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# Transnational flood crisis management exercise in the Meuse basin

## WP4 report - Action 27



gembloux  
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Rijkswaterstaat  
Ministerie van Infrastructuur en Milieu

## Introduction

The transnational Meuse catchment spreads over four countries, France, Belgium, Germany and the Netherlands. As a flood-prone area, the banks of the Meuse river represent a vulnerable territory, with major stakes related to the people and industries settled in this transnational drainage basin. Within 2050 or 2100, the catchments likely to be strongly impacted by climate change – just like most hydrological systems – with possibly bigger floods occurring more often, and concomitantly, more severe droughts. It is therefore necessary to define strategies of adaptation and to take preventive actions, in order to be properly prepared for crisis.

In this context, the AMICE Project (Adaptation of the Meuse to the Impact of Climate Evolution) is a transnational project, gathering 17 partners, which aims to investigate the current and future hydrological behaviour of the basin, and to determine the expected floods characteristics along with the flood-water management actions which have to be undertaken. It thus provides the opportunity to use common scenarios, tools and methods at a transnational level, to share the obtained results and to strengthen the cooperation between stakeholders in the Meuse basin.

The AMICE Project is divided into 5 Work Packages (WPs). WP4, which this summary deals with, is related to the anticipation and preparation to crisis situations due to future extreme meteorological events. Its objectives are:

- to establish an efficient transnational flood crisis management system, by combining the available methods for individual countries;
- to provide a common operational picture, by assessing the exchange of information between all the concerned organisations during a flood event;
- to improve situational awareness, by sharing the various returns of experience and developing a network of users.

To meet these targets, a joint transnational exercise has been designed and organised, based on the flood scenarios defined in WP1.

This document summarizes the main features and results of this exercise, describing in a first section, its objectives and organisation at a national and transnational level, with the common parts and the local specificities, and in a second section, the lessons learnt by each stakeholder of the project.

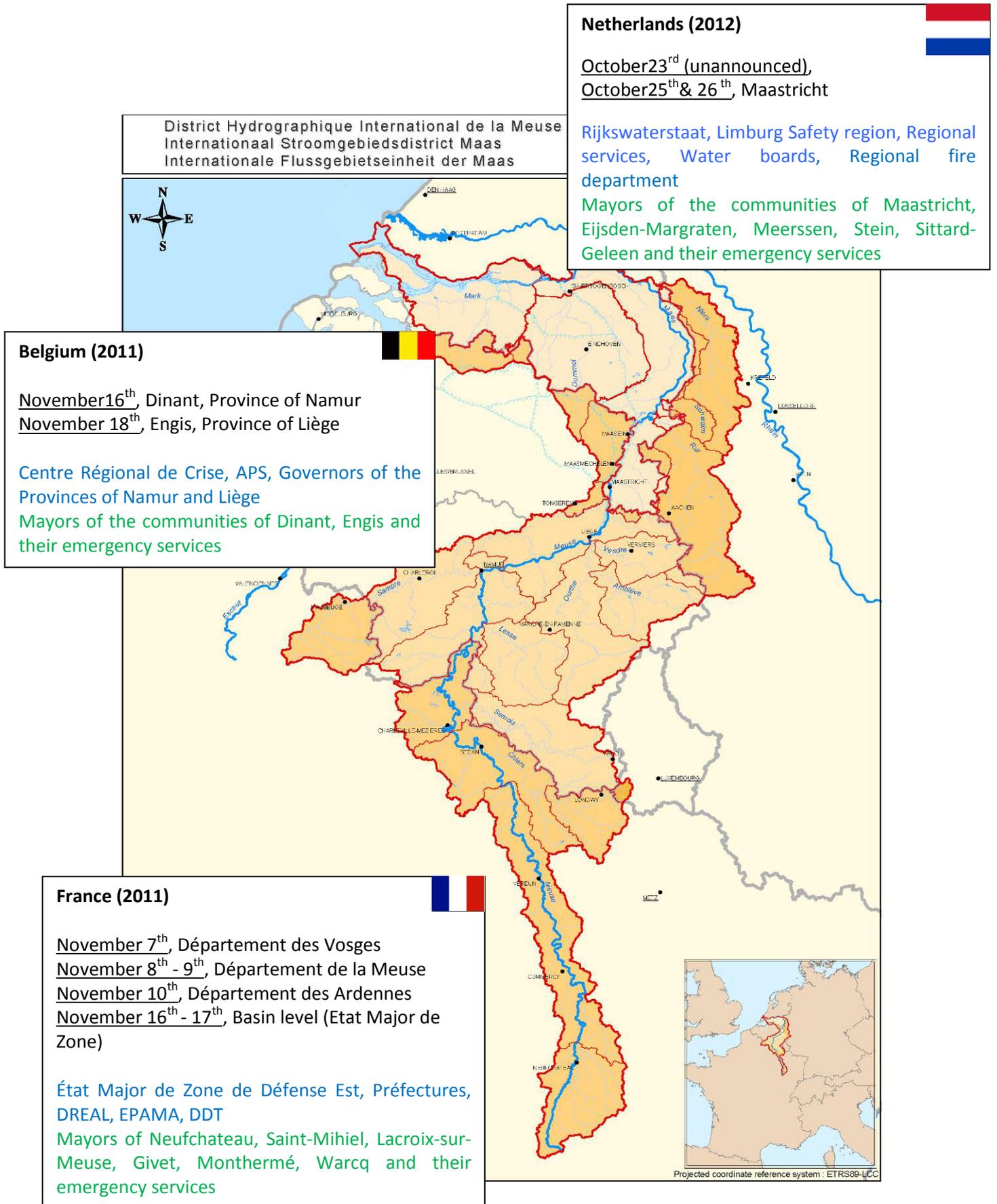
## Objectives & organisation of the exercise

The targets of this transnational exercise essentially reside in the **sharing of information**. It thus focuses on the following questions:

- Who communicates to whom? Is the timing appropriate?
- Which information is relevant at an international level during a crisis? For which purpose?
- How is the information up-scaled?
- How do the platforms for information sharing work?

In practice, after a **kick-off workshop** organized on February 23<sup>rd</sup>, 2011, which aimed at sparking bilateral discussion, WP4 essentially consisted in performing consecutive **flood exercises** at a local level, but in the presence of foreign observers. Local exercises and simulations are quite usual, but with AMICE, it was the first time they had been prepared and performed with a transnational dimension, i.e. with spectators from 3 of the countries involved in the AMICE Project (France, Belgium, Netherlands). This enabled the stakeholders both to **get to know each other** better, and to **highlight necessary improvements** and new needs.

The map in Figure 1 below presents the extent of the Meuse basin (34 500 km<sup>2</sup> and 8.9 million inhabitants), the dates on which the local exercises were performed in the three participating countries, and the involved organisations at national, regional and local levels.



**Figure 1:** map of the whole Meuse basin with the main characteristics of the AMICE exercises in the three countries. The names of the participating organisations are written in blue for state and regional level and in green for local level.

The local organisation is delegated to sub-project managers, but the global frame had been established by the AMICE team; a transnational coordination team was created and an indicative common schedule was proposed. The first part of this section describes the elements which were decided at a transnational level (i.e. which were the same during all the exercises, whatever the country), the second one focuses on the specificities added in each country.

### **Box 1:** why a flood simulation exercise?

Crisis management and civil protection involve a wide panel of actors and organisations, with specific assignments: control of the meteorological and hydrological data and forecasts, real-time determination of flood maps and areas under threat, management of the hydraulic structures, population warnings or evacuation, need for rescue and material...

A flood crisis thus requires the stakeholders from all sectors to be connected in an interdisciplinary way, in order to establish an efficient protection system for the population and its livelihood.

To ensure a coordinated comprehensive crisis management, simulation exercises represent an essential tool to:

- remind that the risk is still present, even if a flood has not occurred in the area for years;
- prepare organisations and individuals to crises, so that they get the right reflexes and the timely reactions when they are faced with critical situations;
- **examine, and improve if need be, the procedures concerning cooperation, sharing of information and decision making;**
- identify possible actions aimed at improving the crisis management.

In a transnational context, simulation exercises can more specifically offer an opportunity to combine the available tools and methods in each one of the neighbouring countries and reinforce the information sharing.

## **Joint parts in the exercises**

### *i) The flood scenario*

One unique flood scenario has been used by the three involved countries, according to the results of AMICE WP1, which determined the discharges that could be expected on the Meuse river in relation to the predicted climate evolution. The chosen flood scenario corresponds to a simulated situation in which the **100-year return period peak discharge**  $Q_{100}$  would **increase by 15%** within 2050. From this data, the flood maps – along with the local circumstances of the flood – were determined at national levels. Depending on the wishes of the participants, it was possible to add local ‘crisis elements’ (e.g. power shortage or traffic disruption).

### *ii) Information inventory*

During both the preparation phase and the performing of the exercises, several elements and characteristics were essentially evaluated:

- relevant information sharing networks;
- relevant information needs;
- relevant information sharing systems (tools) used;
- the **frequency** of information sharing;
- **on what level** it was shared (regional/national/transnational);
- **how this information was used** (common operational picture, decision making, execution, public information).

A distinction was made between the different phases of the exercise: **before crisis** (knowledge of the field, hydraulics, vulnerabilities and necessary elements for anticipation), **during crisis** (real-time evolution of the flooded area and predictions, weather, crisis management, needs for rescue and material...) and **after crisis** (return of experience, casualties, recovery).

## Specificities for each country

The local organisation had to be made by the participating countries, which induced some specificities in the preparation and the way operations were conducted during the exercises. The differences mainly consisted in: (1) whether a ‘crisis scenario’ was added or not, (2) how the flood map was determined, (3) which organisations took part in these simulations, (4) which technical means were available for the operational teams, (5) who was present during the exercises as observers, (6) what transnational interactions were carried out and (7) what the return of experience focused on.

		France	Belgium	Netherlands
<b>‘Crisis scenario’</b>		Defined by the Civil Security Authorities: <ul style="list-style-type: none"> <li>- Several roads, farms, public buildings, commercial areas threatened or flooded</li> <li>-1 victim</li> <li>- Electricity cuts</li> <li>- Field exercises (evacuation and rescuing)</li> <li>- Media pressure...</li> </ul>	Defined by the CRC-W (Walloon Crisis Center) in collaboration with the Agency for Prevention & Safety (APS). Mixed exercise : table top exercise and exercise with contacts and actions on the field. <ul style="list-style-type: none"> <li>– Measuring on the field</li> <li>– Coordination with the managers of industries</li> <li>– Done in municipality located in the center of the flood and having a good vision on the field</li> <li>– In table top exercise : the intervention teams did foresee measurements &amp; actions in case of flood Q100 +15 % &amp; +30 %.</li> <li>– Disrupted mobility</li> <li>– Affected economical activities</li> </ul>	A “planned” exercise (AMICE) and an “unexpected” alert exercise on the same (high tide) scenario: start of reporting at 1000 m <sup>3</sup> /s; 1250 m <sup>3</sup> /s reached 1:30 later (warning message); alerting RBT <sup>1</sup> and team population care at 2500 m <sup>3</sup> /s
<b>Determination of the flood map<sup>2</sup></b>		<ul style="list-style-type: none"> <li>- EPAMA<sup>3</sup> modelled the extent of the flood;</li> <li>- SERTIT<sup>4</sup> (specialized centre in satellite image analysis) produced detailed maps of the area and a 3D representation of the flood</li> </ul>	<ul style="list-style-type: none"> <li>- Use of flood risk maps</li> <li>- 2D+ mapping tool</li> <li>- 3D simulation in the preparation phase</li> <li>- “MobilAlarm” system<sup>5</sup>, enabling citizens to communicate water level measurements</li> </ul>	<i>Unreported</i>
<b>Participating organisations</b>	State/ Basin level	<ul style="list-style-type: none"> <li>- Prefectures</li> <li>- Defence Zone</li> <li>- EPAMA</li> </ul>	<ul style="list-style-type: none"> <li>- Regional crisis centre</li> <li>- APS<sup>6</sup></li> </ul>	<ul style="list-style-type: none"> <li>- Public Works and Water Management</li> <li>-Rijkswaterstaat</li> <li>- Water boards</li> </ul>
	District/ Local level	<ul style="list-style-type: none"> <li>- DDT<sup>7</sup></li> <li>- DREAL<sup>8</sup></li> <li>- 6 local communities</li> </ul>	<ul style="list-style-type: none"> <li>- Governors of the Provinces of Namur and Liège</li> <li>- 2 local communities : Engis &amp; Dinant</li> <li>- 24 pilot municipalities in observation</li> </ul>	<ul style="list-style-type: none"> <li>- Regional fire department</li> <li>- Police Limburg South</li> <li>- Limburg Safety region</li> <li>- 5 local communities</li> </ul>

<sup>1</sup>Regionaal beleidsteam (Regional policy team)

<sup>2</sup> An example of flood map is given on Figure 2.

<sup>3</sup>Etablissement Public d’Aménagement de la Meuse et de ses Affluents (Public establishment for land-use planning in the Meuse catchment and its tributaries)

<sup>4</sup>Service Régional de Traitement d’Image et de Télédétection (Regional service for image treatment and remote sensing)

<sup>5</sup>“MobilAlarm” interface is shown on Figure 3.

<sup>6</sup>Agence Prévention et Sécurité (Prevention and security agency)

<sup>7</sup>Direction Départementale des Territoires (Departmental directorate for territories)

<sup>8</sup>Direction Régionale de l’Environnement, de l’Aménagement et du Logement (Regional directorate for the environment, land-use planning and housing)

<b>Technical means</b>	<ul style="list-style-type: none"> <li>- Phone, fax, emails</li> <li>- Software "Vigicrues"</li> <li>- Software "OSIRIS"</li> </ul>	<ul style="list-style-type: none"> <li>- Phone, fax, emails</li> <li>- Software APS Plan Com</li> <li>- 3D virtual simulator</li> <li>- APS sharing platform</li> <li>- "MobilAlarm"</li> </ul>	<ul style="list-style-type: none"> <li>- Phone, fax, emails</li> <li>- GRIP<sup>9</sup> system</li> </ul>
<b>Observers</b>	<ul style="list-style-type: none"> <li>- 2 international partners (Walloon and Dutch)</li> <li>- 4 students and their 2 teachers from French Universities</li> </ul>	<ul style="list-style-type: none"> <li>- <i>partners of France and the Netherlands</i></li> <li>- <i>indirect observers : 24 pilot municipalities</i></li> <li>- <i>media (television &amp; radio)</i></li> </ul>	Observers from France, Wallonia, Flanders and the Netherlands
<b>Transnational interactions during the exercise</b>	Exchanges between France and Walloon authorities through the CRC-W <sup>10</sup>	Exchanges between France and Walloon authorities through the SETHY <sup>11</sup> and the CRC-W	<i>Unreported</i>
<b>Return of experience focused on...</b>	<p>There was no reported global frame for these returns of experience</p> <p>Feedbacks were organized at various levels (local and district levels, defence zone, mapping)</p>	<ul style="list-style-type: none"> <li>- Receiving and understanding the flood warnings</li> <li>- Understanding the risk/flood maps</li> <li>- Organisation of crisis management                             <ul style="list-style-type: none"> <li>- Using computer software</li> <li>- Information sharing</li> <li>- Media coverage</li> </ul> </li> </ul>	<p><i>"Planned" exercise:</i></p> <ul style="list-style-type: none"> <li>- Information management</li> <li>- Cooperation and coordination between the sections</li> <li>- Knowledge of the use of assistive resources</li> </ul> <p><i>"Unannounced" exercise:</i></p> <ul style="list-style-type: none"> <li>- Alerting and scale-up</li> </ul>

The following figures illustrate the type of tools available during the exercises: flood maps (Figure 2) and the "MobilAlarm" interface (Figure 3). Figure 4 presents a typical schedule of a local simulation and Figure 5 shows how the exercise was conducted in Engis (Belgium).

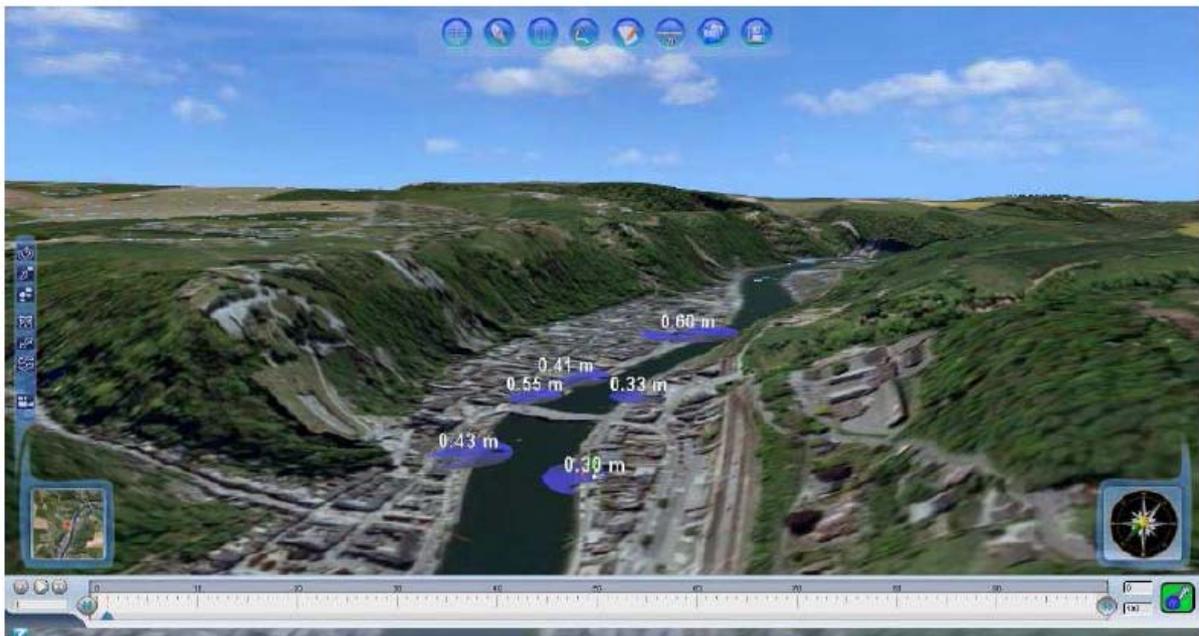


**Figure 2:** flood map obtained with SERTIT for the city of Neufchâteau (France); the blue zone corresponds to the flooded area, the red zone to the impacted urban area.

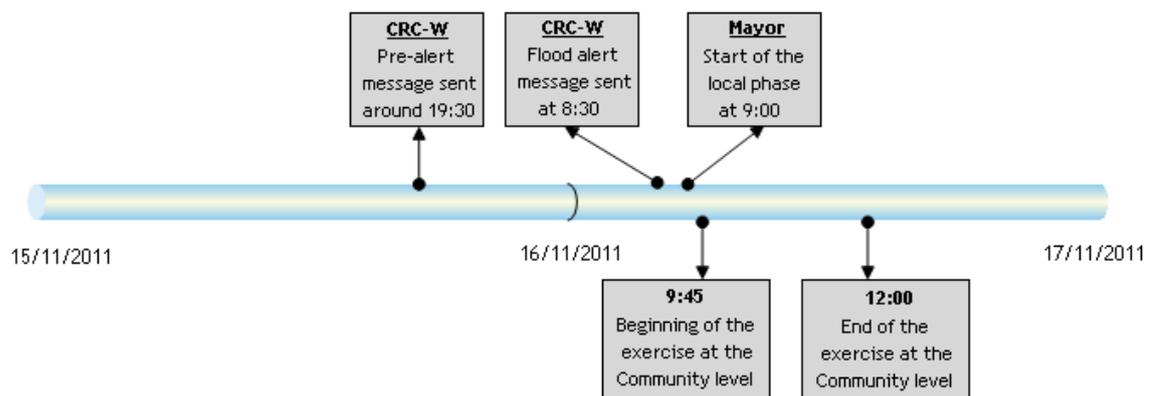
<sup>9</sup>Gecoördineerde Regionale Incidentbestrijdings Procedure (Coordinated Regional Incident-Management Procedure)

<sup>10</sup>Centre Régional de Crise de Wallonie (Regional Walloon crisis centre)

<sup>11</sup>Service d'ETudes Hydrologiques (Service for hydrological studies)



**Figure 3:** the “MobilAlarm” interface (APS - Belgium). The values which appear on the 3D simulator correspond to the water heights communicated by the citizens who are geolocated.



**Figure 4:** typical schedule for a flood exercise (Dinant, November 16<sup>th</sup> 2011)



**Figure 5:** the Walloon exercise in Engis (source: RTC-Télé Liège program, November 21<sup>th</sup> 2011, 10:37)

**Box 2:** example of a typical flood exercise

The operational crisis management centre, which gathers the involved national and regional services (firemen, police, army, population care team, civil protection, services in charge of meteorological and hydraulic data...) has been activated.

The following scenario is communicated to the participating “players” by the exercise organizer: extreme rainfall events have led to a rise in the water level of the Meuse river and its tributaries. The present situation corresponds to the alert threshold for the downstream Meuse. According to the current meteorological forecasts, another rainy event is expected after a short lull: the water level is likely to keep on rising, and to reach urban and industrial areas.

The “players” have access to the maps representing the historical data (water levels reached during the past floods), hydraulic protections, weak spots, as well as the location of the main stakes (distribution of population, Seveso sites...). They regularly receive updated information about the current situation and the forecasts, the flooded zones, the areas under threat, needs for rescue and material... Moreover, some “stimuli” are proposed to the participants: they receive specific crisis messages, dealing with aspects such as people evacuation, socio-economic impacts, power failure, media pressure... Consequently to these stimuli, they have to make decisions and to communicate them to the exercise organizer.

At the same time, crisis meetings are performed at community levels, through the local safety plans, along with actions undertaken on the field.

After the exercise is over, all participants are gathered to share their return of experience.

## Remarkable points and returns of experience

This section insists on several significant points relating to the AMICE transnational exercises and the main conclusions of the returns of experience, country after country. Indeed, it has been agreed between Partners that documents related to the organisation of the national exercises and return of experience would be drafted respectively by each AMICE Partner.

It is important to remind that the feedback is only dedicated to assess which information is relevant and the utility of the sharing systems, and not to evaluate how crisis centres work – or how well people were coordinated during the exercise. Furthermore, the tools which were used by the operational teams had already been validated from a technical or methodological point of view; the goal was not to test new tools, but rather to evaluate the capacities of existing ones.

### FRANCE

The AMICE simulation has been organized as part of the annual flood exercise for local communities in the French Meuse basin, which is coordinated by EPAMA. 5 local communities out of 23 were involved in the AMICE exercise, in coordination with the emergency and Civil Defence services of their respective district. The task has been held in two main steps, focusing at local community level from 7<sup>th</sup> to 10<sup>th</sup> of November 2011, and at the upper level of the Defence zone on the 16<sup>th</sup> and 17<sup>th</sup> of November 2011.

The crisis management exercise merged the different major components of an exceptional flood with a totally simulated situation, interactions between decision makers and safety departments and actions on the field. Due to the limited timeframe of the exercises, it was decided to produce flood bulletins ahead and to deliver them to the “players” every 2 hours – whereas they are normally delivered every 12 hours.

This “compression” of time, which was necessary for simulating a 10 days flood increase in one or two days training session, was said to have been a difficult element for the local staff, during the return of experience. Indeed, in a real case, the dynamic of the flood would be less quick and leave time to set-up preventive measures. Using a future date (year 2050) has also disturbed the participants and slowed-down the starting of the exercises.

The return of experience collected after the exercise highlighted the following points:

### *i) Local level*

- The moderators sent some crisis events but hardly responded to the requests of the communities (which were not planned in the scenarios).
- **It was the first time some crisis events had been included:** it was deemed really interesting but it requires to be sufficiently prepared to use computers, the OSIRIS software and the Local safety plan (PCS). There should be at least two trained persons in each community.

### *ii) District level*

- The ‘delocalised’ services somewhat lacked timely information about the situation.
- There is a **need for a global vision of the situation and equipment to display information:** through interactive maps, for example.
- Tracks of the actions to be carried / being carried / completed, and by whom, should have been kept.
- Information sharing with Belgium in the Ardennes still needs to be improved.
- People who have already experienced a major flood have a great importance in the anticipation process.
- **A special cell should be dedicated to anticipation,** the others being focused on reaction.

Two questions were also raised:

- Who should take the decisions? For example, should the evacuation of a retirement home be decided by the Director, the Mayor or the Prefect?
- What process should be followed to upscale the crisis management?

### *iii) Defence zone*

- The lack of global information has led to a wrong affectation of means.
- Some tools (such as Synergy, maps from SERTIT, and flood alert bulletins) could have been used more to get a global vision.
- The recovery (or back-to-business) phase has not been tested due to lack of time. It should be included in the future because it is also time - and money- consuming.

### *iv) Mapping*

It was noticed that the fire brigades have high resolution maps displaying past floods (historical data), whereas the DDTs<sup>12</sup> do not have such maps but are commissioned to produce them. Through the online platform, it would become possible to share these maps during the flood event.

**Most participants complained of the lack of tools to have an overall vision of the situation. The regular “crisis points” are not enough to get all the information.**

## **BELGIUM**

The exercise was held on November 16<sup>th</sup> in Dinant and 18<sup>th</sup> in Engis, each lasting half a day. Plan Com software (APS) had been updated with flood maps, flood planification & installed by APS in the 26 pilot municipalities. Each one of the main stakeholders had already identified individual objectives as follows:

### APS (Agency for Prevention and Safety)

- To get the return of experience about the use of Plan Com software, the APS exchange platform, the Amice flood maps (Q100 + 15% & +30%), the 2D+ APS-tool, the “MobilAlarm” system and the 3D simulator;
- To analyse the local communities’ needs in crisis management tools.

### Walloon Region

- To test and evaluate the warning messages (both the contents and diffusion processes);
- To evaluate the understanding and use of risk maps and flood forecast maps.

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<sup>12</sup>Direction Départementale des Territoires (Departmental directorate for territories)

Local communities

- To evaluate the tools available;
- To evaluate the local crisis coordination staff, the use of available information, the decision making and action plans, and to test coordination with a Seveso plant (in Engis) but also other flood concerned industries.

**Information about mobility** (impassable roads or navigation forbidden), **pollution**, **need for evacuation and measures taken was shared between French and Walloon authorities**. The data sharing between the hydrological services was made according to the following diagram:

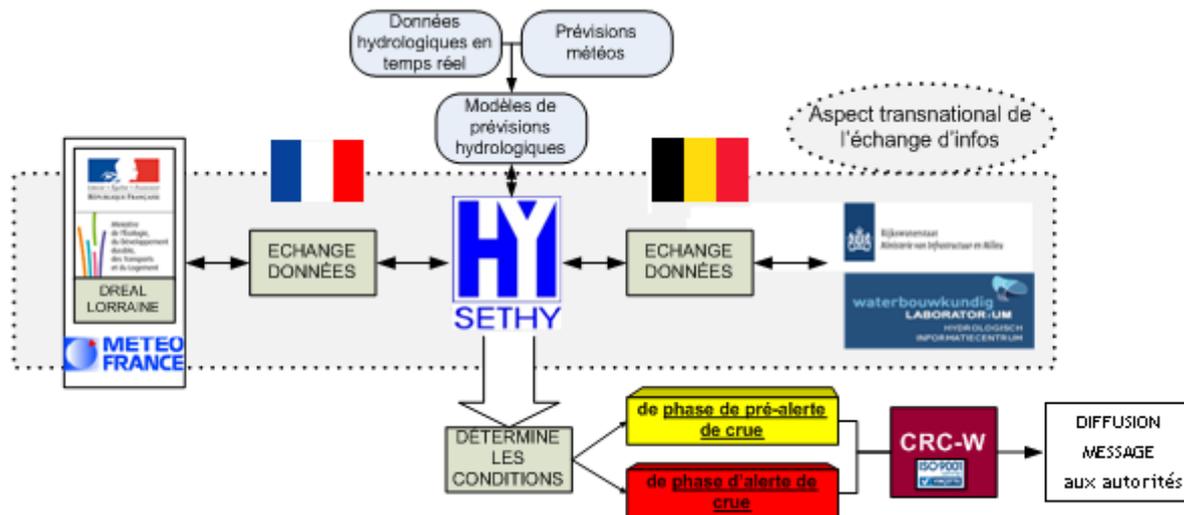


Figure 6: data sharing system between the hydrological services

The conclusions of the returns of experience were that:

- The reception of the flood warnings was successful except for 2 contacts (out of 14). The contact details have been updated. **The pre-alert phase** is welcome by the participants as it **raises their awareness and enables some early preparation**.
- The flood risk maps are well understood and they match the knowledge of the participants about vulnerable points. The streets names should be added.
- The participants would also like to get an **estimate of the number of people potentially impacted**. These maps are especially welcome to organize evacuation, traffic deviation and installation of mobile flood protections.
- **The flood maps should become accessible through an external server**.
- It is important to represent when the water depth is higher than 20cm (as it has consequences for mobility).
- An **updated list of contact persons (with their role)** is of utmost importance in case of a large crisis.
- Easy and quick access to maps has also been pointed as extremely important.

APS has demonstrated 5 tools:

- The emergency planification tool Plan Comm, software developed by APS
- The 2D+ mapping tool, which enables easily to pick & drop maps, to paste 3D circles, plumes or objects and to print, sent by email or store this 'customized' map.
- The 3D-simulator, which can help for the preparation phase;
- The "MobilAlarm" system, which helped make measurements of the water depth in the city and then integrate them in a map interface: citizens could be involved to make the measurements in their neighbourhood;
- The online database, to retrieve information such as the flood warnings, the types of industries in the flood area, etc...

## NETHERLANDS

The AMICE exercise was also part of the annual local exercises implemented since 2009. There were two different practice moments (unannounced on 2012, October 23<sup>rd</sup>, announced on October 25<sup>th</sup> & 26<sup>th</sup>) and different exercise objectives. The unannounced exercise (alerting, attendance and reporting) was especially designed as a test of the Assessment Framework and therefore mainly had a **cognitive nature**. The announced exercise focused particularly on information management and the cooperation and coordination between the sections and was therefore more focused on the **skills required during a crisis**. The most important goal was to determine if the scale-up in the main structure works well, if the teams are alerted in the agreed amount of time and if they react properly.

The additional aims, in the transnational context, were:

- to develop the information sharing and mutual knowledge between partners from the Netherlands as well as with other countries;
- to spark discussions on transnational information sharing.

**Observers and stakeholders came from France, Wallonia, Flanders and the Netherlands to follow the exercise**, which is a proof of the progresses and interests in mutual knowledge. It can also be noticed that it was the first time a regional Population Care Team had taken part in the exercise.

Discussions between observers and local crisis managers demonstrated that there is a **great potential transnational cooperation in the Zuid-Limburg Region**, which represents an interesting area for such improvements, taking into account the characteristics of the Meuse river in this region: upstream and downstream countries on the one hand, right and left banks countries on the other hand. This cooperation could be based on the Dutch internal procedure for crisis management at multi-level scale (GRIP system), which is operational in the Netherlands. This would require the addition of an ad-hoc transnational level to the current procedure.

Representatives from the Netherlands are interested in increasing **transnational information sharing: forecasts, common developments in modelling**.

It was recommended to divide the points of learning into section areas, and to **organise periodic workshops** with the following themes:

- Inventory of expectations patterns regarding interdisciplinary and multidisciplinary cooperation.
- Promotion of mutual knowledge of tasks and roles.
- Training: use of assistive resources.
- Training: meeting structure.

## Conclusion

Adaptation to climate change does not merely rely on water protection measures. One of the key pillars of any adaptation strategy is the anticipation of crisis situations: how to react to future extreme events in the most appropriate way. Since the Meuse basin is a transnational area, it becomes necessary to develop and to encourage a cooperation as large as possible between the different stakeholders in the territory.

The AMICE exercise was ambitious and large-scale with regards to setup and expectations. This intent therefore ensured that a tremendous amount of learning experiences and positive points have been accumulated in the field of information exchange and cooperation.

It was indeed the opportunity for crisis managers from the three neighbouring States to gain awareness on the benefits of transnational information sharing. Some of it is already included in the daily procedures, such as hydrometric data. However, forecast professionals and crisis managers would appreciate to go further with cooperation. At the same time, they realized that during a crisis, each stakeholder is focused on the management of the stressful situation, which makes sharing uneasy though wished for.

Communication towards the press was another objective for each partner during all phases of the exercise. It was really successful, leading to many articles or interviews (local and regional newspapers, TV reports), which enabled the public to get concerned with the whole project and with the possible consequences of extreme hydrological events that are more likely to occur with climate change.

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Title	Transnational flood crisis management exercise in the Meuse basin WP4 report – Action 27
Authors	Maité Fournier, Sarah Combalbert, François Hissel, Michèle Booten, Paul Dewil, Delphine Pontegnie, Hendrick Buiteveld, Max Linsen, Joop de Bijl.
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**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](http://www.amice-project.eu)

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