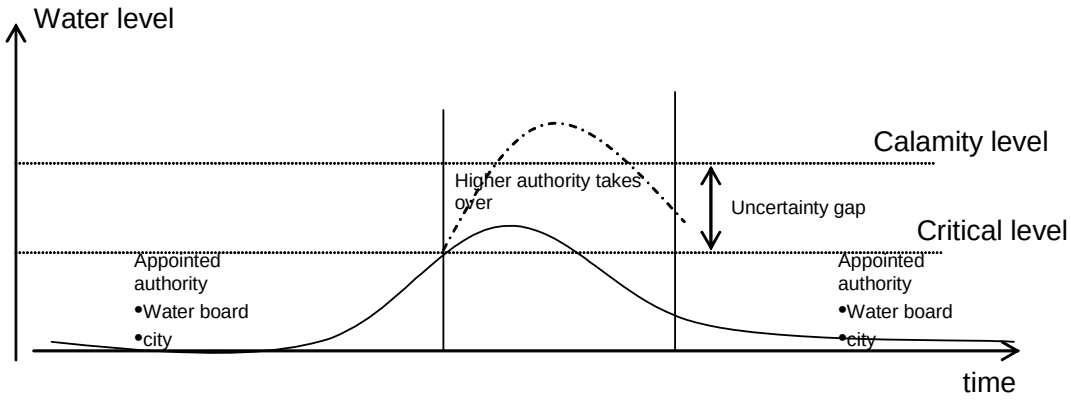

Figure 1: responsibilities during high water event

Decisions whether or not to take action during flood events are made on the basis of the available information. As a result of stress and complexity during emergency situations, this information flow is often uncontrolled, not on time or unreliable, thus raising feelings of uncertainty at decision maker level and with the threatened public.

Unreliable information means that actions may be taken unnecessarily, resulting in avoidable risks and damages. Although an actual disaster may not occur, the impact and costs can still be considerable, not to mention the 'blame game' between the involved governmental organizations after the event and, very important, the loss of trust of the general public in their water managers.

As a consequence, this means that such information has to be as reliable as possible and tailored for the separate fields of flood defence management and emergency management. As they may not row the same boat, the at least share the same information (see figure 2)!

Figure 2: separated organizations

2. NOAH

Information transfer is identified as a key factor in modern and dynamic water management. And the human factor in operational flood management constitutes a significant risk regarding effective information transfer. It is acknowledged that the use of automated tools for operational flood management such as forecasting and warning, but also for action monitoring, communication and post event evaluation can reduce this risk. By using computers for what they are good at (storing information, handling predefined procedures), humans can focus on what they are better at: dealing with unexpected developments and making decisions based on incomparable criteria and data. Therefore, automation of information management can lead to a significant increase of safety and reduction of damage and personal risks caused by flooding.

Within the EU-Interreg funded project NOAH, partners from the Netherlands, Germany and Ireland joined forces to develop and implement such an automated tool and to increase public awareness of the advantages and dangers of water in the neighborhood. The main objective of the project is **to cope with information demands and to make information available** in a fast and unambiguous way during high water events. The project addresses the information and communication issues encountered in actual high water situations and will bridge the uncertainty gap between early warning systems and emergency plans.

The second key objective of the NOAH-project is **the development of Flood Partnerships between governmental organisations, general public and other relevant parties involved.** The goal of these partnerships is to involve all parties on the issues of high water management and by doing so to create awareness of the profits and disadvantages of water in the neighbourhood. By making available and using additional information on flood risks, the required and desired protection level of inhabitants and companies in high-risk areas can be determined and communicated. The much needed awareness of the risk of flooding will be created and/or increased.

2.1 Development of FLIWAS

Information management will be supported by development and application of a new, innovative and generic information system called FLIWAS (FLood Information and Warning System), designed for use in a multi actor environment. FLIWAS will be available and accessible for all key players, focused on short notice dynamic actions and reduction of uncertainties in flood management.

The concept of FLIWAS was developed in close co-operation with the end users. FLIWAS builds upon existing flood forecasting systems, geo-info, alert plans, flood risk maps and disaster scenarios. Basic design principles were derived from systems already under construction in Germany (Hochwasser-informationssystem zur Gefahrenabwehr and HoWISS) and the Netherlands (Geautomatiseerd Draaiboek Hoogwater). After an intensive coordination effort with other ongoing projects, NOAH was able to incorporate other initiatives as well, such as the Dutch High Water Information System (HIS), which is and was being developed by Rijkswaterstaat/DWW (part of the Dutch Ministry of Transport and Public Works). Close co-operation with the VIKING program (Province of Gelderland and Nord-Rhein Westphalia) ensures that the communication to the emergency management organizations (police, fire-brigades) is optimized.

Some specific functionality of FLIWAS are:

- Monitoring the high water situation on the river using available measurement information and forecasts. This information will be used to initialize actions to protect areas from flooding.

- High Water Protection (for structures and embankments). Setting up scenarios and action plans for structures and embankments to protect areas and towns against flooding. Initializing and monitoring actions based on warning stages and direct communication to all involved staff.
- 2D flood modeling. Real time calculation of flood scenarios in endangered areas. In NOAH a prototype area along the upper Rhine River is modeled (figure 3). As a result, flood maps and scenarios of the upper Rhine River between Iffezheim and Mannheim are available. The experience gained during the building of this real time-model can be used in other regions.

2D-Flooding/ Dyke breach scenarios GE

Example:
Dyke breach scenario

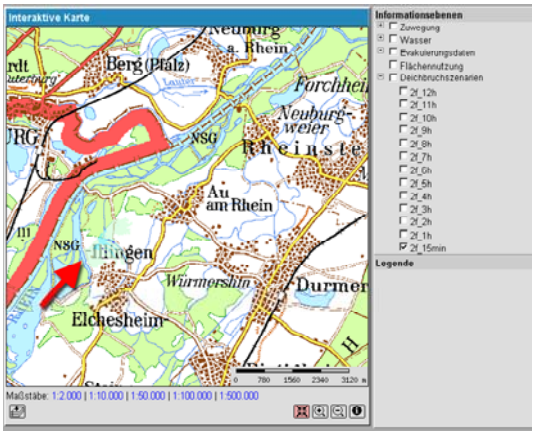

Figure 3: flood scenarario

- Evacuation. Designing of evacuation plans in advance and assisting during the execution during emergency situations, using results of the 2D-flood model, data of geographic maps, population distribution and infrastructure. A decision about evacuation can be taken based on signals from the High Water Protection-model.

General features of the system are its ability to communicate automatically with key staff, its 'watchdog' function to manage execution of actions and its logging module. FLIWAS is multi-lingual (English, Dutch, German) and represents the state-of-the–art in management and decision support systems for operational flood management. It will enable water managers in crisis situations to decide on the basis of real time and reliable data, thus reducing the uncertainty gap. This will help solving the question of responsibilities, which rises during emergency situations.

A first version of FLIWAS has been delivered in Autumn 2007. A second release with additional functionality will be delivered in Spring 2008.

2.2 Use of FLIWAS

FLIWAS is a generic system. The input to FLIWAS customizes the system to the organization that uses it. FLIWAS enables organizations to implement their own contingency plans and basic data on one hand and to structure the information and initiate actions during events on the other hand. In management mode FLIWAS will be used to import contingency plans and data, to test contingency plans and to evaluate previous events. Appointed users will define high water stages or threshold levels,

determine actions needed for those stages and link actions to responsible persons. The way actions are initiated and communicated (e.g. by phone, fax, e-mail or sms) is also determined.

During the high water season or during a high water event the system is switched to operational mode. Information such as telemetry data and forecasts of water levels or rainfall are used to determine the phase in which a monitored object is, related to threshold values set by the administrator of the system. If a threshold is exceeded, the system will inform the user and suggest going to the next stage. If the user decides to accept this advice, the system will initialize actions predefined for this stage. The system will then monitor progress and log the actions on completion. Each user has restricted rights and will only have access to the functionality and information that is relevant to him/her. As the system allows data import during high water events, it will always display the latest status of the situation on the ground. Ad hoc actions may be imported too. For decision makers this kind of reliable information is very important; it helps them to decide on the actual safety situation.

In its operational mode FLIWAS runs on one or more web servers. On client PCs and palmtops FLIWAS is accessed through a graphical user interface, using a web browser. For the communication between web server and clients the Internet or an intranet is used. If this infrastructure is not available because of the emergency situation, FLIWAS must still be operational. To enable stand-alone operation the data (geo-data, emergency plans and evacuation scenarios and operational data) can be mirrored to a local system. If the communication fails FLIWAS can still be used in off line mode on the local system. As soon as the network becomes available again the data of the local system and the web server are synchronized and the system will switch to on-line mode.

2.3 First experiences with FLIWAS

Although the final release of FLIWAS is still under construction, the project partners have already started implementation with first releases. Existing contingency plans have been evaluated and have been strongly improved during the process. Also basic (geo) data is gathered and fed in databases that will be used to feed FLIWAS.

In 2007 a first operational version of FLIWAS was implemented at municipalities and district offices in Baden Württemberg. In October 2007 FLIWAS was submitted to a significant test for the first time, in the framework of a staff exercise. The purpose of the exercise was to test a number of the functions developed in FLIWAS, i.e. “alarm- and deployment plans” and the “presentation of large-scale flood projections following a dike breach”, as well as the “communication possibilities” between the institutions in charge.

The exercise was based on an extraordinary flood scenario in the project area between Rastatt und Mannheim of several days’ duration, in the course of which dikes along the Rhine broke at two places and large parts of the Rhine flats were flooded. This resulted in the evacuation of around 50,000 people and the close-down of large industrial companies, including two refineries.

Participants in the exercise in Baden-Württemberg included the Ministries of Internal Affairs and the Environment, the Karlsruhe Government Presidium, the Districts of Karlsruhe, Rastatt and Rhein-Neckar-Kreis and the urban districts of Karlsruhe, Mannheim and Heidelberg, as well as nine municipalities. All together 120 persons co-operated in the exercise. In addition, some 25 representatives of the project participants and of institutions from Rheinland-Pfalz and Sachsen were able to follow the exercise live, as it was presented on a large screen in the Karlsruhe government presidium.

The exercise took several days, to allow the alarm- and deployment plans of the fire brigade to be concluded. On the actual day of the exercise the focus was on the presentation of flood projections and the issue of communication. In the latter framework, some 2000 e-mail messages were exchanged in the course of the 4-hour exercise.

Apart from typical testing setbacks the deployment of FLIWAS essentially functioned well. Only in the area of communication a real need for improvement has been identified. Such optimisations will be implemented in new releases, so that the FLIWAS Basis version can be introduced throughout Baden-Württemberg from the middle of 2008.

In April 2008 a first exercise with FLIWAS was held in the Netherlands. Also this exercise proved that FLIWAS is very useful in calamity situations. During the VIKING exercise 'ROAR' FLIWAS functioned very well during the exercise. The main strength of the system, the unequivocal and tailormade information for information, came to its right. The users of the system are mainly enthusiastic about the information- and communication functionality. Also the actions immediately attached to the information earned good critics. After this successful exercise the NOAH project partners will focus on the implementation of the system at the other water boards and the further development of the system.

2.4 Public awareness and involvement

Another important issue the project addresses is the increasing demand of the general public for reliable and unambiguous information. From recent high water situations (e.g. the Elbe flood) it is known that the public was informed by several authorities and the media in a diffuse way, leading to uncertainty and unwanted actions such as unnecessary evacuations. Within the project, instruments are developed and implemented to inform and actively involve the general public on high water issues.

In NOAH, the concept of High Water Partnerships is applied. In High Water Partnerships all relevant stakeholders in a community, such as the city council, entrepreneurs, NGOs and the public are brought together. The idea is that in this setting the interests of all parties are identified and looked after and that information transfer is simplified. By providing and using additional information on flood risks the required and desired protection level of inhabitants and companies in high-risk areas can be determined and communicated. If they receive more information and become more knowledgeable, people living in flood-prone areas can be expected to take on a higher level of responsibility for their situation. For instance, they may change the interior of their house in a way that reduces the impact and costs of flooding (e.g. stone floor covering instead of carpet or wood) or they can take precautions to keep the water out.

By establishing flood partnerships in areas adjoining the Rhine the required and much needed awareness of the risk of high water and flooding will be created or increased. This meets ICPR demands to increase the sense of responsibility of people living in endangered areas. High Water Partnerships will also become important information channels to introduce the information system FLIWAS and make it accessible to a larger public.

In Baden Wuerttemberg, the first High Water Partnership was established in the city of Au am Rhein on November 11, 2004, and a score of others has followed. At the moment, Baden Wuerttemberg has been subdivided in a total of 15 High Water Partnerships, covering the whole state (figure 4).

2.5 Project progress

The ultimate objective of the project is to increase flood awareness and to create a common interest for information transfer on high water related issues along a river. Therefore project partners are very actively involving other water management organizations by sharing project results on websites (www.fliwas.eu), by reporting project progress in the NOAH newsletter and by presentations on seminars and in written journals. The NOAH final conference will be held in The Netherlands from 13 – 15th of May 2008.

The project received very positive feedback from the field. For instance, the Hochwassernot-gemeinschaft Rhein, representing all North Rhine Westphalia cities along the Rhine, joined the project as an observer. It also became apparent that further development of the system to support coastal zone

flood management is feasible and desirable, especially after recent flood events in the north of England, Ireland and the Baltic Region. The NOAH project has been rewarded with additional funding to expand the project and broaden the installed base of FLIWAS to Ireland and other organisations in the Netherlands and Germany.

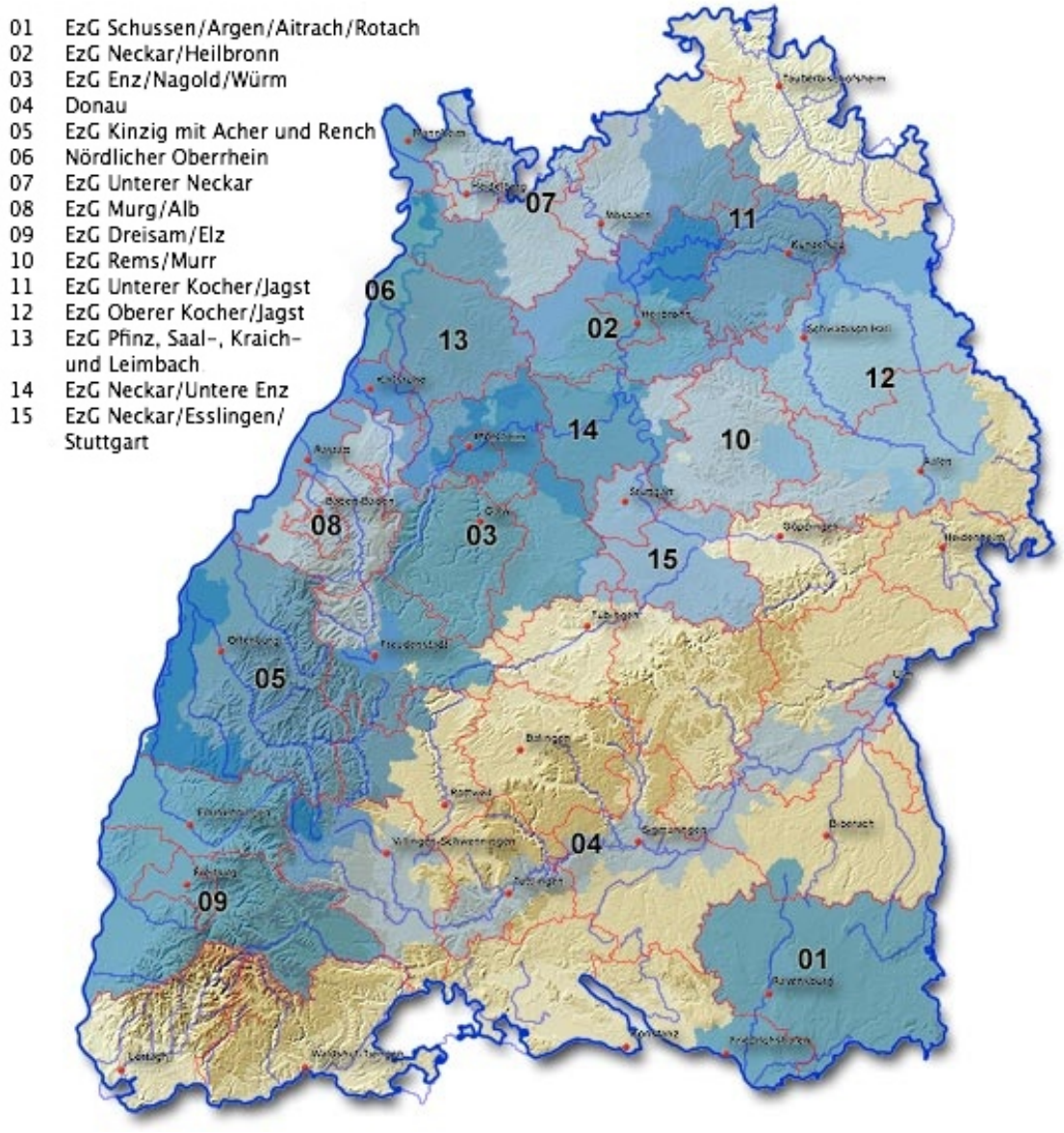

Figure 4: High Water Partnerships in Baden Wuerttemberg, Germany

Another success is the approval of the CADSES INTERREG IIIb project MOSES involving nine partners from Slovakia, Hungary, Germany, Romania and Ukraine. At the moment, implementation of FLIWAS is considered for Slovakia.

The need for such a strategic project as NOAH is underlined by the outcome of the European Council meeting on the 14th of October 2004, in which the Council agreed that Member States should develop and implement flood risk management plans and flood risk maps for river basins and coastal areas. The resulting Flood Directive has been approved by the European Commission on June 27th 2006. NOAH, MOSES and FLIWAS fit perfectly within this development.

In the Netherlands, a Taskforce Management Flooding (TMO) has been established and is working to prepare the Netherlands to major flooding events. TMO has adopted FLIWAS as a major communication tool to be used in a nationwide exercise which will be held in November 2008. With regard to speeding up implementation of FLIWAS, instruments are created to support (future) users of FLIWAS, such as training courses, e-learning and implementation tools.

3. CONCLUSIONS

The NOAH project with development of the high water management system FLIWAS acts upon the widely spread urge to improve information transfer and communication during flooding events. Key feature is that FLIWAS enables organizations to implement their own contingency plans and basic data on one hand and to structure the information and initiate actions during events on the other hand.

First results with exercises based on the use of FLIWAS are very promising. Before summer 2008 a fully operational version of FLIWAS will become available for organisations in the field of water and calamity management. The project is well underway and fits also perfectly in recent EU developments regarding the Flood Directive.