

Flood crisis management in the Meuse basin

General framework of the strategies, methods, tools and technologies used at different territorial scales and by different stakeholders



Title	Flood crisis management in the Meuse basin : General framework of the strategies, methods, tools and technologies used at different territorial scales and by different stakeholders.
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Partners involved	EPAMA - APS - Rijkswaterstaat - Waterschap Aa en Maas – CETMEF – Flanders Hydraulics Research
Work package	4
Action	25

AMICE *Adaptation of the Meuse to the Impacts of Climate Evolutions* is an INTERREG IVB North West Europe Project (number 074C).

Climate change impacts the Meuse basin creating more floods and more droughts. The river managers and water experts from 4 countries of the basin join forces in this EU-funded transnational project to elaborate an innovative and sustainable adaptation strategy. The project runs lasts from 2009 through 2012.

To learn more about the project visit: www.amice-project.eu

The NWE INTERREG IV B Programme

The Programme funds innovative transnational actions that lead to a better management of natural resources and risks, to the improvement of means of communication and to the reinforcement of communities in North-West Europe.

To learn more about the programme visit www.nweurope.eu



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1 OBJECTIVES

1.1 The global context: the AMICE project

In the future there will be more floods and more droughts. Adaptation to changing circumstances is a necessity - but we can choose how we take action.

AMICE is an Interreg IV B Project dedicated to the “Adaptation of the Meuse to the Impacts of Climate Evolutions”. 17 Partners from the international Meuse basin are working together from 2009 to 2012 to propose an integrated and coordinated strategy in water management. The project is divided into 5 Workpackages testing different ways of adaptation and the present report forms the basis of Workpackage 4 cooperation.

Construction projects alone are insufficient to cope with some extreme water events. AMICE wants to improve how water managers and the rescue services anticipate and react to flood events. With the help of interactive software and the experience of AMICE Partners, flood crisis management can be improved and this will ultimately be tested through a transnational, flood-risk management exercise.

The Partners involved are :

- EPAMA, water manager on the French area of the Meuse basin
- CETMEF, French institute for maritime and inland waterways
- APS, Walloon agency for prevention and security
- Flanders Hydraulics Research, research centre for hydraulic sciences in Antwerp
- Waterboard Aa en Maas, Dutch water manager
- Rijkswaterstaat, Ministry of Transport, Public Works and Water Management

1.2 Objectives of the present report

The objective of action 25 in AMICE WP4 consists in comparing the methods, procedures and software used for flood crisis management. It will describe the use and experience gained respectively through the dedicated software used by the WP4 AMICE Partners involved.

To reach this objective, a questionnaire (see Annex 2) has been completed by the WP4 AMICE Partners, presenting their situation and tasks in their national and/or local contexts.

Three meetings were organized for the Partners to know each other, present the software and discuss cooperation on June 18th, September 24th and December 17th 2009. The participants are listed below.

Partners :

- Erik BIJWAARD (Rijkswaterstaat)
- François HISSEL (CETMEF)
- Sébastien RENOU, Maïté FOURNIER (EPAMA)
- Jean-Paul RINGLET, Michèle BOOTEN (APS)
- Mathijs VAN DEN BROEK (Waterboard Aa en Maas)
- Wouter VANNEUVILLE, Leen BOECKX (Flanders Hydraulics Research)

Consultants :

- Gilles MOREL (UTC)
- Guy TALIERCIO (GTConsultant)
- Hanneke VREUGDENHIL (HKV Consultants)

Observer :

- Martine LEJEUNE (RIOU)

The present document consists in presenting the analysis of the questionnaires (second and third chapter) and the opportunities of transnational cooperation regarding flood crisis management (fourth chapter).

2 QUESTIONNAIRE ANALYSIS PART ONE : KNOWLEDGE ABOUT FLOOD MANAGEMENT

This analysis presents how flood crisis management is organized in the Meuse countries and the position of the different Partners.

In the text : Acronyms in bold are developed in the glossary at the end of this document.

2.1 Flow of information from the hydrological data to forecast and decision support system

2.1.1 France

Figure 2.1 shows the flow of information in France on the Meuse river basin.

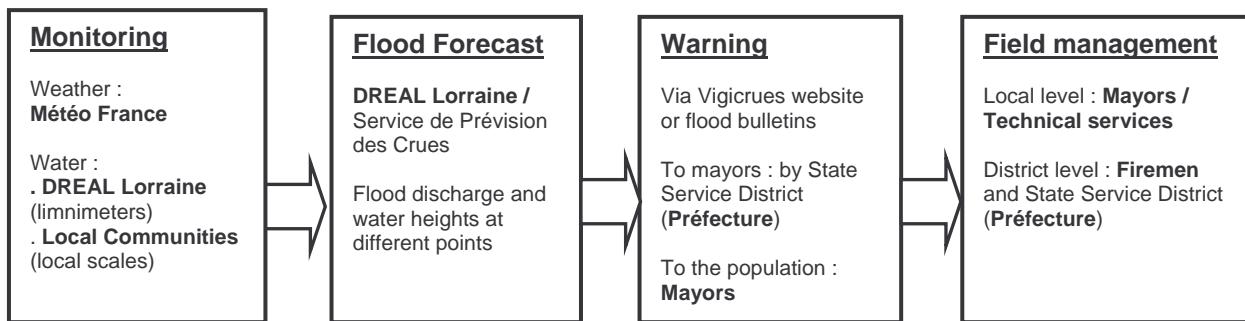


Fig 2.1: Flow of information in France

Table in Annex, paragraph 5.3

Monitoring

An official river monitoring system is managed by the state services at the Regional environmental service (**DREAL** Lorraine) at basin level. Data are in relation to a limited number of gauges pre-identified in the official monitoring network. Information are reported and published at a national level on the internet on the Vigicrues website, in order to be used by population and decision makers at local level : <http://vigicrues.ecologie.gouv.fr>

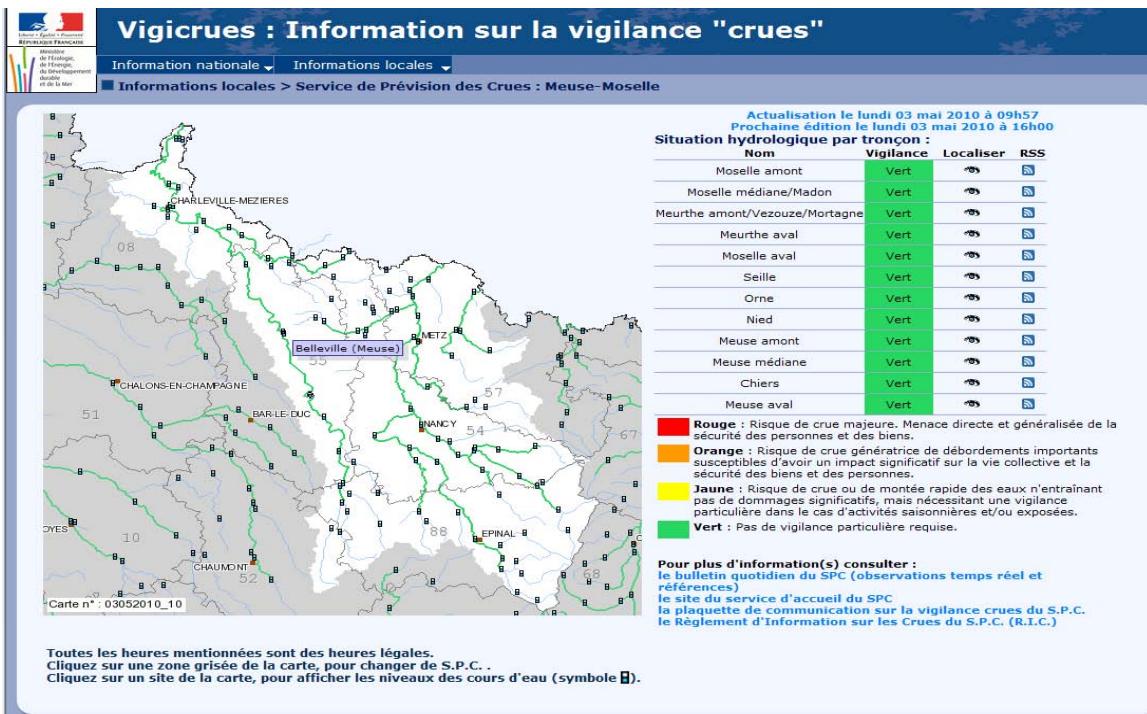


Fig 2.2: Vigicrues webpage for DREAL Lorraine territory

Vigicrues : Information sur la vigilance "crues"

Information nationale ▾ Informations locales ▾

Informations locales > Meuse-Moselle > Données temps réel : Monthermé

Graphique Tableau Infos station

Monthermé (Meuse) - Hauteurs en m

Date	Monthermé	Charleville-Mézières	Choоз [Ile Graviat]	Choоз [Trou-du-Diable]	Landrichamps	Montcy-Notre-Dame	Sedan
03/05/2010 07:00	3.62	2.49	0.56	0.9	0.46	0.96	2.96
03/05/2010 06:00	3.62	2.49	0.56	0.9	0.44	0.96	2.96
03/05/2010 05:00	3.62	2.49	0.54	0.9	0.43	0.96	2.96
03/05/2010 04:00	3.62	2.49	0.54	0.89	0.42	0.96	2.96
03/05/2010 03:00	3.63	2.49	0.54	0.89	0.43	0.95	2.96
03/05/2010 02:00	3.62	2.47	0.54	0.89	0.43	0.94	2.96
03/05/2010 01:00	3.63	2.47	0.54	0.89	0.43	0.94	2.96
03/05/2010 00:00	3.63	2.47	0.54	0.89	0.44	0.94	2.96
02/05/2010 23:00	3.63	2.47	0.54	0.89	0.43	0.94	2.95
02/05/2010 22:00	3.64	2.47	0.54	0.89	0.43	0.94	2.95
02/05/2010 21:00	3.64	2.47	0.54	0.9	0.43	0.95	2.94
02/05/2010 20:00	3.63	2.46	0.54	0.9	0.44	0.95	2.94
02/05/2010 19:00	3.63	2.46	0.54	0.91	0.43	0.95	2.93
02/05/2010 18:00	3.62	2.46	0.55	0.91	0.43	0.95	2.93
02/05/2010 17:00	3.63	2.46	0.55	0.91	0.42	0.96	2.93
02/05/2010 16:00	3.63	2.46	0.54	0.9	0.41	0.95	2.94
02/05/2010 15:00	3.63	2.46	0.54	0.9	0.42	0.96	2.93
02/05/2010 14:00	3.63	2.45	0.54	0.9	0.43	0.96	2.94
02/05/2010 13:00	3.63	2.45	0.55	0.9	0.42		2.96
02/05/2010 12:00	3.63	2.43	0.55	0.9	0.42		2.93
02/05/2010 11:00	3.63	2.42	0.55	0.9	0.42		2.94
02/05/2010 10:00	3.63	2.42	0.55	0.9	0.42		2.94
02/05/2010 09:00	3.63	2.42	0.55	0.9	0.41		2.94
02/05/2010 08:00	3.62	2.42	0.55	0.9	0.41		2.93
02/05/2010 07:00	3.61	2.42	0.55	0.9	0.41	0.98	2.93
02/05/2010 06:00	3.61	2.42	0.55	0.9	0.41	0.99	2.93
02/05/2010 05:00	3.61	2.43	0.55	0.9	0.41	0.98	2.94
02/05/2010 04:00	3.61	2.44	0.55	0.9	0.41	0.98	2.94
02/05/2010 03:00	3.61	2.45	0.56	0.91	0.41	0.97	2.94
02/05/2010 02:00	3.62	2.40	0.56	0.91	0.41	0.95	2.94

Fig 2.3: Vigicrues – Example of gauge data

Other gauges, which constitute a kind of "non automatic local monitoring network", are also available in many communities (city/village level).

EPAMA developed *InfoMeuse*, a web-collaborative information system that gives access to the two networks (http://www.epama.fr/files_fr/epama_risques/infomeuse.php4).

InfoMeuse, Mieux anticiper les crues

[Présentation](#) [Inscription](#)



L'EPAMA lance InfoMeuse, un service en réseau entre les acteurs du fleuve Meuse et de ses affluents.

InfoMeuse permet l'échange de données sur les niveaux d'eau observés en période de crue.

Suivi des niveaux d'eau en cas de crue
Des informations sur les hauteurs d'eau sont fournies par la DIREN Lorraine et accessibles sur le site [vigicrues de l'Etat](#).
Les services et élus des communes suivent également l'évolution des crues sur le terrain en relevant régulièrement les hauteurs d'eau aux échelles les plus proches. Ils peuvent saisir leurs observations sur InfoMeuse.
Tous les relevés sont pris en compte et publiés sur InfoMeuse en temps réel.

Partage des relevés entre communes
InfoMeuse rend disponible sur internet tous les relevés aux utilisateurs recensés dans les communes inscrites. L'utilisateur choisit les points de mesure situés sur sa commune et en amont ; il visualise les nouvelles hauteurs d'eau relevées avec une fréquence de quelques minutes.
InfoMeuse est accessible depuis un ordinateur ou tout autre terminal mobile connecté à Internet.

Notifications paramétrables
Chaque utilisateur peut paramétriser le déclenchement de notification. Pour les points de mesure de son choix, il paramètre la hauteur au delà de laquelle il souhaite recevoir un [mail](#) ou [un sms](#). Dès que le seuil est atteint, InfoMeuse transmet un message à l'utilisateur. Une fonction d'InfoMeuse permet aux collectivités qui le souhaitent de publier directement les informations les concernant sur leur propre site Internet.

Le service InfoMeuse est gratuit et ouvert aux élus et services de toutes les communes ou communautés de communes du bassin de la Meuse

[Cliquez ici](#)

[Téléchargez la plaquette de présentation du service InfoMeuse \(pdf, 300 Ko\)](#)

Quelques captures d'écran d'InfoMeuse :

Choix des stations préférées :

Fig 2.4: InfoMeuse presentation

The weather monitoring is managed by Météo-France. This information is used at the Regional environmental service level for preparing flood forecast.

Forecast

Official forecast is provided by the flood forecast services (**DREAL Lorraine**) at basin level. On the Meuse river basin, the forecast is both qualitative (colours from green to red in reference to the hydro-meteorological context) and quantitative (water heights and discharges at the gauges). The information is displayed on the Vigicrue website.

http://www.vigicrues.ecologie.gouv.fr/niv_spc.php?idspc=2

Local communities can also produce local forecast based on data from the different monitoring systems, their own experience or hydrological analysis provided by EPAMA.

Warning

Under national regulation, the state services at district level are in charge of warning the mayors. Once the warning has been provided, mayors have the responsibility to look for information about the evolution of the flood.

Field management

Field management is ensured by:

- By technical services at local communities level, as far as they have autonomous capabilities to face the flood.
- By firemen and emergency services, in case of major flood.

Action plan

Action plans are prepared and managed at each local community level. In case of important flood, the state services at district level become in charge.

EPAMA offers the mayors means and methodologies to prepare and manage the local safety plans. The methodology is based on the OSIRIS software.

2.1.2 Wallonia (Belgium)

The following figure shows the flow of information in Wallonia on the Meuse river basin.

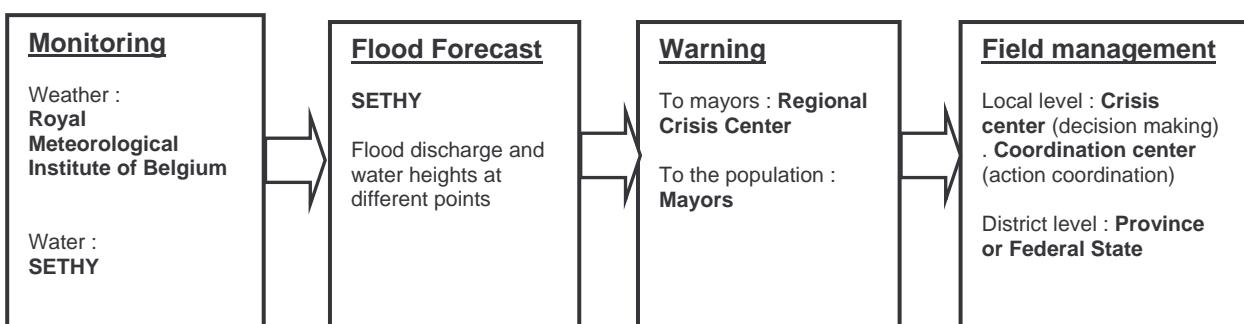


Fig 2.5: Flow of information in Wallonia

Table in Annex, paragraph 5.4

Monitoring

The monitoring system is managed by the **SETHY** (Walloon region). The data are published on the internet <http://voies-hydrauliques.wallonie.be/opencms/opencms/fr> and forwarded to decision-makers by fax, e-mail and telephone.

Meteorological data is monitored by the Royal Meteorological Institute of Belgium.

HAUTE MEUSE : Situation normale								
Avertissement : Les données publiées ci-dessus sont non contrôlées. La fréquence de mise à jour est variable en fonction des stations et de la situation hydrologique.								
Hauteurs (m)								
Station	Rivière	Phase	05/04 - 6h	05/04 - 12h	05/04 - 18h	05/04 - 24h	06/04 - 6h	
PROFONDEVILLE	MEUSE	● ↗	1,29	1,22	1,22	1,18	1,20	
LUSTIN	MEUSE	● ↗	1,56	1,58	1,55	1,50	1,49	
DINANT	MEUSE	● ↗	1,07	1,12	1,04	1,02	0,97	
ANSEREMME Monia	MEUSE	● ↗	1,38	1,39	1,34	1,31	1,26	
YVOIR	BOCQ	● ↗	0,49	0,48	0,48	0,48	0,48	
WARNANT	MOLIGNEE	● ↗	0,60	0,60	0,59	0,59	0,59	
HASTIERE	HERMETON	● ↗	0,82	0,74	0,67	0,64	0,60	
FELENNE	HOUILLE	● ↗	0,92	0,91	0,90	0,90	0,89	
CHOOZ	MEUSE	● ↗	1,82	1,85	1,86	1,82	1,78	
Débits (m³/sec)								
Station	Rivière	Phase	05/04 - 6h	05/04 - 12h	05/04 - 18h	05/04 - 24h	06/04 - 6h	
YVOIR	BOCQ	● ↗	2,7	2,6	2,6	2,6	2,6	
WARNANT	MOLIGNEE	● ↗	2,1	2,0	2,0	2,0	1,9	
CHOOZ	MEUSE	● ↗	308,4	317,0	318,9	307,8	297,3	
Pluies (mm) - somme sur 6 heures								
Station	Rivière	Phase	05/04 - 6h	05/04 - 12h	05/04 - 18h	05/04 - 24h	06/04 - 6h	
SAINT-GERARD	(BURNOT)	●	0,1	0,1	0,0	0,0	0,0	
CRUPET	(BOCQ)	●	-	-	-	-	-	
CINEY	(BOCQ)	●	0,1	0,1	0,0	0,0	0,0	
FLORENNES	(MOLIGNEE)	●	0,2	0,0	0,0	0,0	0,0	
GEDINNE	(HOUILLE)	●	0,1	0,1	0,0	0,0	0,0	

Autre bassin Carte détaillée Provinces et

Fig 2.6: Monitoring data on the SETHY's website

Forecast

Flood forecast is done by **SETHY**. The information consists in water levels and velocities. Forecast takes into account the information from the French area upstream.

Warning

If predefined thresholds are reached, warnings are forwarded to mayors by the Regional Crisis Center of the Walloon Region.

Field management

Field management is the task of:

- The technical services at local communities level, with firemen support, as far as they have autonomous capabilities to face the flood. Each local communities set up a Crisis centre for decision making and a Coordination centre for coordinating technical and public services.
- The provincial or even federal emergency services, if the flood is too important.

Action plan

Intervention and emergency plans (Plans d'Urgence et d'Intervention) are pre-identified and managed at the local level in coordination with the Province.

APS offers the mayors means and methodology to pre-identify and manage local safety plans for all kind of risks.

2.1.3 Flanders (Belgium)

The following figure shows the flow of information in Flanders on the Meuse river basin.

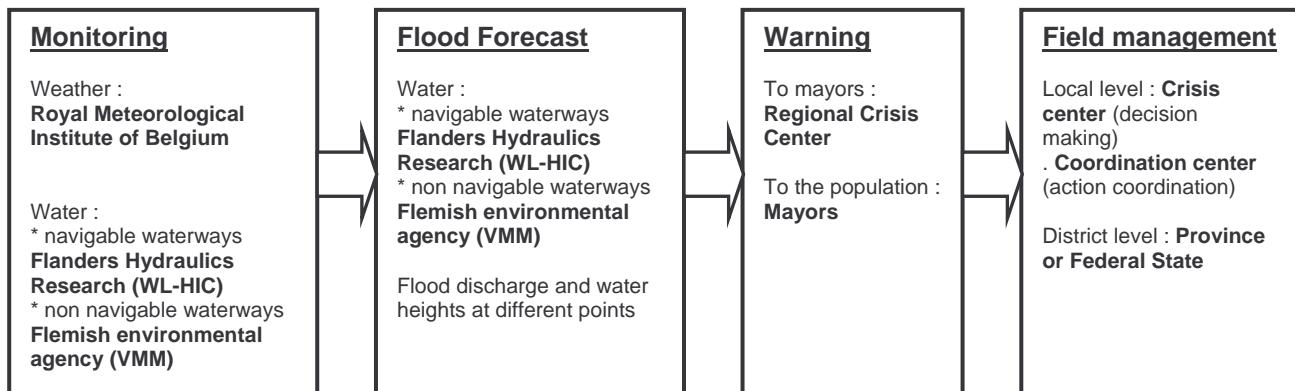


Fig 2.7: Flow of information in Flanders

Table in Annex, paragraph 5.5

Monitoring

The monitoring system is managed by the two regional organizations, Flanders Hydraulics Research (**WL-HIC**) and the Flemish environmental agency (**VMM**).

Data sharing with Rijkswaterstaat (NL) is operational on the Border Meuse.

Meteorological data is monitored by the Royal Meteorological Institute of Belgium Flanders Hydraulic Research (**WL-HIC**) and **VMM** also monitor rainfall in Flanders with its own raingauge network.

Flanders Hydraulics Research (**WL-HIC**) publishes real-time measurements on the internet: www.waterstanden.be

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Gebruikersnaam

Wachtwoord

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Hydrologisch InformatieCentrum - HIC

Het Hydrologisch InformatieCentrum of kortweg HIC, behoort tot het Waterbouwkundig Laboratorium en valt onder het Departement Mobiliteit en Openbare Werken van de Vlaamse Overheid.

We verzamelen en beheren alle hydrologische gegevens die relevant zijn voor het beheer van de bevaarbare waterlopen in Vlaanderen. Deze website geeft je toegang tot de data voor de laatste 10 dagen.

Hoogwaterberichten

Onze hoogwaterberichten bevatten informatie over de huidige en de verwachte weersituatie en hydrologische toestand. Voor de verwachtingen op de bevaarbare waterlopen gebruiken we resultaten uit onze voorspellingssmodellen. Deze riviermodellen kijken 48 uur vooruit in de tijd.

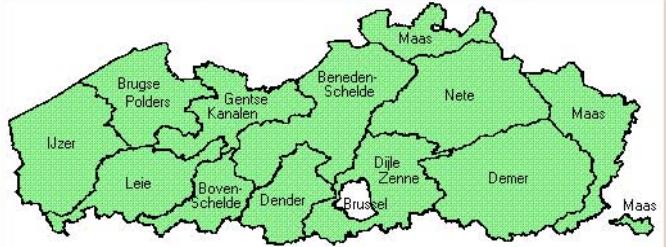
Hydrologische situatie op 21/04/10 om 9 uur

De afvoersituatie op de bevaarbare waterlopen is en blijft de komende dagen normaal.

hoogwaterbericht

Meetpunten Pluviografen Verwachting tijgebied Schelde

Waterstanden, debieten en neerslaggegevens voor de laatste 10 dagen.



More information

Laagwaterbericht

Het recentste laagwaterbericht is te raadplegen onder Publicaties \ Laagwaterberichten.

Nieuws

- 13-uursmetingen in het Zeescheldebekken 20-04-2010
- Sedimentologisch laboratorium WL blijft kwaliteit verhogen 30-03-2010
- Helikoptervlucht boven de overstroomde IJzer 08-03-2010
- MONEOS-jaarboek monitoring WL 2008 24-07-2009
- Neerslagmetingen voor het Vlaamse waterbeheer 24-07-2009

Foto's



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Voor schade en/of ongemak tengevolge van onjuistheid of onvolledigheid in deze berichtgeving kan door HIC geen verantwoordelijkheid worden aanvaard. Externe waak- en alarmpeilen zijn opgegeven door de lokale beheersafdelingen en gerelateerd aan gevaarlijke terreinsituaties. De HIC-hoogwaterberichten zijn gebaseerd op de externe waak- en alarmpeilen.

Fig 2.8: Waterstanden website – Homepage

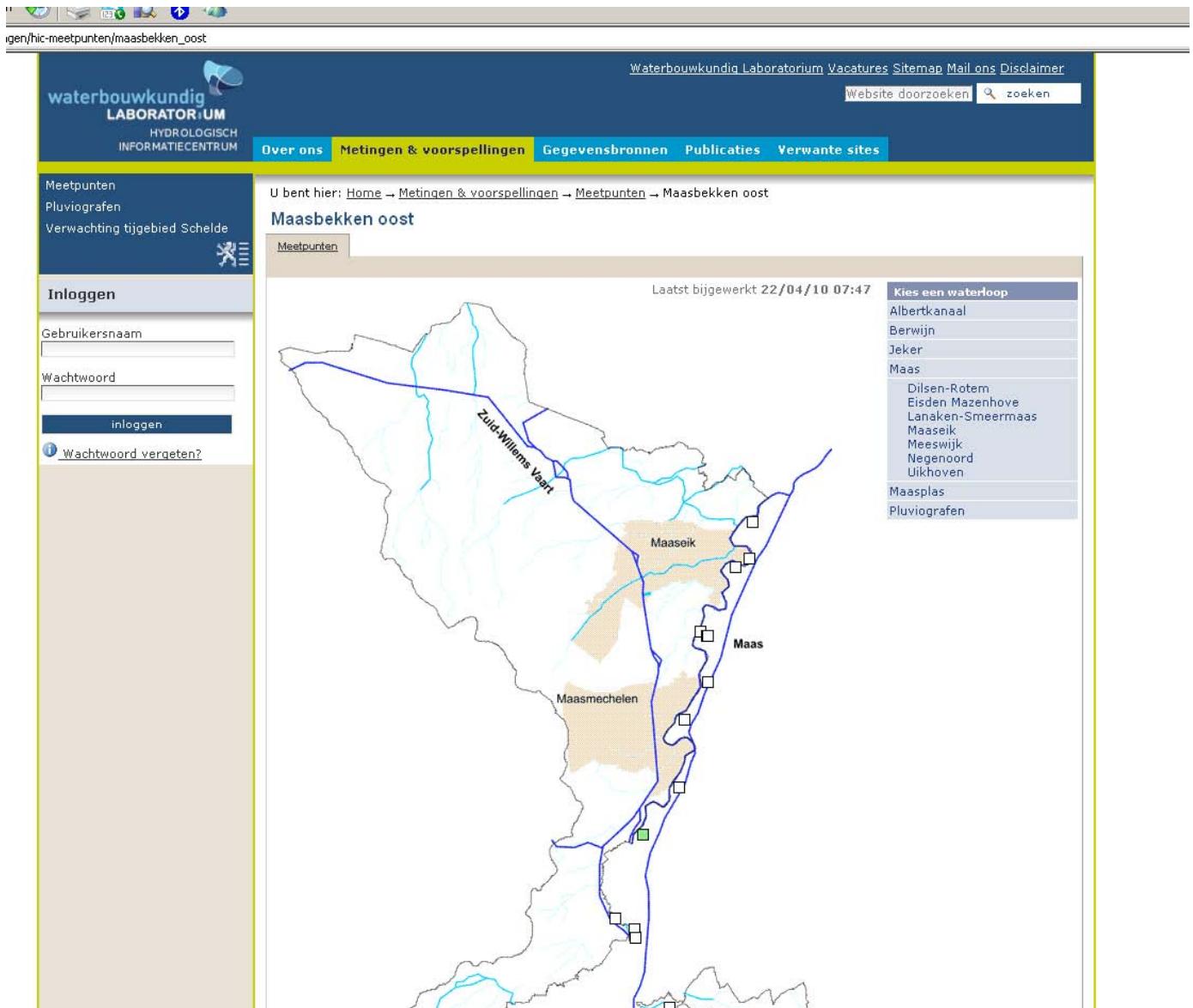


Fig 2.9: Waterstanden website – East Meuse Flanders basin page

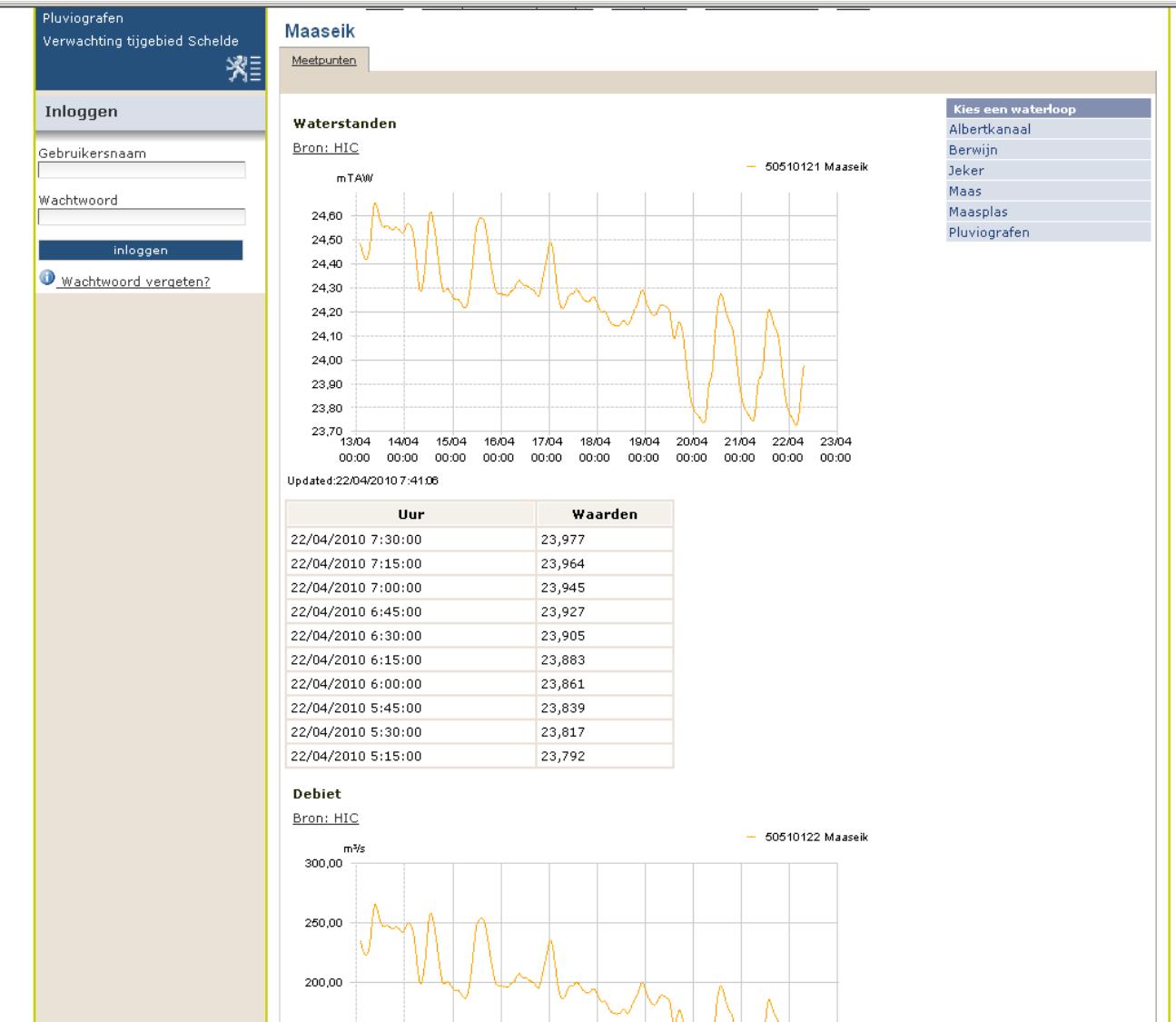


Fig 2.10: Waterstanden website – Example of gauge data

Forecast

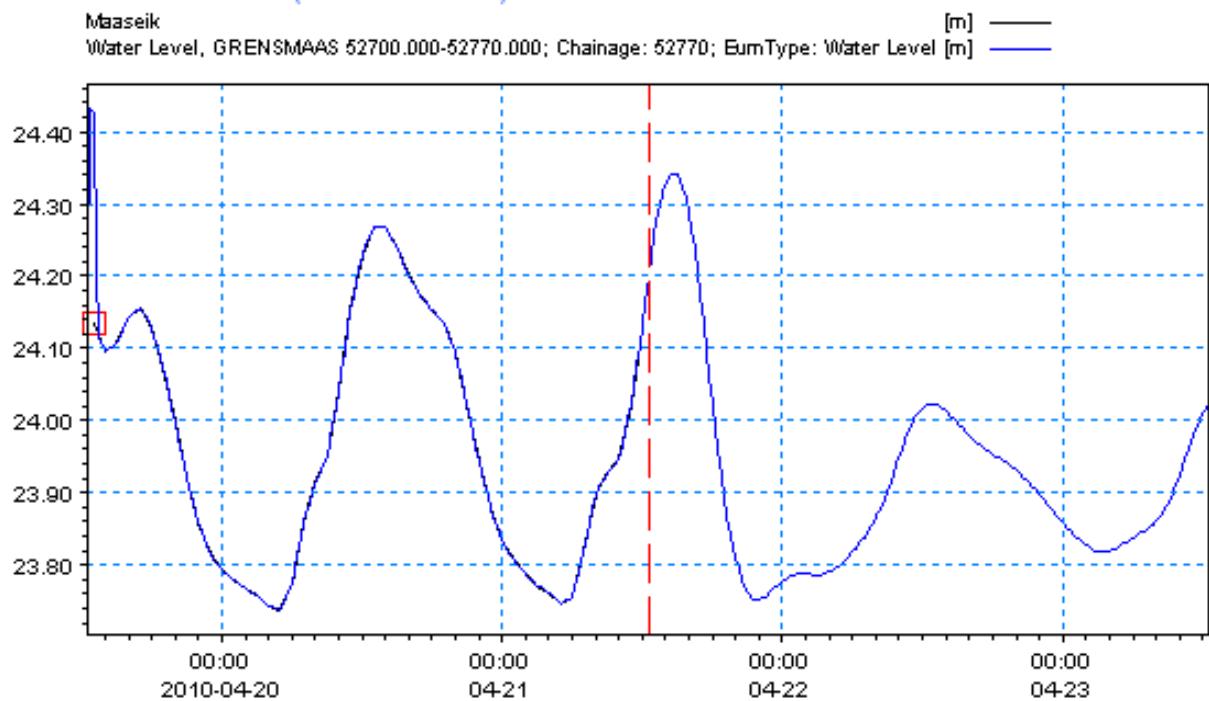
Forecast is provided by Flanders Hydraulics Research for navigable waterways and by the Flemish environmental agency for non navigable waterways.

The information consists in water levels and discharges forecast at several locations. The result of hydraulic model runs or published on the internet 4 times a day. (www.waterstanden.be, access to forecast-graphs only with account, new website under construction at the moment)

Forecast takes into account information from Dutch and Walloon areas upstream.

Maaseik

Maaseik Waterstanden (hic::::50510111)



Maaseik Afvoer (hic::::50510102)

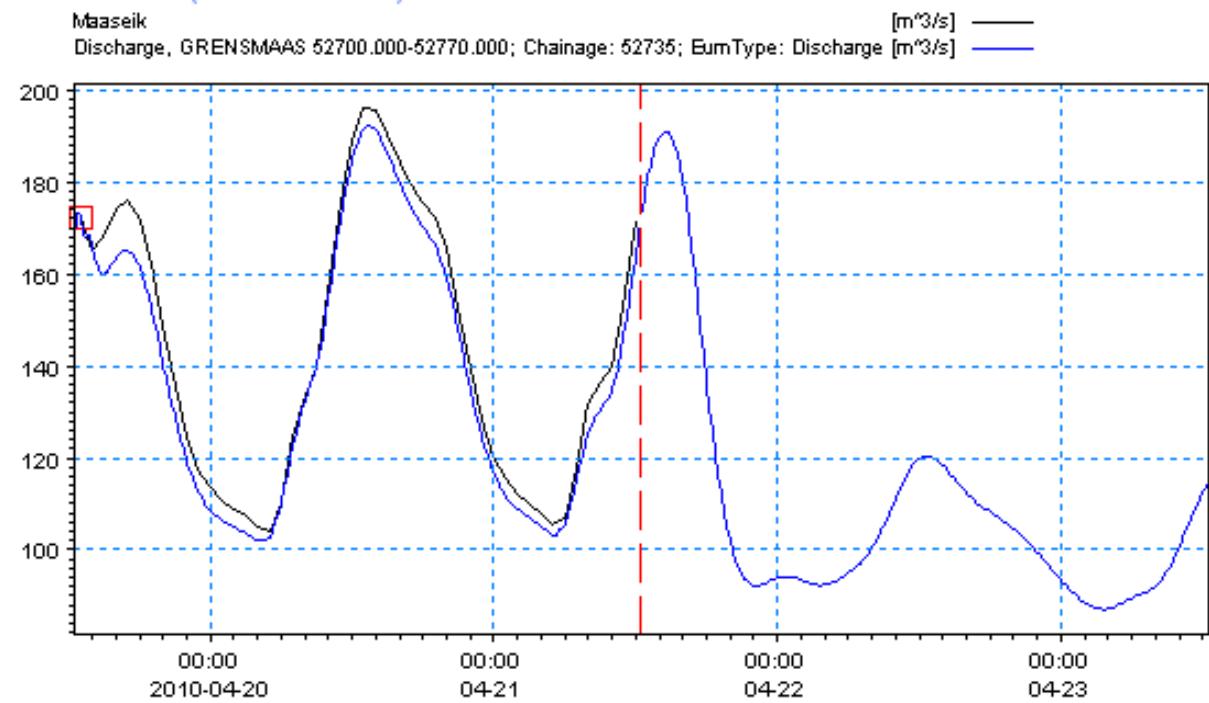


Fig 2.11: Forecast provided in water level and discharge at a gauge station

Warning

The forecast information is derived into “high water information messages” from regional to province level. These “high water information messages” are published 3 times a day on www.waterstanden.be. In times of increased flood risk, these messages are published up to 5 times a day and actively spread to water managers, crisis centres, mayors... The RIS (River Information Service) is responsible for the spreading of these messages.

Action plan

Action or “disaster plan” is managed at the municipality level under the authority of the mayor. Depending on the evolution of the flood, the disaster plan might be up-scaled at provincial and federal level.

2.1.4 The Netherlands

The following figure shows the flow of information in the Netherlands on the Meuse river basin.

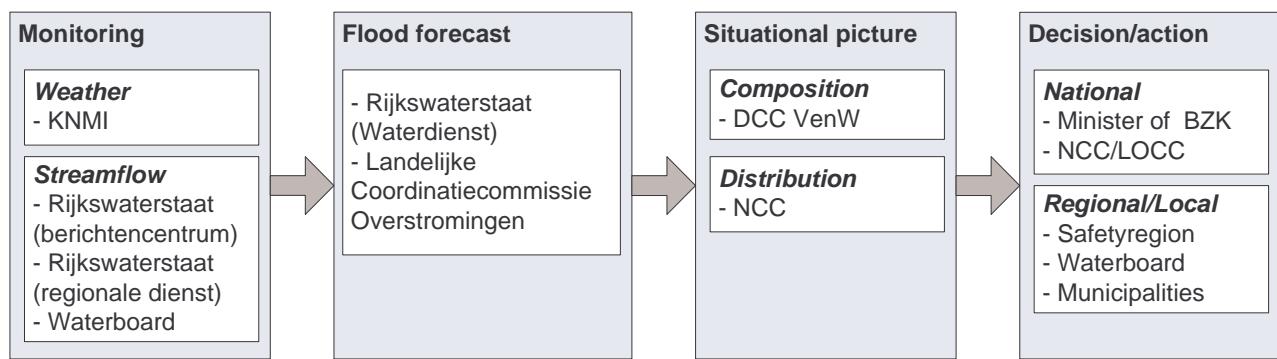


Fig 2.12: Flow of information in The Netherlands

Table in Annex, paragraph 5.6

Monitoring

The main river monitoring system is managed by the Rijkswaterstaat (**RWS**). Waterboards can add local data when available.

Meteorological data is provided by the Royal Dutch Meteorological Institute (**KNMI**).

Forecast

Flood forecast is made by **RWS**, in collaboration with regional services.

Upstream data and forecast are used.

Warning

When pre-defined discharge values are reached, national flood messages are sent to decision makers (governments, emergency services, companies...).

Action plan

The national commission for flood threat (**LCO**) plays a key role for supra-regional provision of information. The **LCO** provides a national water picture.

This situation is combined at national level by the Coordination centre of the Ministry of transport, public works and water management (**DCC V** and **W**) with other available information related to traffic management, shipping, ... This leads to a lumped picture of the threat situation, which is supplied to the National Crisis Centre (**NCC**).

NCC forwards the information to Ministries, operational coordination centres, Safety regions, ...

In parallel, regional and national crisis organizations are getting ready, in case the alarm is scaled-up to regional or national level.

Locally, action plans and decision making are the responsibility of mayors and their local councils. Local and regional knowledge is supplied by the Waterboards.

2.2 Partners' position in the flood management system

2.2.1 EPAMA

On the French Meuse river basin, EPAMA gives support to the local officers to increase their own capability to face crisis, by providing:

- Information system (OSIRIS, web sharing info system)
- Calculation of flood states
- Hydrological tools for establishing relationships between gauges and flood scales

2.2.2 APS

APS provides a specialist service to the Province of Luxembourg and its municipalities, for the preparation of emergency plans for all kind of risks including flood.

APS created and implements the "Municipal plan", a software for local emergency planning.

APS coordinates its action with the Federal government of Belgium, the Walloon Region, the Provinces, the Mayors, the Fire and Health services, the Civil defence and security.

2.2.3 Flanders Hydraulics Research

Flanders Hydraulics Research (**FHR**) is the forecast service for the main waterways of Flanders (Meuse and channels). The forecast for small waterways is done by **VMM**. **FHR** is also producing the alert messages in case of high water levels.

2.2.4 Rijkswaterstaat

RWS is responsible for providing accurate water levels and communication in case of floods.

2.2.5 Waterboard Aa en Maas

The Waterboard Aa en Maas is a user of **FLIWAS** and the manager on the Meuse tributaries. They are responsible for drafting the calamity plans and for field management in case of high waters.

2.3 Notable experience gained through past crisis or incidents on the Meuse river basin

All partners have experience of floods, especially with the 1993 and 1995 events on the Meuse river basin.

Most dramatic consequences of these floods have occurred in the Netherlands. In 1995, about 250 000 inhabitants were evacuated from the threatened areas.

The feedback from these floods was analyzed by RWS:

Decision making and coordination

- Necessity to develop good disaster management plans.
- Necessity of unambiguous coordination: who does what in which situation, and which task and means are appropriate.

Provision of information

- Unambiguous information is a fundamental requirement for decision making. RWS experience leads to distinguish information for administrative decision making from information for operational decision making. Unambiguous picture forming of threat, actual situation and operational deployment of means is also regarded as a necessary link in the chain of information.

Relief

- Harmonisation, coordination of reliefs appears to be a necessity. The difficulty to maintain the overview of the deployment of human and equipments is reminded.

Media

- Through the 1995 experience, regional and local, and even national to a lesser degree, media appeared to fulfil an indispensable function towards local people.

2.4 Information from neighbour countries

As a first approach, the experience of past floods highlights the following improvements:

- Actual and expected weather picture
- Actual and expected water picture
- Possible weak points in the barriers, that can lead to international consequences
- Knowledge about the actions of partner organisation / disaster management in neighbouring countries
- Clarity about international relief : who can supply what in which situation
- Clarity about coping with evacuation and viewpoint on ability to cope.

2.5 Crisis coordination in border regions and requirements for effective intervention

The experience gained in 1995 by RWS on the Rhine basin highlights that formal lines for information exchange were too long for decision making and appropriate actions. Informal harmonization was mostly used. Direct contacts, common flood scenarios and joined exercises have been set up between regional organizations since then.

Some requirements are clearly identified by RWS regarding international action on the Meuse river basin:

- Network use for provision of information
- Unambiguous situational picture of the crisis organization
- Situational picture for taking decisions and managing actions
- International cooperation and sharing of scenarios, situational picture, knock-on effects and weak point structures, knowledge about each other's organisational structures and approach and joined exercise

2.6 Exercises of flood crisis management

Exercises of flood crisis management are organized in each country regularly.

2.6.1 France

EPAMA organizes a yearly exercise in autumn, since 2006. This exercise involves all OSIRIS users on the Meuse basin.

- Process
 - EPAMA and flood forecast service create a flood scenario
 - Each city chooses or adapt its own objectives (training, database improvement, action in the field...)
- Feedback
 - Phone conference at the end of each day during exercise for live feedback
 - Final and formal feedback meeting between representatives (1 technical and 1 elected representative for each city) + state staff (district manager + flood forecast regional service) + firemen.

2.6.2 Wallonia (Belgium)

Several exercises have been carried out around the Meuse sub catchments, on the Ourthe and Semois rivers. Feedback is integrated to the local flood plans.

2.6.3 The Netherlands

Several large-scale exercises have taken place.

Waterproof (Waterproof)

The national government put Floods on the agenda in 2008. The government tested a Worst floods imaginable case (**EDOs**: Ergst Denkbare Overstromingen).

In November 2008, the **TMO** organised a national exercise week, during which flood scenarios were tested for coastal, river and lake areas. The objective of the exercise was to get an insight into:

- Decision making
- Information management
- Communication (media and the public)
- Intrinsic quality of action

Governments, emergency services, media and public were involved in these exercises. A national evaluation report was published. In addition, regional/local evaluations were also made.

HELGA

Exercise HELGA was held at the beginning of 2006. The provision of information and mutual harmonization between participating parties was given an especially central place. The exercise objectives were:

- Operational and administrative information exchange during floods
- International administrative harmonisation
- Harmonisation between water managers and disaster fighters
- Team and leadership skills.

The parties involved in the exercise were: safety regions, Waterboards, the province of Gelderland, the District Government of Düsseldorf and two German Districts.

The exercise was evaluated afterwards.

HAGAR

Exercise HAGAR took place in November 2005; it was a multidisciplinary exercise in the safety region of South Gelderland. The flows of information, information systems, organizations and

processes were experimented, with the purpose of achieving (even) more structure and cohesion in activities with the participating parties.

The parties were: police, local councils (4), parts of Public Works and Water Management East-Netherlands, the province of Gelderland and Rivierenland Waterboard.

The exercise was evaluated afterwards.

2.7 Synthesis

On a functional point of view, the flows of information are quite similar from one country to another in the process of monitoring, forecasting, warning and intervention systems.

All processes depend on national regulations.

We can notice that the stakes are quite different between the countries: local stakes in France and Wallonia, with little risk for human life; very important stakes in terms of human life and economic activities in the Netherlands. This could explain the difference in the responsibilities for flood management: mayors in Wallonia and France (possibility of increasing to district / provincial / national level if required), Waterboards in the Netherlands.

The sharing of monitoring and forecast data is already effective between neighbouring countries or regions: between France and Wallonia, Wallonia and Flanders, Flanders and The Netherlands.

Exercises at regional, national or even basin level are already operational and quite frequent but do not exist at international level. Return of experience between countries is rare (exception with Germany and the Netherlands).

3 QUESTIONNAIRE ANALYSIS PART TWO : INFORMATION SYSTEM AND SOFTWARE

The questionnaire was the opportunity to make an inventory of the information systems or software used by each Partner.

3.1 OSIRIS (France)

www.osiris-inondation.fr



Fig 3.1: Osiris Inondation software - Homepage

3.1.1 General presentation

OSIRIS-Inondation is dedicated to local representatives and technical services. The software enables autonomy for flood crisis preparation and management, in agreement with the recommendations from the French Ministry of Defence.

On the Meuse river basin, EPAMA develops a philosophy of global system, stressing on the importance to develop sustainable networks relationships at different levels:

- User level : by permanent relation between the users themselves and with EPAMA
- State and legal level : District, Region, national : with services involved in operational monitoring system, forecast, warning and operational intervention (firemen)

- Intermediate level : in order to develop expertise in some public services and private companies in charge of the implementation of OSIRIS in the field and of the elaboration of local safety plans

OSIRIS implementation is integrated in a broader approach towards local communities. This is a global flood prevention approach based on 3 joint purposes:

- Memory : marking of passed floods in the field (flood landmark)
- OSIRIS and the local safety plan
- Permanent networking



Access to all functions and services are made through the EPAMA web portal "Risque inondation" http://www.epama.fr/files_fr/epama_risques/epama_risques.php4

OSIRIS is dedicated to:

- The preparation of security plans at the local level (crisis preparation), by the local teams and the mayor,
- The planning of interventions in case of a crisis or within an exercise, based on a real-time connection with a forecast bulletin of water levels (at a nearby gauge or/and in sectors).

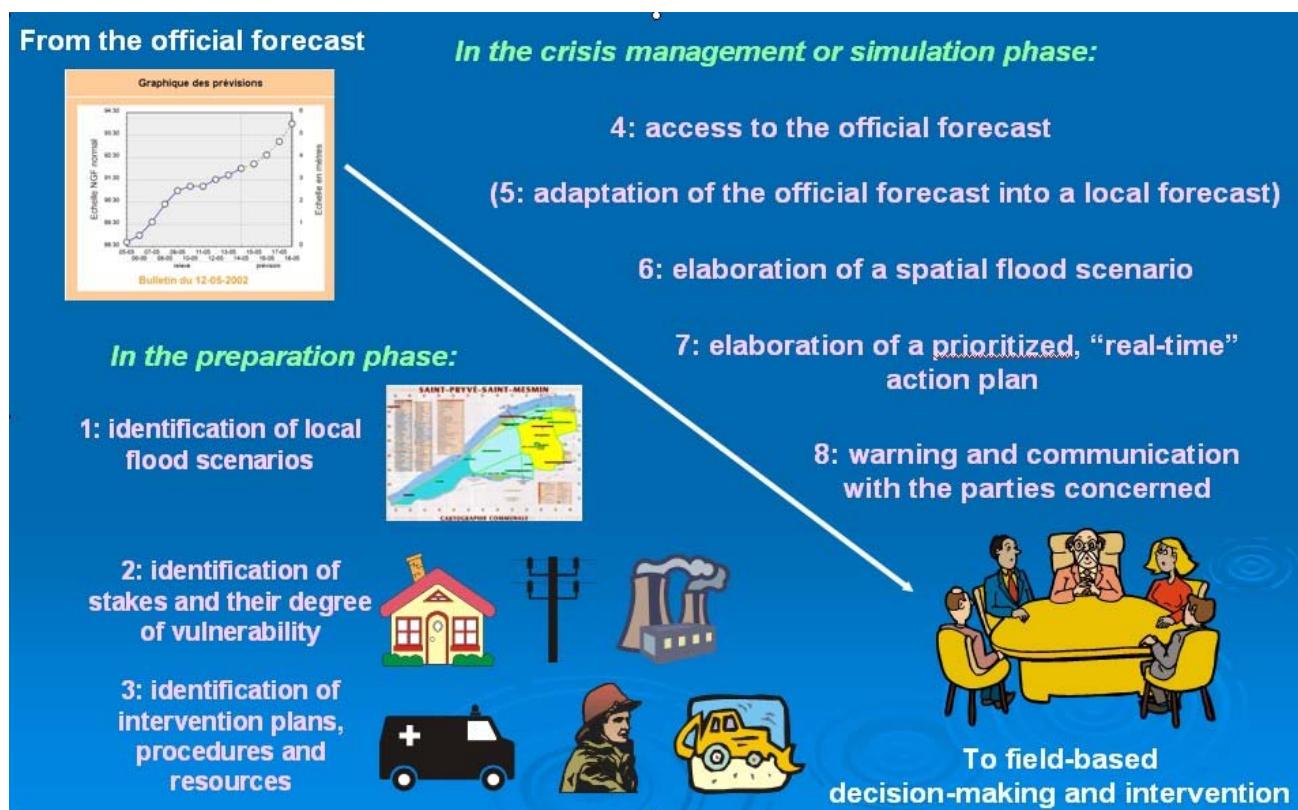


Fig 3.2: The OSIRIS process for crisis preparation and management

The preparation phase consists in filling a database.

From the database, OSIRIS generates a complete pdf document which complies with the obligation for French communities to produce a local safety plan (new 2005 regulation on civil security).

Sigets

- Document
 - Préambule
 - Sommaire
 - Synoptique des opérations par état d'inondation
 - E0 : Pas d'inondation
 - E1 : crue 10 ans
 - E2 : crue 50 ans**
 - E3 : crue 70 ans
 - E4 : crue 100 ans
 - Chapitre des cartes
 - Chapitre des secteurs
 - Chapitre des échelles
 - Chapitre des actions
 - Chapitre des enjeux
 - Chapitre des moyens humains
 - Chapitre des moyens matériels
 - Annuaires
 - Documents de référence
 - Glossaire

Plan d'actions de l'état E2 : crue 50 ans

Actions globales prévues :

Action	Durée	Fait
Assurer la liaison permanente avec le maire ^[65]	12:00:00	

Actions liées aux enjeux :

Nom du secteur	Niveau d'alerte	Enjeux concernés	Action	Durée	Fait
Les clamps nord ^[43]	Fort	Ferme des Bruyères ^[130]	Ferme des Bruyères : information de M. Le mons ^[79]	00:20:00	
Centre ville ^[41]	Faible	Bibliothèque municipale ^[112]	Bibliothèque : mise en sécurité des victimes de livres anciens ^[81]	02:00:00	
Bras mort ^[40]	Fort	Route nord ^[135]	Route nord : battander la route ^[81]	04:00:00	
		Lotissement du bras de décharge ^[131]	Route nord : déviation routière (fermeture) ^[82]	02:00:00	
Quais ouest ^[48]	Moyen	Accès vieux pont ^[118]	Evacuation du lotissement du bras de décharge ^[68]	16:00:00	
		Habitat du quartier Quais Ouest ^[128]	Couper voie d'accès vieux pont (déviation) ^[68]	04:00:00	
		Hôpital ^[138]	Evacuation du quartier quais ouest ^[69]	12:00:00	
		Accès pont Mirabeau ^[128]	Hébergement dans la salle des fêtes de la Butte ^[73]	06:00:00	
		Camping ^[114]	Hôpital : Mise en sécurité de la chaudière du sous-sol ^[72]	02:30:00	
Zone industrielle ^[52]	Moyen	Station d'épuration ^[137]	Hôpital : information du personnel et des résidents ^[74]	01:30:00	
		Accès pont Mirabeau ^[128]	Hôpital : mise en sécurité du matériel sensible ^[76]	05:00:00	
Quartier de la gare ^[31]	Faible	Supermarché Champignon ^[139]	Camping : évacuation ^[82]	12:00:00	
Quai est ^[46]	Moyen	Déchetterie ^[116]	Supermarché : mettre les stocks hors d'eau ^[84]	04:00:00	
			Déchetterie : évacuer les déchets entreposés ^[81]	10:00:00	
			Ouvrir déchetterie annexe ^[91]	02:00:00	

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Fig 3.3: pdf document including the provisional intervention plans for crisis preparation

The second phase (crisis planning) consists in connecting the tool with a water level bulletin or a simulation of water levels. **OSIRIS** interprets the forecast in terms of flood scenario, stakes under threat and actions to be triggered to limit the potential impact (intervention plan). In the case of a coupling with MOISE (or another 1D hydraulic model), the latter can directly provide the flood scenarios (water levels in sectors).

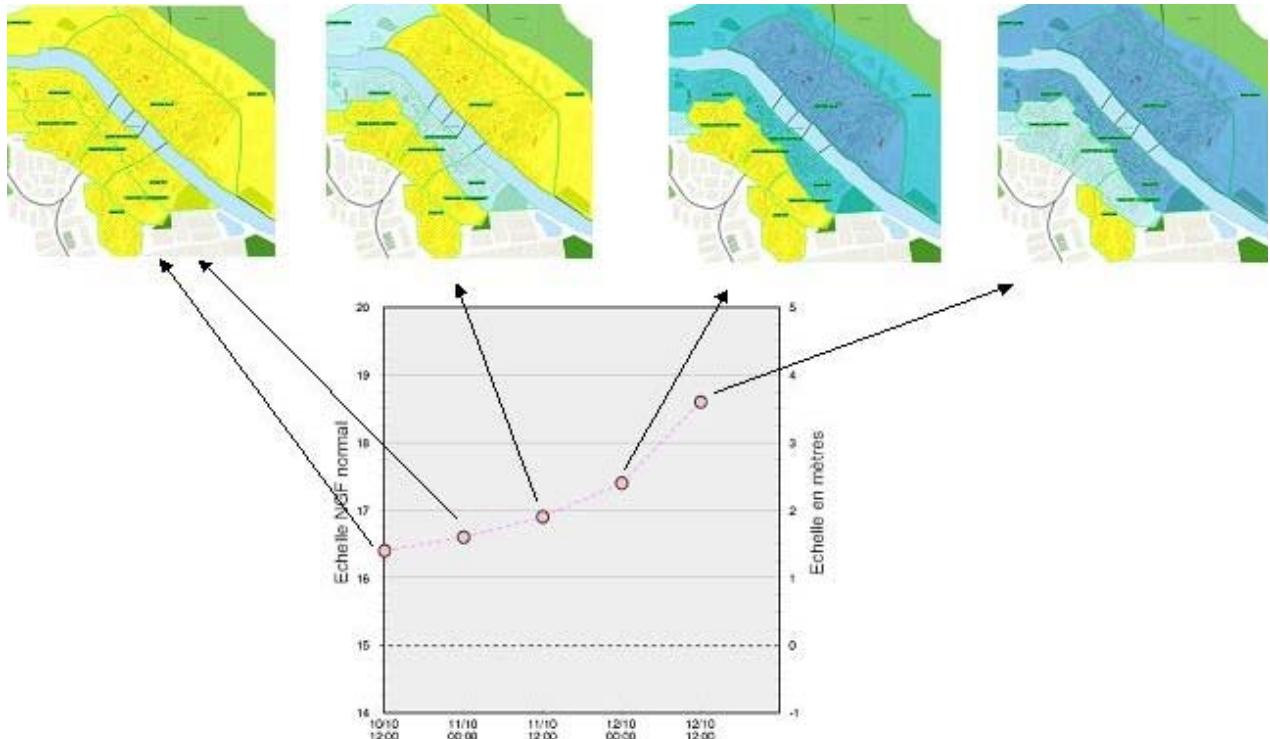


Fig 3.4: Interpretation of a water level bulletin in local flood maps and scenario

OSIRIS Inondation

Préparation de crise | Gestion de crise | Bases de données | Autres

Accueil > Gestion de crise > Plans d'actions > Éditer Version imprimable | Aide
Edition d'un plan d'actions Enregistré le : 10/01/2003

Fiche Plan calculé Cartographie

Actions à déclencher	le 2003/01/10 (à t)	le 2003/01/11 (à t+24h)	le 2003/01/12 (à t+48h)	le 2003/01/13 (à t+72h)	le 2003/01/14 (à t+96h)	
Habitat SDF route de DRY	ARDOUX AVAL	1/Vigilance	EVACUATION CARAVANES	01h00	2003/01/10 00:00:00	2003/01/10 00:00:00
Habitat SDF ROUTE DE MEUNG	ARDOUX AVAL	1/Vigilance	EVACUATION CARAVANES	01h00	2003/01/10 00:00:00	2003/01/10 00:00:00
Habitat SDF route de DRY	ARDOUX AVAL	2/Alerte	SURVEILLANCE DES HABITATIONS ET DES IMMOBILIERS COMMUNAUX	12h00	2003/01/12 00:00:00	2003/01/12 00:00:00
Habitat SDF ROUTE DE MEUNG	ARDOUX AVAL	2/Alerte	SURVEILLANCE DES HABITATIONS ET DES IMMOBILIERS COMMUNAUX	12h00	2003/01/12 00:00:00	2003/01/12 00:00:00

Retour à la fiche | Rapport détaillé | Feuille de route

Fig 3.5: extract of the synthetic action plan with the actions to be triggered classified by priority

The action plan presents for each stake the action to be carried-out, its duration, the degree of priority and a proposition of schedule.

3.1.2 Role of EPAMA and CETMEF

EPAMA gives support and means to the Meuse local communities:

- Installation of OSIRIS, providing of the OSIRIS web service
- Training
- Rainfall-runoff and hydraulic models outputs

CETMEF is responsible for the development of the software at national level.

Nevertheless the development process is not based on a national standard, but made by private companies. Recently, CETMEF has put in place a development server to better manage the evolution of the software code.

3.1.3 *Architecture, data and technologies*

All the data recorded in **OSIRIS** are inter-connected to enable requests, calculate the action plan and help decision. The simplified data model with the object classes and their relations is given below:

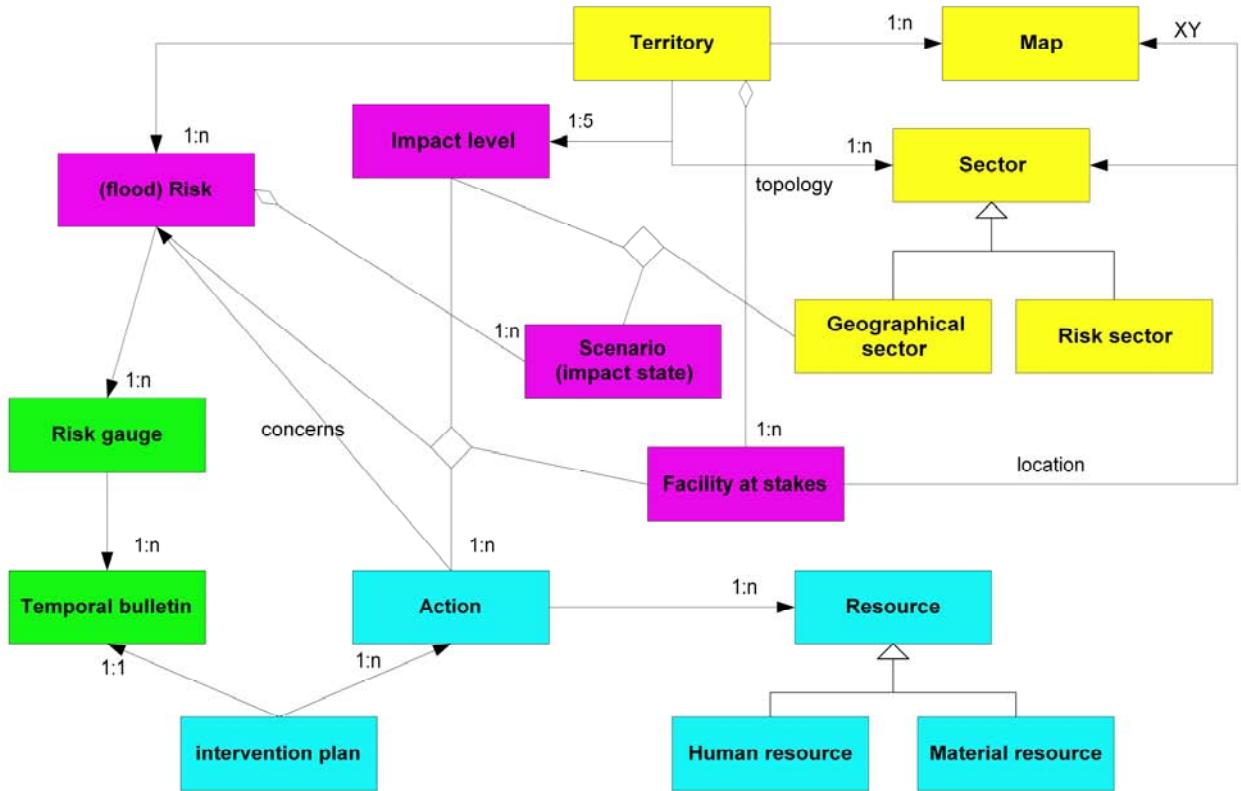


Fig 3.6: OSIRIS simplified data model in UML

The tool is based on a client-server architecture using the free Internet technology WAMP with:

- on the server side : an Apache Internet server (local or distant) with the programming language PHP5 and the database MySQL
 - on the client side : the interface runs on the navigator Internet Explorer and uses the WEB client technology HTML, JavaScript, AJAX and SVG for the graphics and the cartography

The complete tool and its components can be set up locally or with a real client-server configuration and a distant access to the server and the database through an Internet connexion. Man-machine interface are composed with forms (to describe the OSIRIS objects), Excel-like tables (to list and edit all the instances of a type), a simplified GIS module and specific interfaces, including a pdf output representing the complete local security plan.

An interactive cartographic module (GIS-like) using the SVG standard is integrated in OSIRIS to:

- integrate and geo-reference a set of background maps (ortho-photos, local maps, IGN maps ...)
 - create and edit the vector objects that will locate and draw OSIRIS objects like sectors, stakes, ...
 - visualize the flood scenarios or the actions with an adapted set of colours.

The technology only uses free technology and libraries, like php libraries and SVG for graphics.

3.1.4 Past experience and future evolutions

OSIRIS users (number of local communities / cities) :

- Loire river basin : 100
- Meuse river basin : 85 cities

‘OSIRIS-Inondation’ is an operational tool since 2005 and several versions have been developed, distributed and validated since (current version 1.4 – next version is under development for 2010).

Feedback meetings are organised in case of real flood with local communities and services in charge of forecast (last one after the October 2006 flood).

Future developments would enable different tools (including OSIRIS) to be used as a global information system.

- Improvements of existing services are included in the next version to be developed in the beginning of 2010 : simplify flood management
- Networking for several communities sharing OSIRIS / operational means
- Extension to multi-risks software (prototype being developed and tested)
- Sharing of local water level observation between cities (outside OSIRIS)
- Extension to department and basin level with a link to communities
- Development of real-time crisis services and flood management improvements are partly expected after the test of OSIRIS during crisis simulation / exercises.
- Crisis management : management and updating of the actions during a real flood episode
- Already developed : Web service networking : in order to share information concerning the water level at any gauge + personal warning for a chosen threshold

Strictly speaking, there is no maintenance contract.

However, the partners EPLoire, EPAMA and CETMEF ensure *de facto* the evolution and the maintenance of the product through successive developments.

There is no license constraint and fees. The tool is freely available to all potential users that only have to sign a commitment of good practice.

Any private society can make money by selling services related to OSIRIS (training, installation, use of Osiris for the preparation of an action plan).

Official partners don’t make money since the beginning of the project (no license) and invest on the tool with their own funds.

3.2 Municipal plan software (Wallonia)

3.2.1 General description

The municipal plan software enables users at municipality level to manage a crisis for any natural or technological hazard. It has been installed in 50 municipalities of the Province of Luxembourg.

The philosophy behind the software is that several stakeholders can use the same tool. Each stakeholder maintains his/her privileges, but the principles of coordination are established through the software all the data is accessible.

Users are:

- Federal government,
- Walloon region,
- Governor of the Province,
- mayors,
- fire brigades,
- health services,
- police,
- civil defence.

Scheme of a Municipal plan	
Why a municipal plan?	
<ul style="list-style-type: none">• Risk of an incident• Transmission of information• Location of resources• Actions to implement• Location of the incident• Roles of different parties• Coordination• Communication• Legislation	<p>Not just specific emergency plans (PPI) Warning plan Staff and/or equipment Information sheets Maps, plans, photos D1 to D5 How to coordinate/manage Predefined documents A few legal points</p>
Principles of the Municipal plan	
Technical aspect	
<p>2 separate pieces of software</p> <pre>graph TD; A[Technical aspect
2 separate pieces of software] --> B[Consultation]; A --> C[Updates]</pre>	
<p>Consultation</p> <ul style="list-style-type: none">ClearConciseQuickTransportableUser-friendly	<p>Updates</p> <ul style="list-style-type: none">OrganisedStructuredDetailedControlledPractical

3.2.2 Role of APS

APS is the expert and producer of this software.

3.2.3 Architecture, data and technologies

The municipal emergency and intervention plan has been developed in "WinDev". "Windev" is a 5th generation language with all the usual functions of programming languages as well as a native data-oriented base.

The graphic, data verification and validation aspects are managed before the coding stage using a windows editor. "WinDev" is interfaced with the following languages: Java, C, C++, C#, Cobol, Fortran, Pascal, VB etc. The use of ActiveX, OCX etc. make it completely open.

The "Hyperfile" database engine used is delivered as standard with the development software; it manages the relational databases and does not incur any usage fees.

Some maps and plans are bitmapped but it is possible to incorporate vector elements such as "shapefiles". These elements can be read using a free-of-charge OCX.

The software's graphical interface uses Windows development standards offered by the development language and respected by international standards.

3.2.4 Past experience and future evolution

The software is at a pre-operational stage (collection of information for input). APS is in direct contact with users to receive their feedback in real-time. New needs appear on a regular basis, the use of software has just been officially included in Belgium's legal texts. The analysis and development stage is over, but links and integration with other tools are still possible and desirable.

The software is distributed under APS license

The data remains public property, collectively between the Province and municipalities.

3.3 Floodwatch system (Flanders)

3.3.1 General description

The Floodwatch system is designed to give forecast information for all the navigable waterways in Flanders, to be used by the water managers and river information services.

This is not a crisis management software.

FLOODWATCH-MIKE11(MODEL)-INPUT:

- gauging measurements (HYDRA-database): water levels, discharges, velocities, rainfall,...
- bathymetrical measurements of river Maas
- digital elevation model measurements for floodplains
- discharge forecasts of Dutch FEWS-system

FLOODWATCH-OUTPUT

- water level and discharge forecast along the river Meuse from Lanaken to Maaseik
- flood maps and freeboard maps
- forecast-graphs on webpage

3.3.2 Role of Flanders Hydraulics Research

Flanders Hydraulics Research is a commercial user of the software since 2006 (operational) and 2007 (experimentation).

3.3.3 Architecture, data and technologies

- FLOODWATCH: ArcSDE-database on UNIX server
- MIKE11: 2 servers with windows XP installed (quad core)

3.3.4 Past experience and future evolutions

- FLOODWATCH (forecasting system):
 - 2 experienced users (experts)
 - 5 junior users
- MIKE11 (modelling software)
 - 7 experienced users (experts)

Cooperation agreements are operational with different water managers including nv De Scheepvaart providing feedback about predictions, flood warning messages.

Flood forecasting models as existing now were not operational during 1993 and 1995 floods.

Innovation of hydrological modelling tools are planned (use of radar-data – use of ensemble predictions – use of evaporation measurements -...)

FLOODWATCH is a commercial software.

3.4 FLIWAS (The Netherlands)

3.4.1 General description

www.fliwas.nl

FLIWAS collects information from different sources: flood prediction systems, geo-information, flood scenarios, water risk maps and calamity plans. The purpose of FLIWAS is that a composite picture is thus obtained of how the (threatening) flood is behaving and is expected to behave. It is possible to consult selective information from FLIWAS as required.

FLIWAS contains dynamic, geographic and static data that it shares with the parties in the network. This network comprises parties from the water column (Water Boards, Regional Services of Public Works and Water Management, The Water Service, LCO) and from the general column (local councils, safety regions, provinces and the NCC). The parties in the water column are known as the 'users' of FLIWAS; the parties in the general column are known as the 'exploiters'. This latter group has its own information systems and receives the information from FLIWAS via liaison officers in the various consultative structures. Here, the expertise of the liaison officers is indispensable in providing the mainly technical information with an explanation.

FLIWAS is composed of different modules with diverse functionalities. A distinction is made between basic modules and optional modules. The basic modules are necessary to be able to set FLIWAS up and to be able to work with network enabled capabilities.

Optional modules can be added to the basic modules and possibly implemented at a later time.

a - Basic modules

Manager

This basic FLIWAS module is only applicable and accessible for users who have been allocated the function of 'manager'. All other users in FLIWAS cannot use the Manager module. Managers use this module to set FLIWAS up per organisation. Data of the organisation, functions, persons and users is entered and managed with the aid of this module. In addition, this module is required for the allocation, editing and deletion of the necessary authorisations (user profiles).

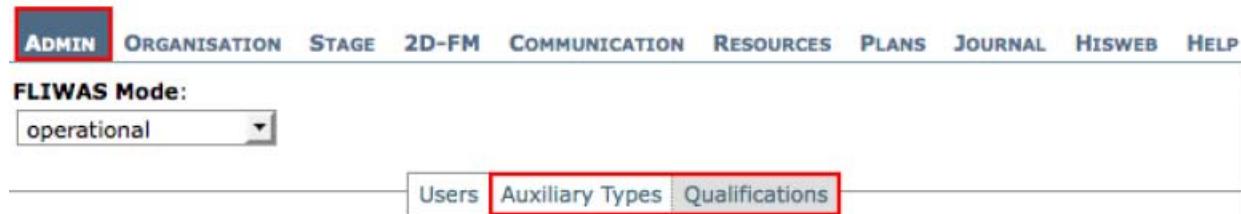


Fig 3.7: Tabs giving access to the configuration of qualifications and auxiliary types

Organisation

This module is used to record and maintain the organizational data. This therefore concerns data about the organization itself and data about organizational elements (departments), functions, roles, persons and users. The implementation of FLIWAS modules is done per Water Board and Regional Directorate of Public Works and Water Management. People from the own organization or other organizations can have a role in a FLIWAS module, for example because they must be informed, without being an active user themselves.

A screenshot of the FLIWAS 'ORGANISATION' interface. At the top, there is a horizontal menu bar with the following items: ADMIN, ORGANISATION, STAGE, 2D-FM, COMMUNICATION, RESOURCES, PLANS, JOURNAL, and HELP. The 'ORGANISATION' item is highlighted with a red box. Below the menu, there is a sub-navigation bar with two tabs: 'Organisations' and 'Persons'. The 'Organisations' tab is highlighted with a red box. At the bottom of the screen, there is a table displaying a list of organizations. The table has columns for 'Name', 'City', 'Venue', and 'External'. The 'External' column contains dropdown menus with the value 'Yes' selected. The table data is as follows:

Fig 3.8: View of the Organisation interface

Communication

This module is used to send e-mail messages in a standardized manner. Besides all functionalities of other current e-mail programs, the communication module has several important extra functionalities, such as the inclusion of geographic data and the logging of the e-mail traffic.

The logging of e-mail traffic is important for analyses after exercises and crisis situations.

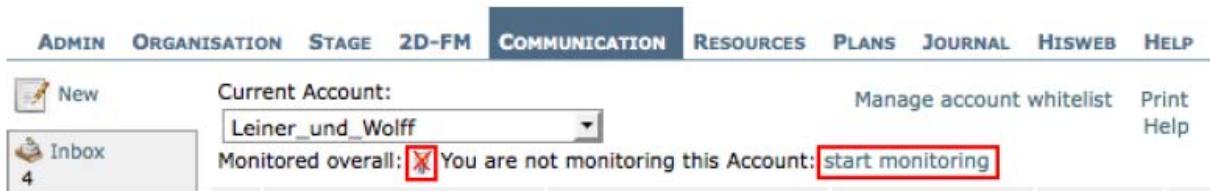


Fig 3.9: Monitoring an account

Sources

This basic module is used to enter, consult, edit and delete documents and addresses of websites. In addition, data of storage places, locations (for example, pumping stations, coast sections, dike sections and shut-off valves etc.) and material stocks can also be entered, consulted, edited or deleted.

ARTICLES					PLANS	JOURNAL	HISWEB	HELP				
					Document	Article	Link	Depot	Location	Auxiliary	New Article	Help
Rel.	Title	Description	Context									
Yes			Leiner & Wolff (Orga)									
Yes	Deichfußsicherung	THW Artikel über	Leiner & Wolff (Orga)									
Yes	Deichschläüche als Sandsackersatz		Leiner & Wolff (Orga)									
Yes	Rettungsarbeiten in kritischen	Hinweise zu	Leiner & Wolff (Orga)									
Yes	Sandsackdamm	THW Artikel über	Leiner & Wolff (Orga)									
Yes	Testartikel 1	zu Testzwecken	Leiner & Wolff (Orga)									

Fig 3.10: Example for an overview table for resources: articles

Calamity plan simple

In this module, simple scenarios can be included and structured in a phasing that can be scaled up and down, without a direct link to active measurement points.

The screenshot shows a web-based application interface for managing calamity plans. The top navigation bar includes links for ADMIN, ORGANISATION, STAGE, 2D-FM, COMMUNICATION, RESOURCES, PLANS (which is highlighted in red), JOURNAL, HISWEB, and HELP. Below the navigation is a sub-navigation bar with links for Plans, Events, Action statuses (highlighted in red), and Admin. Underneath is another row with Model and Status buttons. A link for 'New action type' is visible. The main content area displays a table titled 'Action statuses' with columns for Name, Icon, and Description. The table lists five entries: 'action' (person icon), 'communication' (phone icon), 'default' (square icon), 'evacuation' (person walking icon), and 'monitoring' (eye icon). The 'default' entry has 'default' written next to its icon. At the bottom of the table, it says 'Page 1 of 1 (5 hits)' and has navigation arrows. Below the table, the text 'time: 0.577 s' is displayed.

Name	Icon	Description
action		
communication		
default		default
evacuation		
monitoring		

Fig 3.11: Overview showing the action type available in the context of an organisation

The screenshot shows a detailed view of a calamity plan. The top navigation bar is identical to Fig 3.11. The sub-navigation bar shows 'Leiner & Wolff > Dokuplan > PD1 > Mo3'. Below the sub-navigation are 'Enable Map Layer', 'Print', and 'Remove' buttons. The main content area has a table for 'Upscaling' and 'Downscaling' phases. The 'Upscaling' table has three rows: Phase 1 (1) with Krimpen_ad_IJssel > 40.00 m NAP, Phase 2 (2) with Krimpen_ad_IJssel > 50.00 m NAP, and Phase 3 (3) with Krimpen_ad_IJssel > 60.00 m NAP. All three rows have a 'Create' button in the 'Downscaling' column. Below this is a 'Roles' section with a table. The table has four columns: Name, Phase, Position 1, and Position 2. It shows one row for 'R1' with 'Admin: Clemens Jacobs' in 'Position 1' and a 'Create' button in 'Position 2'. At the bottom, it says 'time: 0.687 s'. A section titled 'Edit mapping: R1 for monitored object Mo3' follows, with a 'Position 2' dropdown set to 'Choose' and buttons for save, cancel, and delete.

Phase	Upscaling	Downscaling
Phase 1 (1)	Krimpen_ad_IJssel > 40.00 m NAP	Create
Phase 2 (2)	Krimpen_ad_IJssel > 50.00 m NAP	Create
Phase 3 (3)	Krimpen_ad_IJssel > 60.00 m NAP	Create

Name	Phase	Position 1	Position 2
R1		Admin: Clemens Jacobs	Create

Fig 3.12: Assigning position to role

The screenshot shows the FliwasPlan software interface. At the top, there is a navigation bar with links: ADMIN, ORGANISATION, STAGE, 2D-FM, COMMUNICATION, RESOURCES, PLANS (highlighted in red), JOURNAL, HISWEB, and HELP. Below the navigation bar, a breadcrumb trail indicates the current location: Leiner & Wolff > Dokuplan > Actions. There are also links for Filter, Print, +Ad-hoc action, Stop plan, Generate situation report, Activity overview, View Warnings Window (highlighted in red), Simulated activities, and Plan details.

The main area displays a table with columns: Name, Type, Status, Event, and Responsible. Two rows are listed:

- M5 Change status R3
- M6 Change status Plantestposition (Leiner & Wolff): Clemens Jacobs

A modal window titled "Warnings" is open, showing a list of warnings. The URL in the browser bar is http://sandbox.fliwas.net/FliwasPlan/warnings?orga_id:int=16&plan_id:int=734. The modal has a title "Warnings for Dokuplan" and contains a table with columns: Type, Warning, Date, Plan, Phase definition, and Monitored object. One warning is listed:

Type	Warning	Date	Plan	Phase definition	Monitored object
Phase transition	<p>recommended</p> <p>Fase-overgang Erste Phase (1) up (Dokuplan) anbeloven door Clemens Jacobs, 15.12.2009 18:10.</p> <p>Erste Phase (1) up</p>	2009.12.15 18:10	Dokuplan	PD1	Mo3

At the bottom of the modal, there is a "Fertig" button.

Fig 3.13: Link to warnings window and example

The screenshot shows the FliwasPlan software interface. At the top, there is a navigation bar with links: ADMIN, ORGANISATION, STAGE, 2D-FM, COMMUNICATION, RESOURCES, PLANS (highlighted in red), JOURNAL, HISWEB, and HELP. Below the navigation bar, a breadcrumb trail indicates the current location: Leiner & Wolff > Dokuplan > Actions. There are also links for Filter, Print, +Ad-hoc action, Activity overview, View Warnings Window, Simulated activities, Stop plan, Operation log, and Plan details.

The main area displays a table with columns: Name, Type, Status, Event, and Responsible. One row is listed:

Name	Type	Status	Event	Responsible
M1	█	!	Event on Mo1	Odmin (Leiner & Wolff): Clemens Jacobs

Below the table, it says "time: 0.334 s". A dropdown menu is open next to the event field, showing options: todo, aborte, done, todo, and in process. The "in process" option is highlighted with a blue background.

Below the table, there is a section for action details:

- Status:** todo, 2009.05.19 14:30, Clemens Jacobs
- Type:** default
- Publish:** Never
- Monitored object:** Mo1
- Duration:** 4.0 h
Time the action may take to be executed from the moment it was set on todo. In hours. Fractions are possible, e.g. 0.25 = 15 min
- Execute before:** 2009.05.19 18:30
- Automatic communication:** No
- Responsible Position 1:** Odmin (Leiner & Wolff): Clemens Jacobs
- Responsible Position 2:** Odmin (Leiner & Wolff): Clemens Jacobs

At the bottom, there is a "Status log" section with a single entry:

- ! todo (2009.05.19 14:30, Clemens Jacobs)

Fig 3.14: Overview of actions whose triggering conditions do not refer to a phase transition

Logbook

The Logbook basic module is used to save decisions taken for information. Ad hoc measures and the status quo descriptions are also recorded in this basic module. Geographic information can be linked to all information, measures, decisions and descriptions. Users can use the data in the logbook to form an actual picture of the situation in a certain area.

The screenshot shows the 'JOURNAL' tab selected in the top navigation bar. A message 'Choose Organisation(s): Leiner & Wolff' is displayed. Below it is a table with columns: Title, Author, Category, and Priority. The Priority column has a dropdown menu with '---' and a checkbox. Below the table are links: New entry, Archive, Fliwas BW, pgdevel, fliwas2, Admin, and Help. The main content area lists three entries:

- Map !! urgent - (Leiner & Wolff)** Released | 2009.03.30 12:53
- Karte ! important - (Leiner & Wolff)** Draft | 2009.03.30 12:51
- Testentry for leiner&wolff ! important - (Leiner & Wolff)** Draft | 2008.08.02 18:55

Each entry includes a 'More' link and a 'by Jacobs Category Testeinträge' link. On the right side of the list, there are buttons for 'Select all', 'Unselect all', and a red-bordered button 'Archivate selected entries'.

Transferring entries from the main overview to the archive.

Fig 3.15: Transferring entries from the main overview to the archive

Maps

This basic module is more or less hidden in the Calamity Plan module. By using this module, geographic information (map and theme layers) in FLIWAS can be entered, edited, selected and deleted. This information can be map layers in ESRI shapes, Geo-Jpeg or GeoTIFF format, for example.

b - Optional modules

Calamity plan complex

The optional Calamity Plan module is much more extensive and complex than the basic module. The use of this module requires technical content knowledge and experience.

The core of the optional Calamity Plan module consists of a set of measures that may or may not be structured in a particular phase. When a phase is used, phase transitions (up scaling and down scaling) are initiated by a condition (failing to meet or exceeding a measurement value or prediction). Measures are started by up scaling or down scaling. Besides this, measures can also be initiated by a condition or status change or a prior measure.

Within the optional Calamity Plan module, the user can work with EN without phasing. Both these working methods can be used together in the plan. A combination of a phasing is therefore possible for dike sections or for the organization, with direct links between measures and monitoring objects.

Measuring and monitoring

This optional module is used to save digitally- or manually-entered measurements and predictions.

Measurements are read in from MFPS for every MSW measurement point, predictions from HMC and IWIC for every river kilometre along the large rivers. This information can be presented per measurement point in a table and graph, in combination with reference levels (for example, historic water levels and MHV or crest height of the water barrier). When an indicated reference level is exceeded, **FLIWAS** can give an alarm signal by sending a message to a user and a presentation in the form of a different colour on the map. The predictions per river kilometre can also be presented in a length profile per branch of a river.

The functionality of this optional module requires a fast broadband connection.

ORGANISATION STAGE 2D-FM COMMUNICATION RESOURCES PLANS JOURNAL HISWEB HELP						
Organisation: Leiner & Wolff Help						
Measurement Point Length Profiles Types						
View all on map Monitor Measurements						
rank	Name	Waterbody	Measurement Type	River km	Dike Pole	
						<input type="button" value="▼"/>
5	Krimpen_ad_IJssel	Nieuwe Maas	waterstand	993.0		
8	Amer km 253	Amer	waterstand	253.0		
15	Belfeld boven	Maas	waterstand	100.18		
48	Doesburg	IJssel	waterstand	903.02		

Fig 3.16: Measurement points overview

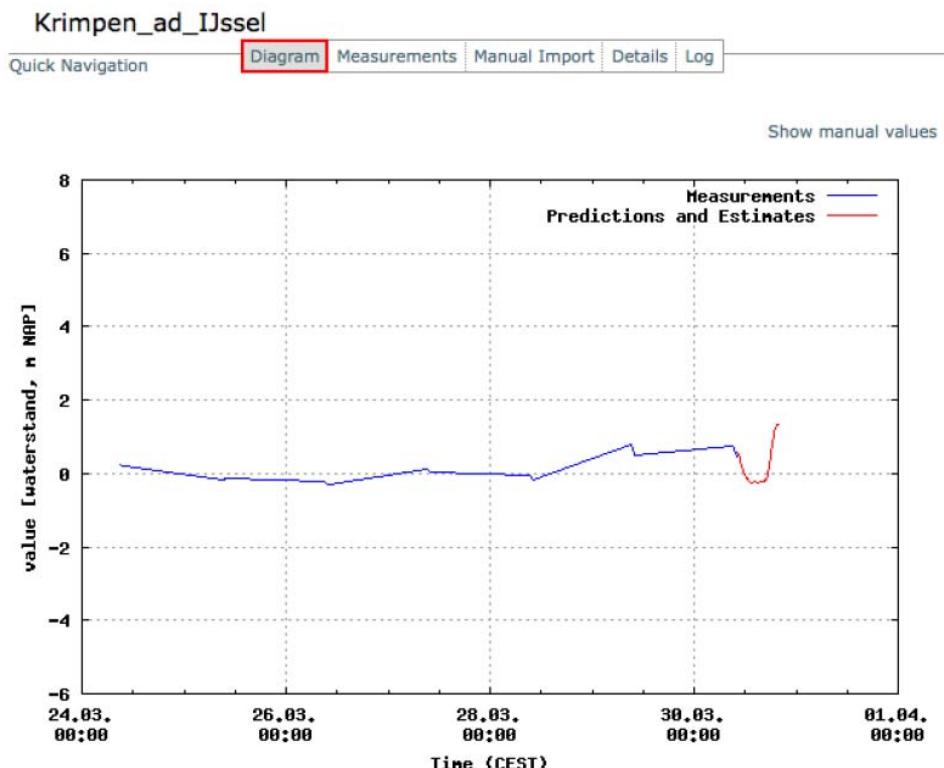


Fig 3.17: Diagram of a measurement point

Krimpen_ad_IJssel		Diagram	Measurements	Manual Import	Details	Log
Measurements		Measurements Predictions Estimates				
		Add manual values Show manual values				
Date	waterstand (m NAP)					
2009-03-30 10:00:00+02:00	0.46					
2009-03-30 09:50:00+02:00	0.52					
2009-03-30 09:40:00+02:00	0.58					
2009-03-30 09:30:00+02:00	0.64					
2009-03-30 09:20:00+02:00	0.69					
2009-03-30 09:10:00+02:00	0.76					
2009-03-29 10:00:00+02:00	0.49					
2009-03-29 09:50:00+02:00	0.54					
2009-03-29 09:40:00+02:00	0.61					
2009-03-29 09:30:00+02:00	0.68					
2009-03-29 09:20:00+02:00	0.74					
2009-03-29 09:10:00+02:00	0.81					

Fig 3.18: Measurements table

3.4.2 Role of FLIWAS Partners

Water Boards

The Water Boards know the **FLIWAS** system. They have contributed to the development of the system. Several Water Boards, including the Aa and Maas, use **FLIWAS** to obtain water levels, to use the calamity plan and the communication module.

Rijkswaterstaat

The Ministry of Public Works and Water Management is responsible for the supply of information on water levels and forecasts. Here, the weather picture supplied by the KNMI is also included. The KNMI fills the system with its information so that other **FLIWAS** users can view it.

3.4.3 Architecture, data and technologies

FLIWAS is a modularly-designed Internet application. The functionality and information are available via a GIS-oriented user interface. User profiles give users access to only that functionality that they need for their tasks and responsibilities. **FLIWAS** is currently available in English, German and Dutch. Other languages can be added simply. Communication with external applications and information sources is made via the web services of XML/RPC.

FLIWAS was developed as an open source (closed community) application for government organizations within the EU. There are no license costs for the use of **FLIWAS** and no additional software licenses required.

Besides PostgreSQL Data Base Management System (DBMS)¹ (open source), **FLIWAS** can also use Oracle DBMS²(closed source). The choice between the PostgreSQL DBMS and Oracle DBMS

¹. PostgreSQL is an open source Data Base Management System (DBMS). There are no licence costs and Data Base Administration is relatively easy, so that the Data Base Administration costs are low. The interoperability with Oracle DBMS is (still) very poor. PostgreSQL DBMS offers all functionalities that are required and necessary for the **FLIWAS** platform.

². Oracle DBMS has high and often also non-transparent license costs. In addition, the costs for Data Base Administration of an Oracle RDBMS are high. The interoperability with PostgreSQL is still very poor. Oracle DBMS offers a large number of possibilities that are not necessary for a **FLIWAS** platform.

is important, especially when one compares the costs of use, management, maintenance and support of these two DBMSs.

Hardware/software	Requirement
FLIWAS development environment	: Zope and Python
Database Management System	: PostgreSQL or Oracle
Server operating system	: Debian Linux
File format for maps	: ESRI shapes, Bitmaps, GeoTIFF and Geo-Jpeg
Workstations:	: Linux, MS Windows XP SP2 or higher and Mac OS
Web browser	: Firefox 2.0 or higher (preferred), MS IE (version 7 or higher), Safari (version 3 or higher)
PDAs and Palmtops	: MS Windows CE 6.x, Symbian 9.x, Opera Mobile 8.x or higher

When a choice has to be made between PostgreSQL DBMS and Oracle DBMS for the implementation of FLIWAS, the selection of the DBMS must be included as an activity in the implementation plan.

3.4.4 Past experiences and future evolutions

FLIWAS was, and is being, developed by and with parties within the water column from 2004. At the moment, approximately 10 organizations use **FLIWAS**.

The ambition is that **FLIWAS** will eventually be *the* system for network enabled capabilities working within the water column. In the meantime, the Secretary of State for Verkeer en Waterstaat (Transport, Public Works and Water Management) and the Directorate of the Union of Water Boards have committed themselves to this ambition in the National Water plan. Several Water Boards have now indicated their wish to work with **FLIWAS**. By participating in the Klantenraad (User Council), these Water Boards have a vote in the implementation and further development of **FLIWAS**. With the implementation of **FLIWAS**, network partners from outside the water column will also be involved, such as safety regions, provinces, police and local councils.

An evaluation is made after every exercise with **FLIWAS** or in the case of (threatening) flood situations.

During the past years, the focus of development was mainly on the processes within the 'water organizations' and on technology. Especially the components of **FLIWAS** that support the internal processes within these organizations have been given much attention.

3.5 Synthesis

The software mainly differ by their target groups and territorial level.

OSIRIS and the Municipal plan are used by the mayors and local technical services at a community level.

FLIWAS is used by the water managers on sub-basins.

Each software is thus adapted to its environment and to the users wishes.

FLIWAS assets are on the high interactivity, the development of modules for communication, the real-time use.

APS assets are on the multirisk approach and the integration of all emergency services in the database.

OSIRIS assets are in the detailed identification of stakes and the possibility to upload water heights from hydraulic modelling.

Each software has achieved a good maturity, satisfies its end-users, and is implemented in the field.

At the moment, it is not feasible to create single emergency software for the whole Meuse basin. Each country needs to maintain its own software adapted to its own crisis organization.

4 INTERESTS AND WISHES OF COOPERATION

The questionnaire was the opportunity for each partner to identify its interest in working at international level. Interests have been expressed on :

- The constitution of common flood scenarios, which could help for common or individual exercises on a same basis.
- The improved exchange of information among users from different levels: from the field to flood or crisis manager (district, waterboards, regional or national).
- The improved exchange of forecast on floods.
- Improving information to the public and from the public: providing the public with more data that is relevant for safety.
- Implementing both **FLIWAS** and **OSIRIS** on identical communities in Wallonia to compare respective benefits.
- Developing an information platform to display database extracts at a larger territorial level (district level instead of municipal).

5 ANNEXES

5.1 Glossary

BZK: Ministerie van Binnenlandse Zaken en Koninkrijksrelaties. National Minister of Home Affairs and Kingdom Relations (NL)

DCC V and W: Departmental coordination of the ministry of transport, public works and water management (NL)

DREAL: Direction Régionale de l'Aménagement et du Logement. In France, this regional state department is responsible for environmental monitoring and flood forecasting

FLIWAS: FLood Information and WArning System. Software used for flood management in the Netherlands and in Germany

InfoMeuse: Collaborative software used in France on the Meuse basin for publishing data concerning water level

KNMI: Koninklijk Nederlands Meteorologisch Instituut. This is the Royal Dutch Meteorological Institute

LCO: National Commission of flood threat in the Netherlands

NCC: National Crisis Center in the Netherlands

OSIRIS inundation: Software used for flood management in France on the Meuse basin

Prefecture: In France, this department represents the State at district level. It is responsible for flood warning

SETHY: Service d'ETudes HYdrologiques. In Wallonia region, this department is responsible for river monitoring and flood forecasting

Stakeholder: A person or an organization that has a legitimate interest in a project or entity, or would be affected by a particular action or policy.

VMM: Vlaamse Milieu Maatschappij. Flemish environmental Agency (Flanders Region) responsible for monitoring and flood forecasting on non navigable rivers

WL-HIC: Flanders Hydraulics Information Center. Responsible for monitoring and flood forecasting on navigable rivers

5.2 Questionnaire

Part I. Knowledge of crisis management and software

Knowledge about flood management

1. Describe the flow of information from the hydrological data to forecast to the actual decision support system and to action/crisis management on the field, including the main data exchange between partners.
Please report to the excel table.

2. In this process,:
o show the position /role of your organization
o highlight your related system/software and their users
o clearly identify the position of on field action management and the position of local population in direct or indirect relation with the system

3. International point of view : do you know of past experiences on an international crisis/incident on the Meuse basin ?
o 31. What are the feedbacks from such an event and the needs identified ?
o 32. Which data would you need from neighbour countries?

- o 33. Was there any coordination of crisis management during the 1993 and 1995 floods around national boarders? be precise : catchment, type of data or information needed, people involved,
....
o 34. Do you have any requirements or ideas for sharing means for field intervention (including coordination if relevant) ?

4. Exercises of flood crisis management :

- o When, how are they done, who is involved?
o How do you get feedbacks ?

The Software

Functional aspects

5. Briefly describe the philosophy for this system/tool : users, scale of use, relationship /position between users, efficiency, ...

6. Describe your system/tool process including inputs and outputs (use scheme)

7. Describe the position / role of your organization in the software uses

8. Experience

- 81. How many users are there now ? Other users soon ?
- 82. How long has the tool been used : operationally ? or as an experimental platform?
- 83. Do you receive any formalised feedback from the end-users during real flood events? If yes, please give details.
- 84. Are there new needs already identified ?:
 - o from the end-users : needs, problems, lacks...

- from other stakeholders (government, decision makers, ...)
- Where they identified after real flood conditions?
- 85. Describe already planned developments of the software/tool

Technical aspects

9. Describe data architecture, interface and technology

10. What type of cartography is used ?

11. Modularity and extension capacities ?

12. Does the development process comply with international or national standards (ISO...)? If yes, what are these standards?

13. What is (are) the programming language(s) of the software and all its components? What third-party programming libraries are used? Are they commercial or free?

14. Is there any maintenance contract ?

Legal framework and commercial state

15. Under which license is the software distributed? If any : annual price, property, ...

16 Do you make money from the software uses (excepted license)?

17. What is the commercial status of the data/information used as input and output ?

Part II. Wishes of collaboration within AMICE (open discussion to be continued)

1. How each tool / module can be interesting for the other software ?

2. Which common modules could be developed ?

3. Is it compatible with the users' wishes ?

4. Imagine new ways of communication towards population to make the alerts accessible to them.

Part III. Proposition of concrete results within AMICE and of general goals for the future (open discussion to be continued)

This part lists the first ideas expressed during 18/06/09 meeting. It is opened to more contributions and should be presented to the end-users to get their opinions.

1. Develop overlaps and connections ? (please explain in details)

2. Adaptation of the software ?

3. The international exercise : first ideas? What to do? What to evaluate?

4. A common service at the international level for flood crisis management : maps, decision support tools, communication, collaboration, real-time view of software outputs ...? (please explain in details)

5. Develop communication towards population = top-down (please explain in details)

6. Develop real time feedback from the population = bottom-up (please explain in details)

7. Develop communication between stakeholders (population, other stakeholders)

8. Develop other tools to warn the population (SMS, ...) ? In case other means do not work (please explain in details)
9. What would be the new modules to be developed that no one has for the moment : innovative modules?

5.3 Flow of information: France

	Who	What data	How : frequency	How : means software / emails / phone ? maps / texts / color codes ?	Remarks
Monitoring	SCHAPI (state, national service) Flood Forecast service (state representative at basin level) Meteo France (rain forecast and gauges, national)	water level discharge rainfall	Automatic sensors and gauges : Real time recording Frequency of measurements & publication may vary (flood period or not)	Network of automatic sensors and other non automatic measurement means About 30 water level gauges + some discharge gauges + rain gauges publication on vigicrue.ecologie.gouv.fr	Only few of these measurement points are used by forecast services as reference points to publish information
	Local services (cities) (no official monitoring)	water level at local gauges	not regular (flood period or not)	direct observation, phone calls between cities	EPAMA is developing a web-collaborative info system for local communities : sharing of info about water level concerning all measurement gauges

	Who	What data	How : frequency	How : means software / emails / phone ? maps / texts / color codes ?	Remarks
Forecast / Warning	Préfet (state representative at district level)	Warning is sent from district level	depending on the importance of the flood and FFS forecast	Forecast : Color code depends on a global threshold at river or district level Warning : Automatic phone calls to a predefined list of elected representatives, depending on the predefined global threshold	Prefecture uses forecast from Flood Forecast Service
	Flood Forecast services (state representative at basin level)	qualitative forecast (colour) quantitative as much as possible (few)	Forecast is published twice to 4 time a day, depending on the importance of the flood	Forecast : MOISE software (hydrological + hydraulic model), level relation between gauges Warning : State flood info system : Four Colors system to describe present/forecasted flood situation (from green to red) published on vigicrue website	This is quite a global point of view : a color is given at a river or district level (might concern several dozens cities) MOISE forecast still in development
	Local services (cities) (no official forecast)	local water level estimation	depending on the importance of the flood	level relation between gauges , phone calls between cities	

Action Plan : decision, coordination, ...					
local scale	Technical services & elected representatives	Maps and sectors Local flood scenarios (from MOISE calculation) Local stakes Ground levels Vulnerability thresholds Actions plans Human & material resources	preparation : exercice organised once a year by EPAMA Crisis management : frequency of forecast bulletin	OSIRIS incl. Local safety plan (Plan Communal de Sauvegarde)	- Development begins in 2010, by EPAMA : Several small local communities have the opportunity to share OSIRIS and local rescue plans
District scale	Préfet (state representative at district level)	Gets information about situation in the field and follows meteorological evolution and consequences	- Permanent in case of flood	Firemen means could help local communities - Major	At the moment : two parallel systems : state on the one hand - local on the other hand
Field Management : detail involved services (emergency services, technical services, ...)	Firemen (SDIS) Security forces (police, gendarmerie)			Own state staff : Police, Gendarmerie, Firemen Info system used on its own by each state service. In case of major flood : the state - district level might fully manage the situation on the field (military means)	
provincial scale					
local scale	Technical services of local communities			OSIRIS incl. Local safety plan (Plan Communal de Sauvegarde)	

5.4 Flow of information: Wallonia (Belgium)

	Who	What data	How : frequency	How : means software / emails / phone ? maps / texts / color codes ?
Monitoring	Sethy	Water level & speed	Hour/hour	Fax/E-mail/Telephone/Colour codes
Forecast	Walloon Region	Prevision + water level & speed	Hour/hour	Fax/E-mail/Telephone/Colour codes
Action Plan : decision, coordination, ... provincial scale	Province : Governor	Data above	On demand of intervention teams	Fax/E-mail/Telephone
local scale	Municipalities : Mayors	Same data as province	Continuously	Telephone/Direct contact
Field Management : detail involved services (emergency services, technical services, ...) provincial scale	Province : provincial governement	Provincial emergency flood plan	Permanently	Fax/Telephone/Direct contact
local scale	Municipalities : Mayors, Fireworkers, Police, Civil protection, Workers (of municipality), SWDE (water distribution)	All previous data + specific data of emergency flood plan for each intervention team or service	Real time	By all means + ASTRID network (specific for fireworkers, police and civil protection)

5.5 Flow of information: Flanders (Belgium)

	Who	What data	How : frequency	How : means software / emails / phone ? maps / texts / color codes ?
Monitoring	Monitoring of water quantity on the navigable waterways in Flanders is in principle done by Flanders Hydraulics, Hydrological Information Centre (WL-HIC [Antwerp]). Monitoring of water quantity on the non-navigable waterways is done by the Flemish Environmental Agency (VMM). WL-HIC has got some measuring locations on important locations on the non-navigable waterways (to provide upstream information for forecast models). For the common part of the river Maas WL-HIC cooperates with Rijkswaterstaat (RWS) and data are exchanged for operational use (Monitoring Gemeenschappelijke Maas). Monitoring of structures in Flanders on both navigable and non-navigable waterways is done by EMA/EMG (electromechanics divisions of the agency for roads and mobility of Flemish Authorities) and data are transferred to WL-HIC or VMM. Monitoring of meteorological data is done by WL-HIC, VMM and RMI (Royal Meteorological Institute of Belgium)	WL-HIC measures water levels at the river Maas in Dilsem-Rotem, Eisden-Mazenhoven, Lanaken-Smeermaas, Maaseik, Uikhoven. Additionally water levels rare measured in some pools next to the river (Maasplass Heerenlaak, Maasplass Maasbeemder Greend, Maasplass De Spaenjerd). Discharges are derived in Maaseik. (+data-exchange with RWS). On canals, water level and discharge is measured (Albertkanaal). Rainfall is measured at several locations in the basin of the Maas (WL-HIC: Dilsem-Rotem, Kanne)	Water level/Discharge: 10 or 15 minutes-interval. Rainfall: hourly values (near future: 15')	For WL-HIC measuring stations the telemetry-system of WL-HIC is used, so data come in by GPRS/phone. Data coming from VMM/RWS/EMA-EMG/KMI are exchanged by the use of an ftp-protocol. All data are stored in the Hydra-Database (Informix). Our clients can immediately see data on the website www.waterstanden.be . When certain levels (alert and alarm levels) on certain waterways are exceeded, the software system automatically sends SMS-warning to the members of the forecasting-team. On an internal webpage these exceedings are visualised (map+color).
Forecast	Forecasting on the navigable waterways (river Maas) is done by Flanders Hydraulics Research, Hydrological Information Centre (WL-HIC [Antwerp]). Forecasting on the non-navigable waterways is done by the Flemish Environmental Agency (VMM).	The forecasting system produces water level and discharge forecasts for the river Maas at several locations along the river Maas between Lanaken and Maaseik. Measurements used to run the models originate from the WL-HIC gauging system. Next to this, measurements of the Dutch and Walloon areas are also imported into the system.	Forecasts are made 4 times a day (every 6hours).	The software used for the production of forecasts is called Floodwatch. Floodwatch is a GIS-system which forms a shell around a 1-D modelling software called Mike11. The Floodwatch systems does 3 things.1. Import of data: this involves the import of measured water levels/discharges and forecasted discharges (Fews-forecast Landelijke waterdienst) for the last 2 days. 2. The system produces time series to execute the model run with a rough validation of the measured data. When time series are ready the model makes a run. The forecast is always 48hours. 3. When the model run is finished the forecast-results are disseminated on a website where all forecast can be viewed. The system is also capable of sending out warnings and alerts. Next to this flood maps and freeboard maps can also be generated.
Action Plan : decision, coordination, ... provincial scale	Role of Flanders Hydraulics Research: making High water information messages as published on the website are e-mailed and send by fax to water managers and river information services (RIS).	A message with 1. the weather forecast for the next days in Flanders and surrounding areas, 2. precipitation of previous days, 3. list of stations where certain threshold levels are exceeded together with the trend of the water level, 4. forecast of water levels and discharges (in text) for	As long as water levels are above the first awareness level and under the second: 3 messages a day, also weekends and public holidays: 9h, 14h, 18h. When water levels are above the second threshold level 2 additional	e-mail messages to contacts at work and at home (private), some people still want them on fax. Text and tables, link to website with map as explained in box above, helicopter contract to make pictures and video during flood accompanied by someone knowing the local situation. Contract with the agency for geographic information Flanders (AGIV) to derive quick first maps of it and later a more detailed version (is used to update the map of recently flooded areas and to calibrate and validate model results)
local scale	for crisis management: first commander of fire station, upscaling to 'community disaster plan' with major as final coordinator, upscaling to 'provincial disaster plan' lead by the governor and finally 'national disaster plan' coordinated by the minister of interior (Belgium)			
Field Management : detail involved services (emergency services, technical services, ...) provincial scale	information to field management groups of HIC information by 'River Information Services' (RIS): communication to police, fire brigades, communities, pilotage, harbour authorities, civil security, ...	see above	see above	
Flood crisis management in the Meuse basin local scale	AMICE – WP4	responsible for the water management on the Meuse and canals		Page 40/50 09/05/2010

5.6 Flow of information : The Netherlands

	Who	What data	How : frequency	How : means software / emails / phone ? maps / texts / color codes ?	Remarks
Monitoring	RWS (national) / Waterboard (regional)	Waterlevel / discharge	Continously	FEWS / MFPS / EMAIL / FAX	FEWS is the operational system used for monitoring and forecasting
Forecast	RWS (national) / Waterboard (regional)	Waterlevel / discharge	Continously	FEWS / EMAIL / FAX / SITRAP	
Action Plan : decision, coordination, ... Water autorithy	Waterboard	Above and conditions for taking measures and up or downscaling	Continously / regular interval	FLIWAS / EMAIL / FAX / SITRAP	The Waterboards are responsible for the watermanagement within defined regions



Public authority	Safetyregion	Above and conditions for taking measures and up or downscaling	Continously / regular interval	Direct contact / Telephone	Safetyregions are a representation of several goveranal autorities and publicservices within defined regions
Field Management : detail involved services (emergency services, technical services, ...) regional scale	Safetyregions	All above	Continously	Direct contact / Telephone	
local scale	Safetyregions	All above	Continously	Direct contact / Telephone	