Developing a culture of risk in the face of extreme rainfall in the Euregio

Final research report - Marhetak project

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Table of contents

Introduction

The floods of July 2021 in the Meuse-Rhine area were a landmark event in terms of their scale, their dynamics, the number of fatalities and the degree of damage they caused to infrastructure and response resources. The mobilization of response resources was particularly complex. What's more, the scale of such a crisis prompted us to re-imagine both local and international support networks, inviting crisis management players to work together at all levels. In the wake of this event, the authorities called for our societies to be better prepared for this type of extreme event[1]. Events which, with climate change, are likely to multiply (Biermann & Kim, 2020; Keys et al., n. d.).

This research report is part of the "Maas-Rhein Task Force" (MARHETAK) project, co-financed by the European interregional cooperation program "Interreg Europe". The latter supports this desire to bring together different players in the Euregio area. As part of this project, the Spiral research center at the University of Liège worked in conjunction with the Wallonia Regional Crisis Center (CRC-W) to identify concrete ways of strengthening the management of risks linked to extreme rainfall in the Euregio.

The Euregio is a cross-border cooperation that brings together territories belonging to Belgium, Germany and the Netherlands in a network of common interests. The territories included in the Euregio are :

- The province of Liège (including Belgium's German-speaking community), located in the Walloon region.
- The Belgian province of Limburg, located in the Flemish region.
- The province of South Limburg in the Netherlands
- The 'REGIO Aachen' in Germany, comprising the districts of Aachen, Düren, Euskirchen and Heinsberg, all in the Cologne district of North Rhine-Westphalia.

This report is divided into three parts. Firstly, a review of the state of the art and a discussion of the concept of risk culture, in which we attempt to define the notion, but also to identify its limits. This will be followed by a comparative analysis of flood management systems in the Euregio, as a basis for identifying avenues for the development of a risk culture. Finally, we will highlight the various aspects arising from our research in the Euregio and conclude with some ideas for the development of a risk culture in the Euregio.

[1] Report of the Parliamentary Commission of Inquiry "Floods", Parliament of Wallonia, March 31, 2022.

Methodology

The general methodology used in this project is based on a literature review and a major qualitative data collection phase involving several methodologies: semi-structured interviews, a Delphi survey and focus groups, over a period of 11 months.

First of all, we conducted an analysis of the scientific literature on the concept of "risk culture". This concept, often used in the discourse of field actors, remains relatively vague and ambivalent as to its meaning. We have also studied the emergency planning systems for flood risk in force in Belgium (Flanders and Wallonia), the Netherlands and other border countries such as Germany and France. To do this, we examined the legislation on emergency planning, which we compared with the help of an educational tool[2] (EMRIC, 2023) developed by a cross-border institution specializing in the coordination of crisis management players in the Meuse-Rhine Euregio (EMRIC). This analysis enabled us to understand how risks and crises are managed in the different countries, which players are involved, and how crisis coordination takes place. This analysis was very useful in preparing the semi-structured interviews and focus group.

We then carried out a qualitative analysis phase with two components: semi-structured interviews and two focus groups. With regard to the interviews, we conducted 13 semi-structured interviews with water and crisis managers in the three regions covered by our research. These interviews were divided between water and crisis managers, as well as citizens who had been involved in the management of the 2021 floods. The various interviews are distributed as follows across the different regions:

Wallonia	**Flanders**	**Netherlands**	**Germany**
Area manager relief	Member of SFDG	Active firefighter during flooding	Member of Wasserverband
Member of the Governor's Federal Service	Manager at Vlaams Waterweg	Medical emergency manager for the Limburg-South emergency zone	
Experts in extremes rainfall	Manager in the VMM[3]	Responsible for water-authority du Limbourg	
Member of a non-profit organization promoting public participation in times of emergency. crisis			
Management of a river contract in Wallonia			
CILE Management[4]			

[2]https://elo.brandweer.nl/Pages/ViewItem.aspx?cp=%2FCMS%2FVR%20Zuid-Limburg%2F80.%20Multi%2F08.%20EMRIC%2FV2%2F211213_VRZL_EMRIC_FR_SCORM2004

[3] Vlaamse Milieumaatschappij, in charge of category 1 non-navigable waterways

[4] Compagnie intercommunale des eaux, in charge of drinking water distribution

The interviews were conducted in a semi-directive manner, following the methodology outlined by Kaufmann (2014). The main objectives of these interviews were to gain a more detailed understanding of how flood risks were managed in the different territories, and also to gather the experiences of the various players with regard to inter-regional relations, relations with civil society and the state of preparedness of the different territories. To this end, an interview guide was drawn up and adapted to suit the interviewee and the issues raised during the interview. It can be found in Appendix 1: Interview guide.

In addition to these interviews, we carried out two focus groups. The first, with 10 participants in Wallonia, was aimed at organizing a discussion between, on the one hand, actors from the disciplines of crisis management, managers and planners, and, on the other, citizens proposing methods for involving the population. Indeed, the inclusion of the grassroots population in the focus group is a particularly important element of the system. We then organized a second focus group in Flanders with 8 actors from Flanders and the Netherlands. The aim of this focus group was to confirm the hypotheses emerging from the first part of our research in terms of relations between managers within a country, but also in terms of communication between Belgium and the Netherlands. Guides to the two focus groups can be found in appendices 2 and 3.

Finally, we carried out a qualitative online survey using the DELPHI methodology. The "Delphi" (or "Delphi Group") method is a technique that is both sophisticated (it makes it possible to account for the complexitý of an issue and to organize the transition from reflection to coordinated action) and modular (it demonstrates a great capacitý for adaptation according to the issues under consideration). The list of questions in our Delphi survey, together with an analysis of the respondents' profile, can be found in Appendix 4. Another report, entitled "Marhetak - Analysis of the Delphi survey" is also available, and includes a full analysis of each of the questions.

It's important to note that in the course of our research, we came across a minority of players active in the German part of the Euregio. This can be explained by several factors. On the one hand, the floods in Germany had particularly far-reaching consequences, especially in terms of the number of people who died. In addition, a number of crisis managers are currently under investigation in Rhineland-Palatinate, with potential criminal prosecution, which may lead some managers to be reluctant to answer questions that could put them at fault. Finally, none of the members of the research team spoke German, so the interviews had to be conducted in English, thus limiting the possibilities for speakers.

This report presents the results of the research in three parts: the first part on risk culture was based on a literature review, while the next two parts are based on both the literature review and a synthesis of the results of the analyses from the various data collection methods (interviews, Delphi and focus groups). More specifically, the analyses of the German case were therefore largely based on a review of the scientific literature and the various reports produced by the authorities at the different levels of German management.

Part 1: Reflection(s) on risk culture and the dimensions to be taken into account to support its emergence[5]

Introduction

Currently, if the term risk culture is regularly mentioned during crises, it is above all to highlight its absence or deficit[6] (Bier, 2020; Blesius, 2013; Peretti- Watel, 2005; Siedschlag, 2011). In Belgium, following the floods of July 2021, the parliamentary commission of inquiry established the improvement of risk culture in Wallonia as a central and transversal mission in flood prevention and preparedness[7] . Beyond its deficit or absence, the concept of risk culture and what it covers remains rather vague and poorly defined (S. Bier, 2020). Indeed, the notion of risk culture[8] is: polysemous, undefined and insufficient.

Attempted definition

The concept of risk culture has its roots in the 1980s, with the development of the concepts of "risk civilization" (Salomon and Lagadec, 1981) and "risk society" (Beck, 1986). These two concepts highlight not only the creation of risks by human societies, but also the realization that they are both the origin and the target of these risks. These developments mean that societies need to protect themselves against these risks. The expression "risk culture" was first coined by Giddens (1990) to "make individuals and governments aware of the growing, and inescapable, importance of man-made risks, and of the need to introduce risk management at the heart of national and everyday decisions" (S. Bier, 2020, p. 22). Furthermore, risk culture is characterized by two elements (Vidal-Naquet, 2001; Blesius, 2013; S. Bier, 2020): firstly, an awareness of the dangers faced by a given network of actors, as well as the vulnerabilities of that network. Secondly, it is associated with a willingness to prevent these risks and reduce the vulnerabilities of the actor network concerned. This awareness is based on a collective and individual memory dimension (crisis memory), on a form of fear of the potential damage caused by a hazard, and on an aspiration to preserve (or even improve) the current way of life (CEPRI, ND). Risk culture is therefore intrinsically linked to a sense of community (Callon, 2001; S. Bier, 2020), which ties risk culture to a particular territory. Risk culture is therefore built on knowledge and awareness of the specificities of a given network of actors (Rollason, 2018) in a specific territory and context. It is therefore a non-institutional process based on the co-production (Jasanoff, 2010) of shared values

[5] This reflection stems from chapter 6 "Reflection(s) on risk culture and the dimensions to be taken into account to support its emergence", produced by the Spiral research center with Justine Contor as part of the "Multidisciplinary strategic plan for the Vesdre watershed".

[6] For example, in the wake of the Xynthia storm floods, a Senate report noted: "Without a culture of risk, there can be no anticipation or management of floods. And yet, this aspect of risk prevention policy is far from satisfactory" (Rapport d'information n° 647, Sénat 2010, p.74).

[7] Although absent from Belgian regulations, this concept is not totally absent from the country's legislative framework, since the Flood Directive of October 23, 2007 mentions the desire to develop a minimum level of risk management culture within EU member states (DIRECTIVE 2007/60/EC).

[8] It would be useful to refer to the "residual risk": that which cannot be addressed by adapting the territory as envisaged in the previous chapters. There will remain situations in which technical and territorial systems, even after optimization/improvement, will fail. The aim of this chapter is to consider the human/social/organizational dimension of resilience.

within a social group. To develop a sustainable risk culture, we need to put in place processes that enable this co-production between the expertise provided by public authorities and the knowledge generated by citizens, in a bottom-up fashion. Risk culture is therefore a gradation of awareness and action in relation to a given risk. In crisis management, it translates into a shared, collaborative attitude (Kapucu, 2010) and cannot therefore be developed in a closed environment, either between experts or between citizens in isolation (Callon, 2001; Rollason, 2018). The participatory dimension is therefore central to the development of a risk culture. It must go beyond the probabilistic approach, consider risks in all their diversity and take into account the fact that perceptions of risk vary according to individuals and groups.

The definition proposed by Elise Beck (2006) allows us to place a constant around the concept Risk culture is the result of a collective construction, based on perceptions and knowledge, whether innate or acquired. This knowledge may relate to the risks themselves, in a general way and/or to a local context, but also to the instructions to be followed in the event of a disaster.
". This definition gives pride of place to collective debates on practices, positioning and issues. It also raises the question of the local knowledge that enables us to understand a territory in terms of its history. Thus, cultural work - understood as production - around past events is an essential lever, but also the idea of communicating in a popularized way. We need to move away from technical experts' visions and make the technical aspects comprehensible to the average citizen (e.g.: communicating very clearly about the hazard map).

Moreover, it's not just a question of thinking in terms of "risk culture", but also of linking it to the notion of resilience. In this respect, Tisseron (2007; 2020) looks back at various pivotal stages in the conceptualization of resilience. The notion of trauma is intrinsically linked to it, since resilience refers to the ability to withstand trauma and rebuild oneself afterwards, without however returning to an initial state. Thus, resilience needs to be seen in two ways: as a process in which competence is acquired throughout life; and in a societal way - moving away from the individualized logic of resilience. In addition, the notion of "repair" proposed by Centemeri, Topçu and Burgess (2021) seems interesting to us, as it enables us to think of global changes that take into account the socio-technical, socio-ecological and socio-cultural dimensions in the perspective of reconstruction following a disaster. Thus, the authors see the process of resilience (reconstruction) as a collective opportunity not to return to the previous situation, but to respond to pre-existing social, cultural, political, ecological and ethical issues (Centemeri, Topçu and Burgess, 2021, p. 8). They insist on the importance of specifying and contextualizing the objectives of reconstruction and recovery, constantly asking the questions "for whom" and "according to whom" is the reconstruction designed (Centemeri, Topçu and Burgess, 2021, p. 4)? Finally, the authors introduce the notion of "care" in post-disaster management (Ibid., p. 11), inviting us to take care of our environment - in this case, the river and its infrastructures (physical and social) - to consider our relationship with our environment as a way of "maintaining, continuing and repairing our 'world' so that we can live in it as well as possible" (Fisher and Tronto, 1990, p. 40). In this way, the culture of risk contributes to the importance of an imaginary, a shared culture, a narrative to enable the conditions for "care".

The limits of the concept

Risk culture has many meanings. On the one hand, the notion of a "risk culture" seems to meet with consensus, in the sense that all players (public and private) agree that it is a major issue for so-called vulnerable territorial zones: either because - like the Vesdre watershed - they are subject to flood hazards, or because of the significant increase in climatic events (drought, flooding, etc.). On the other hand, the question of risk culture is the subject of debate, particularly because of the meaning of the words used and because it is part of a managerial vision. Indeed, it presupposes the creation of "expert" knowledge that would be disseminated to the poor and vulnerable (Langumier and Revet, 2013). However, this way of thinking prevents us from considering the complexity and particularities of the situations in which events take place. According to the authors (Ibid., 2013), we need to go beyond this vision, through a perspective supported and co-constructed by researchers, activists and local players with in-depth knowledge of the field. Without romanticizing local actors, the aim is to gain recognition for local knowledge as a tool for disaster governance. It's all about making vernacular knowledge visible (Ellen, Parkes and Bicker, 2000).

Furthermore, the "risk culture" is based on a managerial notion of risk, which helps to make risk acceptable within the framework of a probabilistic approach. But this vision, while reassuring, is insufficient insofar as it doesn't allow us to think about exposure to hazards, or the resilience mechanisms that need to be developed.

In this note, we propose to distance ourselves from risk in the technical and managerial sense, and to propose an alternative management approach.

Furthermore, drawing on the meta-analyses carried out by Blesuis and Vidal-Naquet (Blesius, 2013; Vidal-Naquet, 2001), risk culture can be characterized as a non-institutional process based on shared values (rather than imposed norms) within a community. Indeed, risk culture is not built through the proclamation of unilaterally transmitted norms or information (from a holder of knowledge to a set of stakeholders facing one or more risks), but through a process of co-production of values and symbols involving all stakeholders. Risk culture implies the creation of a form of community, and therefore a principle of affiliation (membership). It is therefore eminently contextual, and varies according to geographical location. It is generally coupled with a territorial culture, i.e. a knowledge and awareness of the specific features of the network of actors[9] (territory and community) in which a group of citizens live. In this way, communication is fundamental to maintaining a collective memory of past events.

Putting it into practice: developing the risk culture

The floods of July 2021 in Wallonia were a landmark event in terms of their scale and dynamics, and the level of damage they caused to infrastructure and response resources. In the wake of this event, it is now clear that we need to strengthen our societies' preparedness for this type of extreme event. Events which, with climate change, are likely to multiply. To face up to crises (disasters) which, by definition, will take us by surprise, we need to work on collective resilience: how, in concrete terms, can we strengthen our collective resilience?

[9] The term actor network is inspired by the literature on the sociology of translation, and refers to all the human and non-human actors (agents) (infrastructure, flora, fauna, communications networks) who interact with each other (Callon, 1986; Latour, 2005).

How can we ensure that people are aware of the risks associated with flooding (and climatic events in general)? How can we develop the ability of populations and citizens to take charge of their own lives, and build up a support network? French psychologist Serge Tisseron identifies two dimensions to collective resilience: on the one hand, public authorities have an important role to play in contributing to the development of an efficient risk culture through infrastructures and services; on the other hand, populations and citizens need to develop their ability to take charge of their own lives, and to build up a network of mutual aid and solidarity. As the primary actors in civil protection, they must play a role (yet to be defined) throughout the risk cycle (prevention, planning, crisis management, reconstruction and feedback; Figure 1).

Adapted from Fallon, Thiry and Zwetkoff, 2016, "Bilan des 10 ans de l'arrêté royal sur la planification d'urgence: le cycle tourne-t-il rond?", Les anciens moulins de Beez, Namur, 24/02/2016.

At each of these "stages" in the risk cycle, we would like to focus on three central dimensions: (1) public participation; (2) reinforcing the professionalization of front-line players; and (3) cross-functional communication.

Opening up systems to the participation of populations

The issue of public participation in risk management has crept onto the political agenda, notably with the management of the covid-19 pandemic and then during the floods of July 2021. Already in October 2019, at the annual colloquium of the Planu.be association, French-speaking emergency planning coordinators addressed this question around round tables: is it possible to involve citizens in emergency planning and crisis management? How can they be involved? At what stage in the risk cycle can citizens be involved again? (Fallon & Thiry, 2021) Based on concrete cases, participants shared positive and counterproductive aspects, leading to an analysis of the strengths, weaknesses, opportunities and threats associated with public participation during the risk cycle (Table 1).

Whether in the risk identification, prevention, emergency planning, crisis management, recovery or feedback phases, the participation of local populations must be considered/thought through. Table 36 clearly shows that public participation is a key element in risk management. Citizens have a detailed knowledge of their land, and are even keen to be more active in crisis situations. The level of involvement of impacted and/or non-impacted communities (e.g. volunteers) is all the more important and necessary in the event of disasters (such as the floods of July 2021) that prevent conventional crisis management structures from being put in place. A purely top-down approach, characteristic of strict strategic planning, is too rigid to achieve this objective (Fallon & Thiry, 2021). It would be preferable to replace this rather hierarchical logic, based on a predetermined list of actors, with a reticulated scheme favoring the intervention of "usage experts" (Ansell & Boin, 2019): forced to improvise with their available resources in these "do-it-yourself" activities imposed by the situation, they don't do just anything but mobilize usage expertise with a critical perspective, always open to revision.

Strengths (residents and territory)	**Weaknesses**
During coordination, a variety of information sources are shared, and attention is paid to practical details for greater consistency. Local players know their territory. The Seveso committees act as relays between the authorities and operators. Residents support their neighbors.	Lack of coordination between volunteers. Risk-taking by volunteers. Volunteers cannot ensure 24/7 continuity of service. Volunteers are not necessarily recognized by the public.
Opportunities	**Threats**
Citizens can help disseminate information and set up social networks. Some volunteers or companies have equipment directly available on site (farmers' equipment; amateur radio operators). Associations and committees act as communication relays for the authority.	Risk of a drift towards authority on the part of volunteer workers. Problem of mastering a common language. Problem of unequal treatment: certain groups of victims may be overlooked. The temporality of the crisis is not sufficiently anticipated by ➡ volunteers. against the times.

SWOT analysis of the strengths and weaknesses of involving citizens or associations in planning or crisis (2017) - Fallon and Thiry (July 2021). Involving citizens in crisis management? Be prepared, emergency planning and crisis management magazine, 3

The citizen will generally be the very first person to intervene in a crisis situation (Fallon & Thiry, 2021): present in the field, he or she can be considered as a "scout" and pass on the most important information to the authorities. Hence the importance of having them well prepared, and trained to react appropriately. In particular, they play an important role in informing the official services, looking after their own safety and, as far as possible, that of others. In the event of a major crisis, this citizen involvement can be completely autonomous, as the authorities themselves are overwhelmed. The private sector, too, voluntarily supported the efforts of the authorities. At the start of the health crisis, many volunteers produced thousands of fabric masks free of charge. Some companies developed the production of disinfectants, while others produced plastic masks. These parts of the network are innovative and creative: they contribute to efforts to combat the disaster, but also signal a certain societal commitment that the authorities would do well to encourage and highlight.

The solidarity shown by volunteer citizens during the July floods was unprecedented and widely reported by the media. Local businesses and farmers were quick to step in with resources that the emergency services could no longer mobilize, given the extent of the territory affected. And yet, in no official document is there the slightest support for the direct participation of citizens, even though it would benefit from greater involvement in crisis management.
! This spontaneous help from thousands of volunteers was generally unprepared and unstructured, but the situation was so chaotic that no hierarchical structure could define what was needed, given the degradation of infrastructures and means of communication.

In this respect, it would be worthwhile to initiate a process of reflection on the creation of local authority civil protection reserves made up of volunteer citizens "who can be mobilized to support the public authorities in preventing and managing the major risks present in the local area" (CEPRI, N.D.). Encouraging cooperation with the voluntary sector at the emergency planning stage, upstream of a crisis situation, helps bring decision-makers closer to groups of citizens who know the local terrain well and have specific expertise that can be rapidly mobilized. Experts cite: river contracts; amateur radio groups (very important in the event of a breakdown in communications or in the ASTRID network); as well as local prevention partnerships (PLP) (which are familiar with the dynamics of their neighborhoods); parents' associations (schools and children), sports groups, foresters, and so on.

Reinforcing the professionalization of front-line workers

This means strengthening our crisis infrastructure by investing in training, exercises and networking between the professionals who will be on the front line of crisis/disaster management (rescue zones, police zones, municipalities, governors' offices, civil protection, emergency medical aid, etc.). To ensure that emergency planning is both effective and appropriate, the authorities must first invest resources in terms of means, skills and coordination. The last two crises (the Covid-19 epidemic and the July 2021 floods) highlighted the lack of political interest in investing in emergency planning, a syndrome that affects most systems of government (Boin, 2021). Indeed, this kind of activity consumes resources but without political gain. We're thinking in particular of emergency planning coordinators (planu), who all too often encounter obstacles in freeing up time and resources outside times of crisis. "We prepare scenarios, we try to prepare for situations that may never occur in a commune".

The aim is also to professionalize the various trades involved in the risk cycle, through certified training, experience sharing and more frequent multidisciplinary exercises.

The professionalization of field staff also requires training in participatory practices, so as to integrate citizens more fully into the process.

The result is an interest in interconnections and meshing, but also an awareness of the great importance of setting up warning systems (sentinels) (Langumier and Revet, 2013), as well as maintaining training initiatives for jobs perceived as thankless, or even useless, when "everything's going well", and reinforcing communication work.

A cross-disciplinary approach to communication

The point here is to re-emphasize the importance of communication at all stages of the cycle, i.e. across the board. Taking a crisis situation as an example, it's important to remember that the first crisis communication process is institutional: communication between different bodies - and particularly between disciplines - is an obligation that must be mastered by the departments concerned, and is the subject of regular exercises. Experience feedback (RETEX) from past crises shows that one of the challenges is to operationalize coordination and communication between political entities and communication with stakeholder networks at the height of a crisis (Fallon & al. 2019).

In the case of complex crisis management (such as flooding), it is necessary to set up communication channels to ensure that information from the field is passed on, as this often provides early warning signals that need to be taken seriously.

Whether in terms of communication with the public or institutional communication between the players in charge of crisis management, it's only after the crisis has passed that it's possible to assess the quality of the procedures and resources mobilized. Indeed, crisis communication is also responsible for the history it helps to write. Far from a purely functional, top-down approach to communication, it is more interesting to think of crisis communication as the fruit of a social dynamic. The central question becomes: how do actors make sense of the crisis? (Fallon & al. 2019).

A more specific element concerns the use of social media by Internet users, who respond to a need for immediate information on the part of individuals affected by a crisis situation. However, they also provoke numerous reactions from crisis managers, who criticize the fact that information is not necessarily validated, while rumor production processes are amplified ("it's chaos") (Fallon & al. 2019). Indeed, network participants play the role of both producers and consumers of information via Facebook, Twitter, Instagram and so on. Rather than centralized information, these devices lead to the implementation of a networked communication model amplifying the phenomenon of breaking down the spatial boundaries of potentially interacting actors. In terms of crisis management, such means of communication make it possible to rapidly inform a wide or, on the contrary, targeted audience. They also enable the participation of citizens, who can transmit information on a voluntary basis.

The use of social media makes it possible to mobilize a new approach to communication: it's not just a question of transmitting information, but of organizing a collective process of interpretation/re-interpretation of the situation by the participants, with a view to coping with events. The use of social media can also be a source of socially innovative interactions (Fallon & al. 2019). Between Internet users, each member of the network plays, in principle, an equivalent role and makes available to the others the information he or she possesses, thus creating a mega-collaborative process. In some cases, this use of social media can expand the public's role in disaster management, because it increases situational awareness: there are no limits to the number of people who can engage in this cooperation, and exchanges are almost instantaneous. But the benefits of such collaboration lie in the challenge of ensuring the coherence of distributed knowledge.

Working on communication, and more broadly on social networks, makes it possible to deal with rumors, which can also be recognized as a process of collective deliberation: they enable each person to ascertain the attitudes of others, and to situate themselves in relation to both the values of the group and those of society as a whole. It also maintains group cohesion and creates a collective. Rumor analysis provides information on the "social in the making" and on networks of trust. Rather than seeking to eradicate this phenomenon, it is more interesting to analyze it, in order to highlight the dimensions of the crisis that are the subject of debate on the networks and that are likely to enter the collective memory.

In this way, cross-functional communication elements contribute to a risk culture by maintaining attention and activating and reactivating memory. In fact, communication is both cross-functional and specific to each stage of the risk management cycle.

Part 2: Managing extreme rainfall Euregio

In this second part of the report, we will highlight the complexity of crisis management networks in the face of flood risk. As we shall see, these systems operate in more or less dissonant directions depending on the region, with actors who are sometimes very divided. We have thus been able to identify dynamics anchored around highly variable actors who are sometimes integrated into crisis management, sometimes completely independent. Our study of drought risk, however, revealed a willingness to integrate drought risk management with crisis management, which is not always the case when it comes to flooding.

A. Crisis management

In this first part, we will review the basic principles governing crisis management and emergency planning in the Euregio. As we shall see, each country has its own distinct approach to crisis management. But before going into the details of each of these systems, it's worth recalling that the European authorities have tightened the planning directives for industrial accidents (known as the Seveso directives), which has had an impact on the way in which crises are dealt with in the various member countries.

In the Netherlands

The emergency planning system in the Netherlands is governed by a law (*Wet Veiligheidsregio's*) published in 2010 following the crash of a Turkish airlines plane in 2009. Based on this law, the Netherlands has opted for management at the level of the *veiligheidsregio*, or safety region, which in the case of South Limburg is roughly equivalent to half the province in terms of population. It is within this relief zone that we will find the operational and strategic actors of the crisis, the

There are 4 '*Kolommen*': Kolom 1: the fire department

Kolom 2: emergency medicine

Kolom 3: police

Kolom 4: the commune

*This illustration shows the two relief zones (in color) in the province of Dutch Limburg - image created by the author of the report based on other sources (*Outline Map of the Netherlands with Provinces | Free Vector Maps | Netherlands map, Map, Map outline*, n. d.; Veiligheid, 2019)*

These 'Kolommen' each correspond to a service and are therefore not interchangeable with one another. These services are fully integrated into the relief zone, all acting on the same territory. We also note the absence of "communication" as a service included among the "Kolommen". It is, however, present in crisis management, but as a "support" service, in the same way as liaison officers or LCMS[10] secretaries. Last but not least, the municipality is directly involved in the organization of operational crisis management services. In the Netherlands, burgomasters are not elected local officials as in Belgium, but representatives of the state at local level, appointed for a period of six years on the proposal of the King's Commissioner (at provincial level): one of their missions is to ensure the safety of citizens.

[10] This is the Dutch equivalent of ICMS, which is also due to be replaced by Paragon in 2024.

All these services will be included in the emergency and response plans drawn up by the emergency zone. There are also mandatory emergency and response plans that depend on international legislation, such as the plans around Maastricht airport and the Seveso *Chemelot* company. However, there is no obligation to have a general emergency and intervention plan[11]. As a result, specific plans are drawn up on the basis of a prior risk analysis. In the South Limburg relief zone, for example, there are only two other special emergency and response plans in addition to those listed above. The first concerns the NATO military base near Maastricht, and the second concerns flooding. Finally, there are the single-discipline plans within each 'kolommen' and the internal emergency plans. As we shall see later, there are also special plans within certain institutions, such as water management bodies.

Strategic and operational coordination of crisis management in the Netherlands

In the Netherlands, crisis management is organized into GRIPs, each representing a different scale of threat. An event is handled directly by the emergency zone level, and remains under its authority regardless of its severity. This is another example of the importance attached to the rescue zone level in the Netherlands. The need for action and the resources deployed will vary as the GRIPs increase. The following table shows the different GRIPs, the actions required and the resources deployed[12] :

	Action required	**Resources deployed**
GRIP 1	Need multidisciplinary multidisciplinary coordination in the source area.	Setting up a multidisciplinary management team (CoPI) with officers from the various kolommen and departments partners. It is headed by an operational manager from one of the first three[13] departments.
GRIP 2	Need for coordination in an area of effect (e.g. chemical fire).	A regional management team (ROT) has been set up, comprising the commanders of the various kolommen and associated departments. It is headed by an operational from one of the first three[14] services.
GRIP 3	Need for administrative action.	Creation of a municipal policy team (GBT) with strategic advisors from the various departments. It is headed by the mayor of the commune concerned.
GRIP 4	Similar to GRIP 3 but on several communes.	The GBT unit becomes a regional unit[15] (RBT). It retains essentially the same composition, but leadership passes to the president of the relief zone, i.e. the mayor with the largest number o f inhabitants in his or her area. community.

[11] This information comes from the person in charge of emergency medical services in the Limburg-South emergency zone, and has been confirmed by the person in charge of the EMRIC network. However, the situation at local authority level with regard to evacuation plans in the event of fire, for example, was not discussed.

[12] The literature sometimes refers to a GRIP 5, which would involve management at national level. However, our interviewees explained that such a GRIP was unthinkable, even during the COVID-19 pandemic.

[13] We couldn't clearly identify who it was, but it was most likely a firefighter.

[14] Idem.

[15] The word regional is then used to describe a vast area and not a region according to the administrative division in the Belgian sense.

As we have seen, all these players are integrated within the relief zone. But while this offers the advantage of trained and efficient coordination, it also means that the same players are involved from one GRIP to the next. So, to avoid a loss of resources from one GRIP to the next, the Netherlands has also set up 'temporary' cells for GRIP transitions. Crisis management in the Netherlands can be summarized as follows:

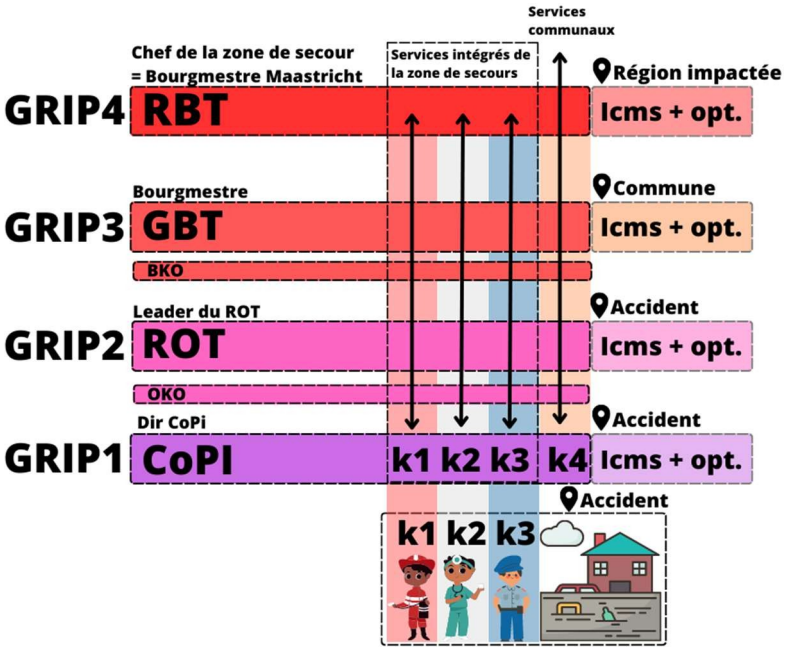

Diagram of crisis management in the Netherlands, drawn by the author of the report.

At Germany

The German state operates on a decentralized basis, with the Länder in charge of crisis management, as long as this does not jeopardize the state as a whole. Crisis managers can be found at various administrative levels: the Länder, the district, the rural districts (Land-Kreise) and city districts (Kreisfreie Städte), and finally the municipalities. Each of these levels of authority will set up crisis management support resources. As the operational emergency services are different within each Länder, we're going to focus on the situation in North Rhine-Westphalia, which includes the German part of the Euregio.

The police are divided into 47 police authorities operating in each of the various districts[16] . In addition to the Länder's own police force, there is also a federal support police force, which can be mobilized in the event of a major crisis. Emergency medical aid is provided independently by the 53 districts of the Länder, which generally call on non-profit organizations such as the Red Cross. The fire department, on the other hand, is organized at municipal level. In Germany, a large number of firefighters are volunteers, as many rural communities do not set up a professional fire department, which is too costly for the risks they face on a daily basis. It's also important to note that the Länder provide economic support to local authorities, notably by donating vehicles.

[16] There are actually 53 districts in North Rhine-Westphalia, but special rules link certain districts together.

Last but not least, there is a technical support force at German state level which, like civil protection in some countries, has substantial technical resources available on request from local authorities.

Strategic and operational coordination for crisis management in Germany

In North Rhine-Westphalia, it is the Fire and Disaster Protection Act of December 17, 2015 that establishes that crisis management is the responsibility of the districts. What's more, a German particularity within the Euregio is that there is no structure for pooling operational and administrative powers in times of crisis. In fact, coordination in times of crisis takes place in parallel, with operational management on the one hand and administrative management on the other, each with their own rise to power (Hecker & Domres, 2018).

On the operational side, there are two multidisciplinary coordination bodies. The first is responsible for directing operations at the site, bringing together the fire department and emergency medical services. The police are not part of this structure; they have their own structure on site. Then there's the Major Accident Coordination Department. This is made up of representatives of the various services (fire department, emergency medical services, police), as well as a representative of the municipality where the site is located, a technical advisor and liaison officers as required.

There are also two administrative structures. Firstly, an extraordinary events committee (SAE) at the level of the commune where the worksite is located. The SAE is headed by the mayor and includes representatives from operational services, the commune or other bodies, depending on the crisis. Then, if the crisis involves several communes, there is a crisis unit (krisenstab)[17] which includes representatives from the communes as well as liaison officers. The Krisenstab may be located at rural or urban district level. When a crisis calls for the pooling of resources on a larger scale, a cell is set up either in the district or in the Länder (via its Ministry of the Interior). However, our research does not allow us to identify a crisis structure beyond the district level, as this was the highest level mobilized during the 2021 floods.

Collaboration between the various structures takes place via liaison officers, and a summary of how these organizations work can be summarized as follows:

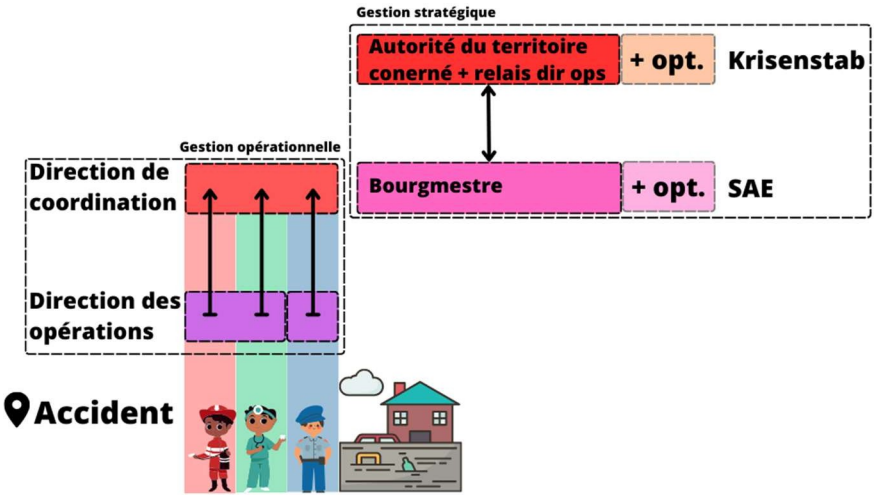

Diagram of crisis management in Germany, drawn by the author of the report.

[17] If a crisis occurs in an urban district comprising a single municipality, the SAE and Krisenstab can be merged.

In Belgium[18]

The legal framework for Belgian emergency planning has its origins in the 1960s, with the first law on emergency planning dating from 1963 (at that time, Belgium was still a unitary state) (LOI DU 31 DECEMBRE 1963 SUR LA PROTECTION CIVILE., 1964). At the dawn of the 21ème century, this system has been modified, partly under European pressure and partly as a result of the crises the country has experienced (Glesner, 2022). The Royal Decree of February 16, 2006 on emergency and intervention plans (*Moniteur belge*, March 15, 2006) gave Belgium a genuine crisis infrastructure. It harmonized the terminology and content of emergency plans, and integrated the multidisciplinary approach and risk analysis into the planning process. This Royal Decree was subsequently updated by the Royal Decree of May 22, 2019 on "emergency planning and emergency management at municipal and provincial level and the role of burgomasters and provincial governors in the event of events and crisis situations requiring coordination or management at national level" (*Moniteur belge*, June 27, 2019). This system establishes a structure for communication and coordination between emergency services and authorities throughout the country. And now it's the turn of this Royal Decree of May 22, 2019 to be updated[19]. Emergency plans specify the division of tasks to be carried out by the various services involved, which are grouped into five functional disciplines to carry out a range of missions:

Discipline 1 (D1): rescue operations ;

Discipline 2 (D2): medical, health and psychosocial assistance; Discipline 3

(D3): police (including investigative services); Discipline 4 (D4): logistical

support;

Discipline 5 (D5): communication.

However, unlike in the Netherlands, while certain services are generally associated with a specific discipline, the disciplines actually cover missions and not services. For example, when the police arrive first on the scene of an accident, the first actions taken are primarily the responsibility of D1 and/or D2, not D3. Similarly, while defense, in line with the principle of subsidiarity, often intervenes at the logistical level, in support of D4, this was not the case during the attacks in Brussels and Zaventem on March 22, 2016, when, for example, the military present at the airport took on first aid (D1) and medical aid (D2) missions.

As far as civil protection is concerned, two main reforms have been carried out in recent years: the first concerns the introduction of rescue zones, and the second concerns civil protection. With regard to civil protection reform, the main objective has been to enhance the technical nature of civil protection operations, as a complement to the rescue zones: civil protection missions are grouped into four categories, and concern specialized operations. Other civil protection activities have been transferred to the rescue zones, and human resources have been drastically reduced (four of the six existing barracks have been closed).

[18] This section is adapted from Appendix B of the crisis management report submitted to Minister Henry, written by SPIRAL.

[19] At the time of writing, we do not yet know what will be in the revised version of the decree. We have, however, taken note of the recommendations made in the White Paper on recommendations for improving crisis management in Belgium - Report to the Minister of the Interior - May 2023.

The operational functioning of Civil Protection 2.0 as a specialized second-line response service[20].

The Royal Decree of May 22, 2019 provides for several types of emergency and intervention plans (PUI): general emergency and intervention plans (PGUI), which define the general guidelines and information needed to manage emergency situations, and specific emergency and intervention plans (PPUI), which supplement the PGUI with additional provisions specific to particular risks as identified in the risk identification phase[21]. The development of these plans is the responsibility of the administrative authorities: a distinction must be made between the general emergency and intervention plan of the local authorities (at communal level, under the responsibility of the burgomaster, or at provincial level, under the authority of the governor[22]) and the national emergency plan (which aims to organize a response structure for events and crisis situations requiring coordination or management at national level).

There are also monodisciplinary intervention plans, which regulate the practical arrangements for intervention by one discipline outside conventional situations.

Finally, internal emergency plans (at site level) must also be drawn up by those in charge of the site to establish the material and organizational measures needed to enable staff to manage an emergency situation and make possible the intervention of external authorities and services (aforementioned Royal Decree of May 22, 2019, Article 1, 8°). Companies (and local authorities such as nursing and care homes, prisons, schools, etc.) must therefore develop special internal emergency plans. Dam-related infrastructures have drawn up internal emergency plans (at the request of CRC-W and in consultation with the Belgian Dam Committee) based on the Royal Decree of May 2019. Based on the internal emergency plans and the identification of risks, it is up to the competent authority to decide whether to draw up a specific emergency plan for dam-related risks. As far as critical infrastructures are concerned, the law on the security and protection of critical infrastructures of 1/7/201123 requires the NCCN to draw up an up-to-date list of critical infrastructures present on the territory. The NCCN is the Belgian contact point for *the European Programme for Critical Infrastructure Protection* (EPCIP).

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[20] https://www.securitecivile.be/sites/default/files/explorer/annexes_News/2017-09-20ar_modification_missions_mb.pdf

[21] These risks can be very diverse, depending on the risk inventory carried out: they range from the Seveso risk to the presence of a river, not to mention the presence of a school or nursing home on the territory.

[22] With regard to the Brussels Region - whose territory is extra-provincialized - the aforementioned Royal Decree of May 22, 2019 does specify that the group of governors includes the provincial governors and "the authority of the Brussels conurbation competent by virtue of article 48 of the special law of January 12, 1989 relating to Brussels institutions" (article 1er , 1°, b). In the Brussels Region, this is therefore a "regional senior official" at level A5: he or she is responsible for civil security missions and for drawing up plans relating to emergency situations (in accordance with the decree of the Brussels-Capital Region government of March 22, 2019 amending the decree of the Brussels-Capital Region government of September 3, 2015 assigning missions to a senior official referred to in article 48, paragraph 3, of the special law of January 12, 1989 relating to Brussels institutions). He is integrated within the public interest organization (OIP) Bruxelles- Prévention & Sécurité, created by a Brussels ordinance of May 28, 2015 and centralizing the management of prevention and security policy in the Brussels Region.

[23] This law implements Council Directive 2008/114/EC of December 8, 2008 on the identification and designation of European Critical Infrastructure and the assessment of the need to improve their protection.

Strategic and operational coordination for crisis management in Belgium

The Royal Decree of May 22, 2019 stipulates that emergency situations can be coordinated either operationally, strategically or both operationally and strategically. The disciplines involved intervene at two levels: On the one hand, operational management ensures the coordination of responders from different disciplines in the field. In the field, first responders assemble an operational command post (PC-Ops) which enables multidisciplinary coordination under the authority of a Dir-PC-Ops who must momentarily drop his monodisciplinary hat to ensure a coordination function for all the disciplines present around the table (one representative per discipline). On the other hand, strategic management is responsible (in addition to supporting the operational side of the business) for communicating with external departments and taking decisions on strategic direction, which generally have political implications. It should be emphasized that the exchange of information between the PC-OPs and the strategic coordination committee is particularly crucial during crisis management. PC-Ops provides the strategic coordination committee with concrete feedback on the crisis situation in the field (what are the needs on the ground? what solutions need to be put in place? etc.).

In addition, this Royal Decree distinguishes three phases of strategic crisis management coordination: the communal phase, the provincial phase and the federal phase, which is defined by a Royal Decree of 2003 (following on from European measures). Emergency plans are drawn up for each level of authority, defining the broad lines of action to be taken in the event of a crisis. Their main purpose is to prepare for the coordination of relief efforts by the competent authorities, i.e. mayors, provincial governors and the Federal Minister of the Interior, so that all available and mobilizable resources (human and material) can be effectively deployed to protect the population and its environment in the event of a crisis. The organization of the disciplines within the different phases can be summarized as follows:

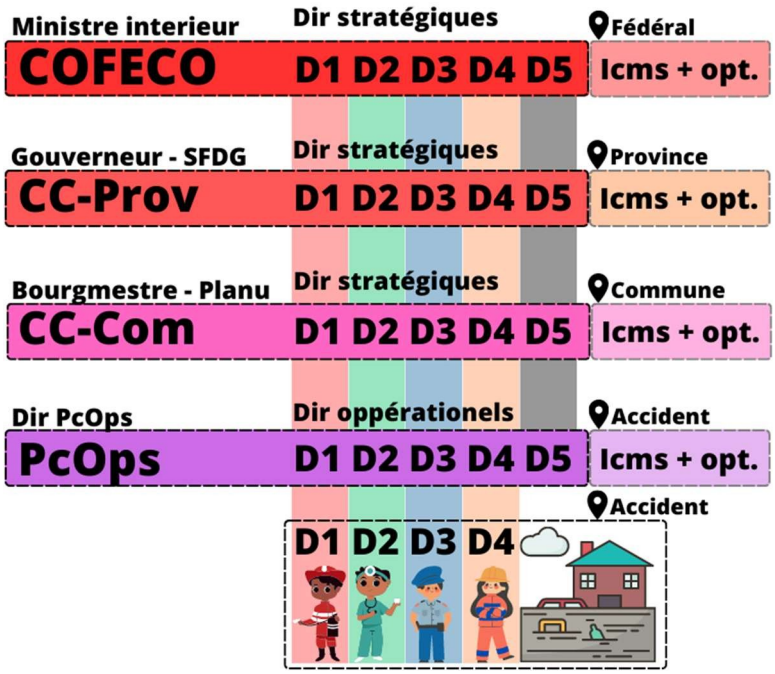


Diagram of crisis management in Belgium, drawn up by the author of the report.

Each commune is required to appoint an emergency planning coordinator and set up a "security cell". This is made up of the mayor, the emergency planning coordinator, a member of the municipal staff responsible for informing the population (representing the D5) and a representative of each discipline (emergency zones, public health, police, civil protection, etc.), as well as, if necessary, a person with specific expertise in a subject deemed particularly important for the municipality. Provincial governors, for their part, have a team in charge of emergency planning, as well as a coordination unit and an emergency planning officer: between the federal authorities and municipal officials, they play a crucial role in terms of coordination.

B. water management

In this section, we'll look at how rainfall extremes are handled in the Euregio. We'll be looking at how crisis situations are handled in both countries, and how this resonates with water management in the regions concerned by our analysis. However, before delving into the nitty-gritty of the subject, it is important to take a detour into legislation common to these regions, which plays a structuring role in the way floods are dealt with in the different regions.

Indeed, flood risk management in Europe is governed by the so-called "Flood Directive" of October 23, 2007, the aim of which is "to establish a framework for the assessment and management of flood risks, which aims to reduce the negative consequences for human health, the environment, cultural heritage and economic activity associated with floods in the Community". (Directive, 2007). This requires states to produce a three-stage flood risk analysis, to be renewed every 6 years.

The first step required by the 2007 directive is a preliminary flood risk analysis. This assessment is built on the basis of past floods in a given area, as well as the risk of similar floods occurring in the future. The second stage consists of flood risk mapping, including flood zone maps for different scenarios. Finally, the third stage consists of 'managing' the flood risk by drawing up flood risk management plans (PGRI).

In addition, the directive provides for the administrative division of river basins into sub-basins for the purpose of drawing up IRMPs. A sub-basin is a subdivision of a river basin, corresponding to the catchment area of a river. However, although the directive provides for a scale of action divided into river basins and sub-basins, it does not impose a specific body on states to implement the directive's objectives. As we shall see, this gives rise to a variable geometry of water management within the various territories of the Euregio.

In the Netherlands

Water management in the Netherlands is divided between two bodies. On the one hand, the Rijkswaterstaat is responsible for waterways and major infrastructure. It is part of the Ministry of Infrastructure and Water Management and operates at national level. They are responsible for maintaining waterways and dams, as well as freeways, for example (Waterstaat, 2023). In the event of extreme rainfall, they are responsible for monitoring and issuing warnings, but also for managing access to water on a national scale.

On the other hand, there are the 'water authorities'[24] in charge of everything else, including access to water and its potability, for example. The water authorities are independent bodies that are largely financed via the 'water tax'[25] , enabling them to operate autonomously without competing with other municipal budgets. In addition, they benefit from a legislative arsenal that enables them to apply directives themselves, on reducing water consumption for example. They are established on a sub-basin scale, which means that several authorities can sometimes act at the same time within the same province. However, in the case of the province of Limburg, the sub-basin territory corresponds to that of the province. Another point worth noting is that there is no body for consultation between the various water managers, such as the CIW or the GTI in Belgium. This could be explained, among other things, by the limited number of players involved and their greater integration within government departments.

*This illustration shows the water authorities at sub-basin level (in color) in relation to the provinces (in bold). We can see that the province of Dutch Limburg, bottom right, corresponds perfectly to the sub-basin. - Image created by the author based on other sources (*Outline Map of the Netherlands with Provinces | Free Vector Maps | Netherlands map, Map, Map outline*, 2023 ; "Waterschapskaart", 2023).*

The following table shows the managers by type of watercourse:

Scale	Manager
Waterways and major infrastructures	The rijkswaterstaat
Non-navigable category 1	Water authority at sub-basin level
Non-navigable category 2	
Non-navigable category 2	
Unclassified	
Access and drinkability	

In Germany

In Germany, as with crisis management, water management powers are decentralized to the level of the individual Länder. Here, too, we will focus our analysis on the situation in North Rhine-Westphalia and its particular features. Nevertheless, it is important to highlight the role of three state institutions. Firstly, the state water working group (Die Wasserstraßen- und Schifffahrtsverwaltung des Bundes), which serves as a forum between the various Länder, and whose Standing Committee for Flood Protection and Hydrology drafts and submits IRMPs in line with European standards. The next step,

[24] Wate authority, formerly War Boards

[25] According to a director of the Limburg water authority we interviewed, 80% of their income comes from this tax, while the other 20% comes from the services they provide or subsidies.

the German Environment Agency (Umwelt Bundesamt), which scientifically monitors water-related data in Germany. Finally, the Federal Waterways Management Agency (Bundesanstalt für Gewässerkunde), part of the Federal Ministry for Digital and Transport, monitors and maintains waterways.

Within the Länder, non-navigable waterways and dams are the responsibility of the region-state. The district then approves and monitors water-related measures on its territory (e.g., the operation of wastewater treatment plants). The district is also responsible for drawing up the PGRI in accordance with the European directive. Secondly, the municipalities are responsible for monitoring and maintaining non-navigable watercourses that are not covered by the Länder, as well as for the distribution of drinking water. To support local authorities in their tasks and promote integrated water management, North Rhine-Westphalia has set up wasserverbands (water boards/associations de l'eau). These are divided into 11 sections within the Länder, according to the scale of the sub-catchment areas. All wasserverbands are members of the Arbeitsgemeinschaft der Wasserwirtschaftsverbände NRW (AGW), a working group of water management associations.

Two of these associations concern the Euregio. Firstly, the Wasserverband Eifel-Rur (WVER), which is active in the four districts included in the Euregio. Secondly, the Erftverband, which covers part of the Duren and Euskirchen districts. The Erftverband is also active in the districts of Aachen and Heinsberg. This extensive area is an assessment zone for the underground water supply for Rhine lignite mining, which takes place in this catchment area.

*This illustration shows the water authorities at sub-basin level (in color) in relation to the districts (in light gray). We can see that the province of Dutch Limburg, bottom right, corresponds perfectly to the sub-basin. - Image created by the author based on other sources (*Broschüren*, 2023; "North Rhine- Westphalia", 2023).*

In return for a fee, local authorities can hand over some of their responsibilities to the wasserverband. In some cases, such as wastewater treatment, the wasserverband can choose to take control without the agreement of the municipality. This was the case for the Aachen wastewater treatment plants, which are now the responsibility of the WVER. However, this is not yet possible for the management of watercourses. During our research, a member of the WER explained to us (Interview) that this posed problems insofar as the communes upstream of the catchment area do not see the point of paying them to manage the watercourses, as this represents too great a cost in relation to the number of inhabitants. According to our interviewee, this is open to discussion and may change in the years to come.

The following table shows the managers by type of watercourse:

Scale	Management level
Waterways	Bundesanstalt für Gewässerkunde
Non-navigable category 1 and infrastructure	Technical services of the Länder
Non-navigable category 2	Municipalities and private individuals or wasserverband
Non-navigable category 3	
Uncategorized	
Potability and access	

At Belgium

Belgium has three river basins in its territory, two of which are of interest to us in this research[26] : the Meuse and the Scheldt. These two basins are divided into sub-basins, generally linked to a river and its tributaries. In the province of Liège and Belgian Limburg, there are seven sub-catchment areas (3 in Limburg, and 4 in the province of Liège).

Illustration showing Belgium's river basins (in color) and provinces (Wallonia-Brussels Federation, 2023).

Since the institutional reforms of 1980, water management in Belgium has been divided between the various federated entities. The normative framework for water management and related infrastructure therefore differs between the province of Limburg (Flemish region) and the province of Liège (Walloon region). Before turning to the particularities of each of the federated entities, we will first look at crisis management which, being a federal competence, is subject to the same rules in the north and south of the country.

In Wallonia

In Wallonia, water management is divided between different departments depending on the size of the waterway concerned. Firstly, (1) navigable waterways and major structures (e.g. dams, bridges, etc.) are managed by Wallonia's public services within different departments (depending on the locality or nature of the infrastructure) of the mobility and infrastructure service. Next, the (2) major non-navigable waterways, or category 1, as well as runoff are managed by the Walloon public services, within a department of the SPW ARNE[27]. After that, the (3) least significant non-navigable waterways, or category 2, are managed by the provincial technical services. For the (4) smallest non-navigable waterways, or category 3, it's the commune that takes charge. Finally, there is a fifth division for the (5) unclassified waterways, which are managed by the local authorities.

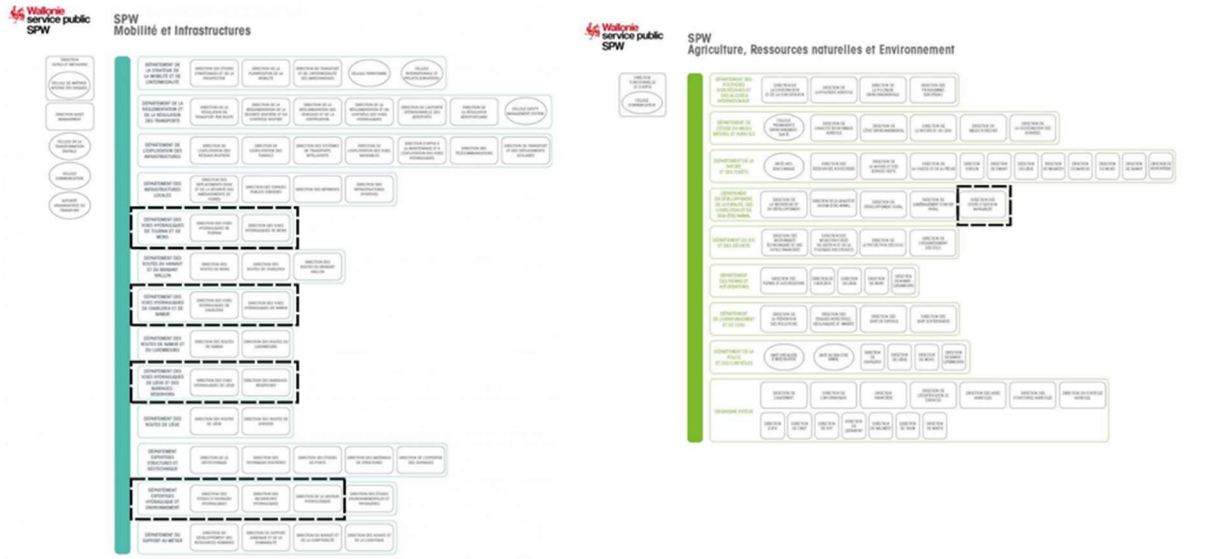
[26] The third corresponds to the Rhine watershed, which does not cover our research area.
[27] Services Publiques de Wallonie : Agriculture, Ressources Naturelles et Environnement

by individual or grouped riparian owners. In addition to these different levels of management, there are also exceptions such as Natura 2000 areas and various inter-municipal bodies that play a role in access to water and the maintenance of related infrastructures (SWDE, CILE, etc.).

The various watercourse managers are listed in the table below:

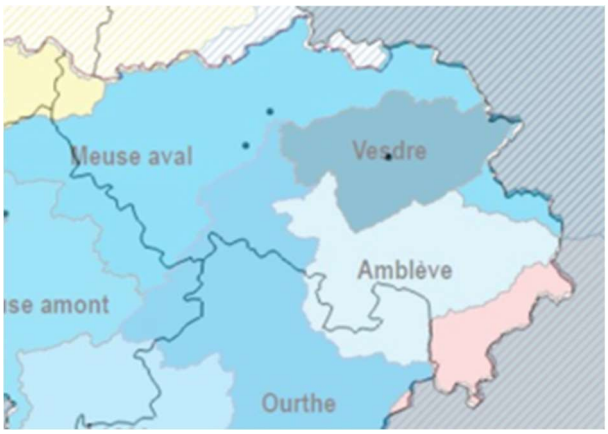
Scale	Management level
Waterways and major infrastructures	SPW MI, divided into departments according to province, and directorates according to the subject
Non-navigable category 1	SPW ARNE, Directorate for non-navigable watercourses, part of the Department of Rural Development, Watercourses and the Environment animal welfare
Non-navigable category 2	Provincial technical services
Non-navigable category 3	Municipal technical services
Uncategorized	Individual or group private management
Potability and access	Municipal or inter-municipal

In addition, the management of the most important watercourses (in terms of flow) is divided between two Walloon public services (SPW): SPW Mobilité et Infrastructures (MI) and SPW Agriculture, Ressources naturelles et Environnement (ARNE). The sub-divisions in charge of water are listed in the organization charts below:



*Representation of the place of watercourse managers in the SPW MI (left) and ARNE (right) organization charts - images from SPW (*Organigrammes | Service public de Wallonie*, n.d.)*

There is thus a strong administrative division between the different river scales. It is important to note that the division favored in Wallonia corresponds to the administrative division of provinces, and not of sub-watersheds. Thus, the Liège department of waterways and reservoir dams will have various sub-watersheds under its jurisdiction, with only the Vesdre sub-watershed entirely under its responsibility. It should also be noted that this administrative division is not found within the SPW ARNE, where the management of non-navigable waterways is the responsibility of the Department of Rural Development, Waterways and Animal Welfare.



*This illustration shows the sub-catchment areas (in color) in relation to the provinces (in bold) - Image produced by the author based on other sources (*Belgium free geographic map, free outline map, free blank map, free base map, current graphic formats contours, provinces, main cities*, n.d.; SPW, n.d.)*

According to Mees et al. (2018), this sub-division is part of a policy that can be found throughout Belgium[28] and consists of moving from "defending the territory as a whole to distinguishing between the protection of more or less vulnerable areas" (Mees et al., 2018, p. 247), via the establishment of polders and retention zones for example. However, Mees et al. (2018) also insist that the regionalization of water management and the number of stakeholders should not be taken as a transition to decentralized water management. Indeed, in order to enable a shared vision of water management the SPW has set up a body that in principle serves to coordinate water management issues at regional level, the Groupe transversal inondation, or GTI.

The aim of the IWG is to ensure a cross-disciplinary approach to flood risk by bringing together the various water managers in Wallonia, i.e. certain SPW departments, provincial technical services and technical experts from public interest organizations. In particular, this group is responsible for drawing up the flood risk management plan as defined by the European Directive. To do this, the IWG relies on the work of the river contracts, which meet within the technical committees for sub-catchment areas (CTSBH), around 5 times per flood directive cycle (6 years).

The[29] river contracts are, as their name suggests, contracts that link and network the various stakeholders, both institutional and from civil society, who act within a sub-catchment area. River contracts therefore maintain day-to-day contact with the various water stakeholders who join them on a voluntary basis. However, the work of the river contracts is not always (re)known by the various authorities operating in the same territory. Indeed, these do not necessarily correspond to the Belgian administrative division. For example, since river contracts require the support of only 70% of the communes in their territory, it can happen that the river contract "*doesn't even try to mobilize a commune that is barely in a sub-basin*" (extract from an interview with the management of a river contract). What's more, the river contract has limited power, which is not always legitimized by the local authorities, as the following excerpt illustrates: "*We couldn't work together on the emergency plan [...] We wanted to develop a simple protocol to improve the management of small crises with riverside residents, but the authorities stopped us*" (excerpt from an interview with a river contract manager).

[28] Although, as we shall see, Flanders has taken a very different approach.
[29] Add legal source for CRs

The following table lists the managers according to the type of watercourse and the parallel pooling bodies:

Water management		Pooling	
Scale	**Management levels**	**Participants**	**Organ**
Waterways and major infrastructures	SPW MI, divided into departments according to provinces, and directions according to subject	. PWS departments . Provincial technical services . Technical experts from public interest organizations	Transversal Flood Group
Non-navigable category 1	Directorate for non-navigable watercourses, part of SPW's Department of Rural Development, Watercourses and Animal Welfare ARNE		
Non-navigable category 2	Provincial technical services	Voluntary +- 5 times over 6 years: . River contracts . Watercourse managers . Crisis managers . Wateringues representatives . Players involved in flood risk management	Technical committees by sub-basin
Non navigable category 3	Technical services communal	. Citizens with a project . Local watercourse managers (private or public, individual or group)	River contracts
Uncategorized	Individual or group private management		

In conclusion, as we can see, water management in Wallonia involves a large number of different players in two parallel dynamics. On the one hand, there are the managers of watercourses and infrastructures who follow a logic based on the scale of the watercourse, in which they have only limited relations with each other. On the other hand, the same players are to be found in the pooling bodies, which are themselves based on the logic of sub-watersheds. It is therefore important to emphasize that this dynamic is not in line with the administrative division favoured by SPW managers, which is based more on the administrative division of provinces or communes.

In addition, local/provincial authority investment in these areas varies greatly from one commune/province to another: in fact, there is no obligation to commit a minimum level of resources.

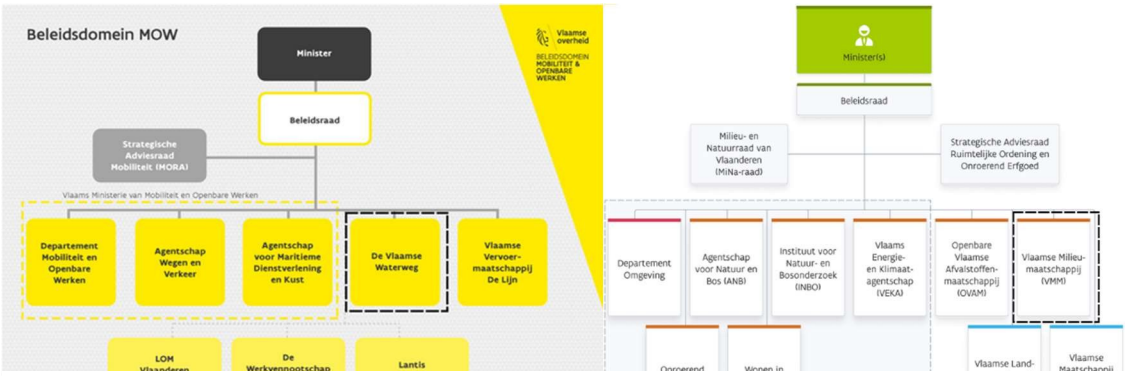
In Flanders

In Flanders, as in Wallonia, there is a distinction between different waterway scales. There is one organization in charge of (1) navigable waterways, the Vlaams Waterweg, which is divided into three regions (East, Central, West). Then there are the (2) category 1 non-navigable waterways, managed by the Vlaamse Milieumaatschappij (VMM). Finally, as in Wallonia, the (3) category 2 non-navigable rivers are also the responsibility of the municipality. However, Flanders has opted to remove competences from the municipal level, making the provincial level the lowest level. This absorption of the most local competences has thus reduced the total number of water managers from 406 to 216 in 2018 according to Mees et al. (2018). Finally, as in Wallonia, there are also a number of peripheral players who play a role in access to water and the maintenance of related infrastructure.

The following table shows the managers by type of watercourse:

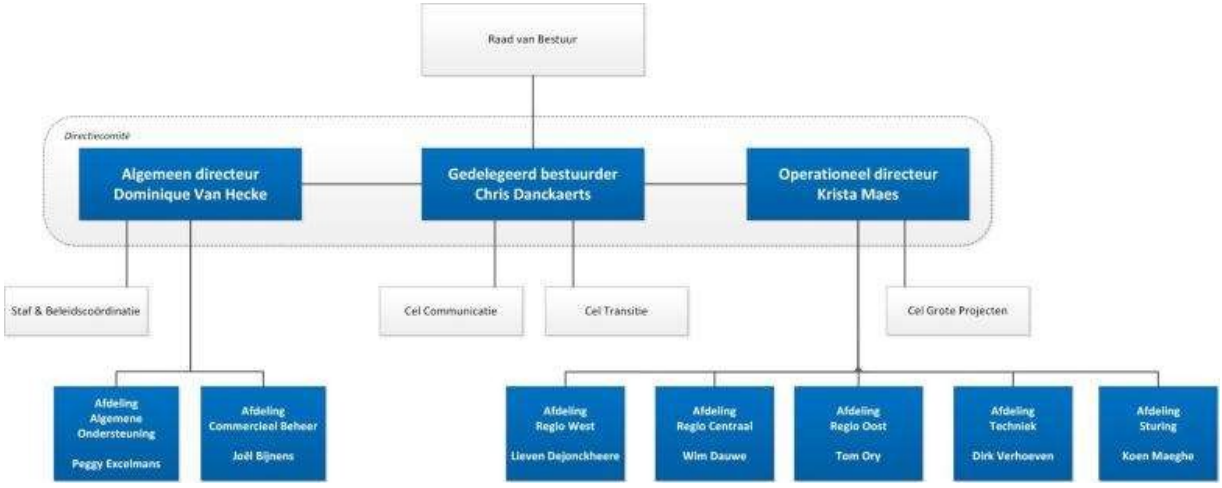
Scale	Management level
Waterways and major infrastructures	Vlaams Waterweg, which is a department of the ministry of mobility and public works
Non-navigable category 1	The VMM, which is a department of the French the environment
Non-navigable category 2	Provincial technical services
Non-navigable category 2	
Unclassified	
Access and drinkability	Municipal or inter-municipal

As in Wallonia, the most important river management bodies are divided between two ministries: the Ministry of Mobility and the Ministry of the Environment, as illustrated by the organization charts below:



Representation of the place of watercourse managers in the organization charts for the Ministry of Mobility (left) (Beleidsdomein Mobiliteit en Openbare Werken*, 2023) and the Environment (right)* (Beleidsdomein Omgeving*, 2023).*

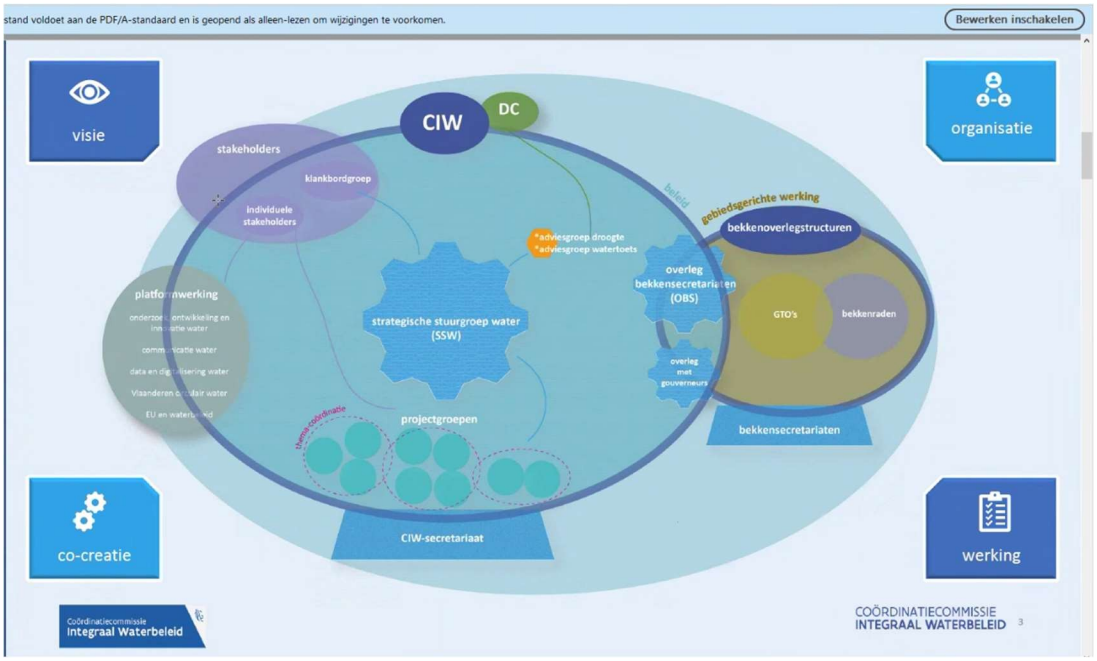
Already, we can observe that water management in Flanders is less dispersed than in Wallonia, with only two directorates in charge of a major part of the waterways at regional level, with no sub-divisions at provincial level. As a result, the management of navigable and non-navigable waterways is at a similar level in their respective ministries, in contrast to the situation in Wallonia, where non-navigable waterways depend on a sub-division of a department of the SPW ARNE. Furthermore, to take things a step further, the division within Vlaams Waterweg is by geographical region rather than by administrative division of provinces, with one person responsible for West, Central and East Flanders (see organization chart below).



Organization chart of VMM's water management section (Organogram, 2017)

Thus, although our interviews did not enable us to clearly identify whether each of these directorates had an entire watershed under its responsibility or not, the federal services of the governor of the province of Limburg explained to us that this division enabled them to have a single intervener in the event of a problem with a sub-watershed in their area.

However, although managers are less dispersed than in Wallonia, there is also a body for pooling water management in Flanders, the *Coördinatiecommissie Integraal Waterbeleid* (Integrated Water Policy Coordination Commission - CIW), headed by the VMM and assisting the Minister of the Environment, who is responsible for integrated water management.



Schematic representation of the players included in the CIW, communicated during an interview with a VMM manager.

Like the IWG, the CIW is responsible for implementing the IRMP in accordance with the European directive. But the CIW's primary objective is integrated water management in general, and not just flood risk management. One of CIW's objectives is not to act on a specific risk, but rather to bring together water managers at all levels. In terms of its structure, the CIW uses more or less the same players as the GTI. However, although there are

The CIW also has sub-basin divisions, the bekkenoverlegstructuren, whose main aim is "*to exchange best practices at local level in order to extrapolate them to other sub-basins*" (extract from an interview with a member of the Vlaams Waterweg). Thus, unlike the Walloon CTSBs and river contracts, the administrative structure at sub-basin level is primarily concerned with information exchange, rather than centralization as in Wallonia.

To ensure exchange between sub-basins, but also between water managers and politicians, each sub-basin in Flanders is equipped with a permanent secretariat. The sub-basins are thus headed by a technical secretary and a council that consults the various stakeholders involved in water management in its territory. The secretariat acts as a transmission belt between the various players, ensuring continuous operation. This represents a major departure from the organization of the IWG, where consultation at sub-basin level takes place at semi-regular intervals, rather than on a continuous basis.

The following table shows the managers by type of watercourse and the pooling bodies in Flanders:

Water management			**Pooling**	
Scale	**Management levels**		**Participants**	**Organ**
Waterways and major infrastructures	Vlaams Waterweg, a department of the Ministry of Mobility and Public Works		Vlaams Waterweg and VMM Provincial technical services Technical experts from stakeholder organizations public	Integrated Water Policy Coordination Commission
Non-navigable category 1	The WWW, which is a department of the ministry of the environment		Secretariat for liaison with CIW and other committees Local divisions of water managers	Sub-basin committees
Non navigable category 2	Technical services provincial			

C. Flood risk management

In the Netherlands

As we have seen, there is a special flood plan for the South Limburg relief area. In addition to this plan, there is also an internal plan implemented by the two water management organizations in the Netherlands. We'll go into more detail on the operation of these two organizations in the next section, but it's already important to note that these organizations have internal plans that can be implemented by staff trained in crisis management. These plans cover not only the protection of critical infrastructures, but also liaison with emergency services. Indeed, the LCMS platform has been developed with special access for water stakeholders to facilitate communication in times of crisis. Finally, water management organizations also train crisis managers who are able to join the various cells set up under the GRIPs.

In the Netherlands, we have already been able to identify a more established link between the crisis manager and the water managers. In fact, the ramp-up to emergency level is organized "*according to the water level situation in collaboration with the water managers and their analyses*" (interview with the emergency services of the Dutch province of Limburg). This approach is facilitated in particular by the presence of a dedicated interface for water managers on LCMS, as well as in-house crisis management training for water authorities.

Water authorities have a special crisis management body within their organization. This is made up of agents trained in crisis management, who can monitor the GRIP build-up in the emergency zone[30]. However, debriefings after the floods of 2021 revealed that citizens were not satisfied. To counter this, the water authority "is *now working with the relief zone and the municipalities to draw up local plans with, for example, weak points in a house to block the water [...] for their safety but also to develop their sense of responsibility*" (interview with a South Limburg water authority manager). Thus, the relationship between water and crisis managers can be schematized as follows:

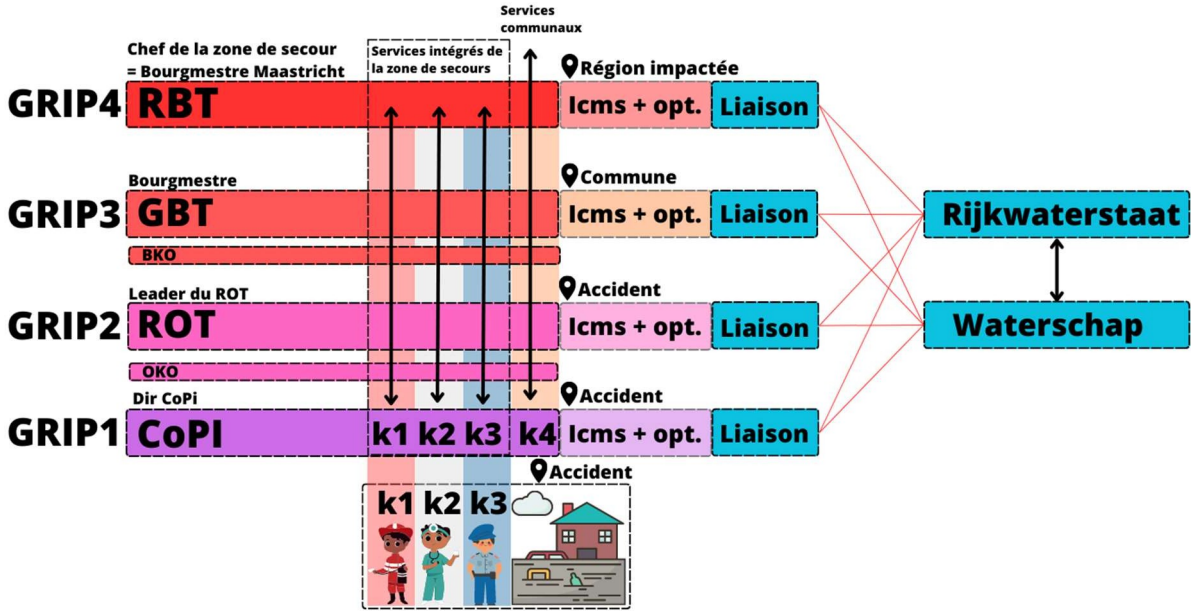


Diagram of crisis management in the event of flooding in the Netherlands, created by the author of the report.

The liaison officers, who are part of the water authority or Rijkwaterstaat as the case may be, are much more integrated than in Belgium. Although they are not automatically part of the strategic management bodies, they are an integral part of crisis management, right down to the local level, via the LCMS platform.

At Germany

As we have seen in the sections on crisis management and water management, a large part of the responsibility for flood management on a given territory lies with the local authority. However, the PGRIs required by the European directive are drawn up at district level. Municipalities and districts then mobilize the hazard maps provided by the districts to draw up their own emergency plans. As we have seen, flood management is mainly carried out by the districts, which are able to request information from the various levels of water management, but without the existence of an actor who centralizes and translates the information for the district.

The large number of players involved in water management and crisis management led to major communication difficulties during the floods of 2021 (Fekete & Sandholz, 2021). In fact, it appears that the lack of exchange upstream of the crisis, caused in part by the institutional complexity of the territory, led to a lack of direct points of contact in the region.

[30] According to a director at the South Limburg Water Authority, there are around 200 people who play an assigned role during a crisis, either in direct collaboration with the emergency zone, or internally.

at the time of the crisis. What's more, during our interview with a member of a wasserverband, it became clear that in 2021 there was still no exchange protocol between the wasserverband and the municipalities and districts on its territory, which undoubtedly complicated exchanges. This undoubtedly complicated the exchange of information, with some communities already overwhelmed by crisis management possibly unable to pass on the necessary information to the authorities (Fekete & Sandholz, 2021).

Following our interview, we also learned that such protocols were being drawn up within the WVER to structure the exchange of information between this wasserverband and the boroughs in its catchment area. The aim of these new protocols would be to create a direct link between the WVER and the krisenstab of the districts on its territory, which would act as a transmission belt to the SAEs of the municipalities (Interview with a WVER member).

At Belgium

There is a special flood plan for the province of Liège and two for the province of Limburg (one for the Meuse and one for the Demer). Depending on the risk identification carried out at municipal level, municipalities can also draw up a specific flood risk plan for their territory (this must include buildings in flood-prone areas, and good communication between the municipal planning department and the town planning department is essential). In practice, however, few municipalities have such a special flood plan. In Flanders, the provincial governors' departments have opted for flood emergency planning at provincial level, without leaving it up to the municipalities to develop their own specific plans. Following the floods of July 2021, in 2023 the federal services of the governor of the province of Liège developed a provincial flood contingency plan (PPUI inondation provincial), which sees itself as a framework plan enabling and enjoining communes to develop their own flood contingency plans. A number of communes have signed up to the emergency planning approach, and are seeking support and assistance in drawing up their plans[31].

In Wallonia

As we have seen, water management in Wallonia is the responsibility of a large number of different players who are involved in parallel dynamics. On the one hand, water management follows a logic based on the size of the watercourse, in which managers have only limited relations with each other. On the other hand, the same players are involved in pooling bodies, which are themselves based on the logic of sub-watersheds. Furthermore, the regionalization of water-related competencies leads to a situation where water managers find themselves in a network that does not involve crisis managers, with limited possibilities for pooling.

The consequence of this separation between players is to limit the implementation of a common approach between water and crisis managers. During the floods of 2021, for example, the SFDG of Liège underlined the difficulty of mobilizing agents at atypical hours as would be done for crisis managers (interview with the SFDG of the province of Liège). On the other hand, water managers also find it difficult to work with crisis managers, as they are not acculturated to crisis management (see focus group analysis).

[31] One of the objectives of this project is to support and provide methodological support for the development of special flood emergency and intervention plans for local authorities.

According to Mees et al. (2018), this division with the region taking charge of water management without being part of crisis management would be the reason for setting up the IWG but also the CRC-W, creating a 'bridge' between the region and crisis managers. In times of crisis, the CRC-W relays information to the various crisis managers, without discrimination. Thus, we could summarize the crisis communication scheme as follows: SPW departments (see above) make analyses -> CRC-W communicates to the NCCN, provinces and municipalities affected. It should be remembered, however, that there are many different managers at SPW level, and that not all watercourses are managed by SPW, but by the provinces or communes.

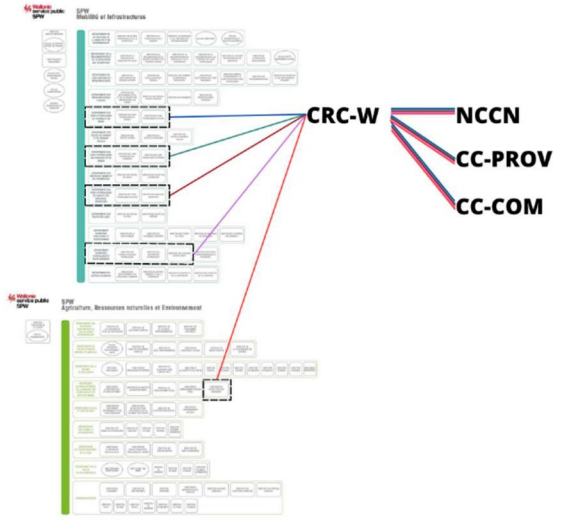


*Diagram showing collaboration between water and crisis managers in the event of flooding in Wallonia. As we can see, the various departments are responsible for communicating their analyses to the CRC-W, whose task is to pass them on, unchanged, to the various crisis managers. - image created by the author based on SPW organization charts (*Organigrammes | Service public de Wallonie*, 2023)*

The division is also felt by local authorities, who are not always aware of who is involved in water management in their area. This can lead to deadlock between players. The management of a river contract, for example, reports that they "*wanted to develop a simple protocol to improve the management of small crises with local residents, but the authorities stopped it [...] because we weren't making progress with the right people*" (interview with the management of a river contract).

In Flanders

In Flanders, flood management is strongly oriented towards provincial management, as illustrated by the following extract:

"When there's a flood, it's important to deal with it on a large scale so as to be able to act upstream of the flood [...] there are always burgomasters who want to manage everything, but we hardly ever do a communal phase for a flood.
"(extract from an interview with SFDG in the Belgian province of Limburg).

This approach is mirrored in the pattern of communication between water and crisis managers. During a crisis, the Vlaams Waterweg will produce a report for the direct use of the SFDG. This report includes their analyses as well as those of the VMM, and will be published at different frequencies depending on the scale of the crisis. It is the SFDG who will then communicate this report to the various communes as required[32]. We can thus see a pattern of communication with an entry point into crisis management at provincial level. It is important to emphasize here that, in contrast to Wallonia, the entity in charge of crisis management in the Flemish region does not have a crisis management unit.

[32] This information comes from interviews with SFDGs in Belgian Limburg, as well as with Vlaams Waterweg and VMM officials.

only to serve as a contact resource during a crisis. In fact, the Flemish region's crisis center has no communications duties during a crisis.

In addition to this province-oriented warning system, "*each province has a point of contact within the [water management] administration*" (interview (translated) with the SFDG of the Belgian province of Limburg), whom they meet once a year and who can be mobilized in the event of a crisis. This is important insofar as "it*'s the [point of contact at] Vlaams Waterweg who will choose who goes into the crisis cell in case of need*" (interview with a member of Vlaams Waterweg). In this way, the highest level of power through which information must pass is at provincial level, and not at regional level as in Wallonia. The pattern of communication can then be summarized as follows: VMM sends its analyses -> Vlaams Waterweg reports -> SFDG communicates to communes and NCCN as required. By doing this, the provinces limit the number of reports they receive, while still having an overview of all their watercourses.

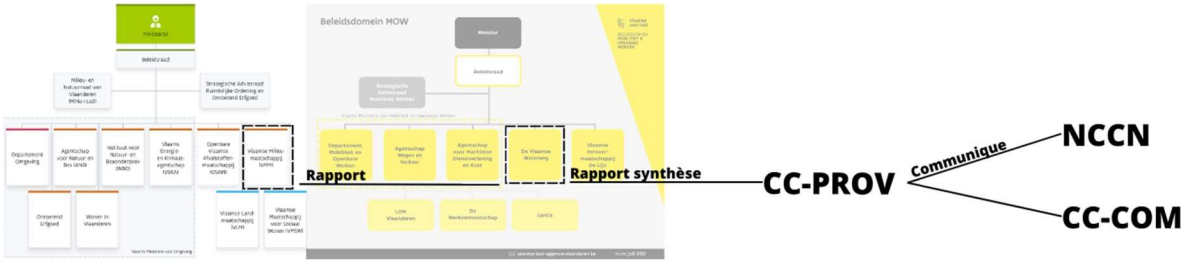


*Diagram showing collaboration between water and crisis managers in the event of flooding in Flanders - image created by the author based on the organization charts of the various institutions (*Beleidsdomein Mobiliteit en Openbare Werken*, 2023;* Beleidsdomein Omgeving*, 2023).*

The diagram above shows the communication flow during a flood in Flanders. The VMM produces a report that is taken up and integrated by the Vlaams Waterweg, which sends a single global report to the CC-Prov. It is then the CC-Prov that communicates this report to the other actors according to the needs of the crisis. Nevertheless, it is important to stress that while most of the people we met in the course of our research are in favor of this approach, some also see its limitations. "*The*[33] *BNIPs are a good thing, but they need to be well coordinated with all the players involved in water and crisis management. This is not currently the case. The province is sometimes too coarse - local knowledge is too limited - distribution of resources is again a good thing that we are at a higher level.*" (Flanders water manager - Delphi).

D. Drought risk management

There are a number of similarities between the risks of drought and flooding. Firstly, policies such as land-use planning to make soils more permeable, changes in agricultural and forestry practices, giving rivers more space and remeandering are all ways of reducing the risk of both flooding and drought. In addition, raising awareness and creating a community around water in all its forms (rivers, rainfall, groundwater) helps people to better understand the importance of water and the risks associated with it. What's more, improving participatory democracy at local level increases the sense of responsibility and the link between local communities and the environment.

[33] BNIP is the equivalent of PPUI in Flanders.

that populations have with the water in their territory, and thus increase awareness of the issues linked to extreme rainfall. Secondly, both drought and flooding raise questions about the distribution of water resources. On the one hand, drought implies a reduction in water resources, and hence the need to make trade-offs in terms of use (agriculture, tourism, housing, industry). It also means decisions have to be made about the infrastructure to be put in place to retain water or not (mega basins in France, private wells, drawing water from the ground, etc.). On the other hand, the risk of flooding also raises issues of water use, through decisions to build dams rather than maintain natural watercourses, or to canalize watercourses for trade rather than maintain meandering waterways, or to densify areas close to watercourses rather than increase the space left for water. For these reasons, we are also concerned with the risk of drought in this report.

In the Netherlands

As we saw when we described the special emergency and contingency plans in the Netherlands, there is as yet no plan to deal with the risk of drought. Nevertheless, the two organizations in charge of water management are putting in place guidelines to combat drought-related risks. Indeed, given the ability of these administrations to make autonomous decisions: for example, water authorities have already taken restrictive measures to limit access to water in certain locations. This is a decision they can take independently, given their special status. This avoids the problems that can arise between different communes, as we shall see in Belgium.

At Germany

Our research did not reveal any plans to combat drought-related crises. Nevertheless, it is important to mention here the national plan for water strategy, introduced in 2023 by the German environmental agency (Umwelt Bundesamt), which scientifically monitors water data in Germany. This document aims to provide a strategy for water managers in the various Länder, on the management of water resources in others. Nevertheless, we have highlighted the division of water management responsibilities in Germany, including within the Länder, and it will therefore be necessary to assess the impact of this document at a later date.

At Belgium

Similarly, Flanders and Wallonia have developed a drought risk unit within their pooling bodies. The IWG and CIW are equipped with a cell made up of a number of water management representatives and scientific experts. However, these units have no decision-making powers, and can only issue recommendations to local authorities. These authorities are then free to implement these recommendations or not.

During our interviews, we were able to discuss the subject of drought risk. What emerged was a low level of preparation on the part of the players involved. Indeed, none of the organizations we met had a drought plan. And even if for some "*we're aware that we're incompetent [...] we can't stop the trend and say 'let's stop and get ready*'" (interview with a firefighter in Wallonia), others fail to identify the risk, arguing that "*we're not really concerned about drinking water because we draw from the napes, it's mainly for the rivers that it poses a problem*" (interview with the SFDG in Belgian Limburg).

It is interesting to note, however, that on both sides of the country, the preferred approach to drought risk seems to be through integrated management of the various services, in contrast to the approach adopted in the United States.

that is being done for floods. However, it is too early to say whether this dynamic will continue in the development of legislation to combat drought.

Part 3: Flood risk culture in Euregio

In the previous section of this report, we highlighted the large number of players involved in crisis management and water management in the Euregio. These analyses, together with the DELPHI survey we carried out, enabled us to identify a number of points of attention concerning the development of a risk culture in the Euregio. This part of the report will therefore focus on two aspects that we identified during our research: (1) relations between experts on the management of extreme rainfall events in the Euregio and (2) the issues surrounding public participation in flood risk management.

Extreme rainfall management at Euregio

Relations between managers within a region

In the second part of this report, we discussed the large number of players involved in flood risk management in the Euregio. This highlighted the need **to improve coordination between water and crisis managers**. During the various stages of our research (interviews, focus group, Delphi), this need also emerged. We will therefore explore here the way in which this issue was tackled and the proposed solutions. One of the main aspects in favor of this collaboration is the need for a shared vision of the field, in order to facilitate crisis alert and information exchange. Indeed, "*We must strive to have the best and most up-to-date picture possible of water levels and forecasts. This picture must be created using data from different countries and possibly different administrative bodies. Communication between crisis managers is essential in this respect.*" (Firefighter - Netherlands). Thus, many crisis actors call for "*Clear, high-quality notification in good time, so that when floods are forecast, there can be a change at local level to prepare.*" (Planu - Flanders).

To improve coordination, some suggest simplifying it by setting up specialized crisis management resource persons in different institutions. For example, a water manager in Wallonia suggests "*Clarifying everyone's functions and roles in crisis management. Subsequently be trained in this and have an internal organization that enables these expectations to be met.*" (Water Management - Wallonia). This request is also echoed by a firefighter in Wallonia, who calls for "*Having people dedicated to this theme, who also know the problems of crisis management (both in terms of legislation and the concrete aspect in the field)*" (Firefighter - Wallonia). Here again, we find a call for the professionalization of players, as highlighted in the first part of the report. It is interesting to note that our research has shown that in the Netherlands, this is the approach that has been promoted with the training of crisis managers within the water authorities, who accompany crisis managers up to LCMS in the event of flooding.

In addition to this desire to professionalize managers, there is also a call for **coordination via a relevant scale** for flood-related crises. "*Rivers don't stop at communal borders! As far as we're concerned, we weren't a victim of the floods, but as part of the Commune is on a sort of island, we welcomed and rescued many victims from neighboring communes, for whom we were the only way out*" (Planu - Wallonia). It's important to remember here that, as we saw in the analysis of the

flood management, this is a problem that is essentially present in Wallonia[34] : as soon as several communes in the same province are affected, management will be organized at provincial level, but the provincial phase may not be automatic. In Flanders, on the other hand, flooding is dealt with on a much larger scale, since the provincial level is automatically responsible for flood management. This scale of collaboration is interesting insofar as it facilitates collaboration with water managers at regional level. The number of partners is reduced, and the exchange of information is facilitated. "*I also work in Limburg, and I think the province's approach is very good. Flooding is not usually a local problem. That's why BNIP flood formatting has to be done at least at provincial level. I think this is the best approach. BNIP flood formatting at the local level is not something I'm going to do directly.*" (Planu - Flanders).

There are also arguments in favor of **provincial management**, although this may lead to reluctance at the local level. "*Floods don't stop at municipal borders, so it seems more logical to opt for provincial emergency plans. Personally, I'm in favor of a combination of general and specific emergency plans. In principle, just about any crisis can be managed with a general emergency plan, but for large rivers like the Meuse and Demer, specific emergency plans are certainly an added value due to their specific characteristics, risks and flows. The BNIP for the Meuse and Demer defines clear alert and activation parameters. But a specific plan for each river separately does not seem useful to me. I've already pointed out that in 2021, some mayors have been driven by electoral considerations to make or not to make decisions. This is not always to the benefit or in the general interest of the population, so I'm not in favor of emergency plans at municipal level. I saw this for myself during a flooding problem due to rainfall, where the coordinator of one municipality's emergency plan adopted a very closed attitude, trying to exclude certain partners from crisis consultations in order to make their own visions and interests prevail*." (Firefighter - Flanders). In this respect, we can point out that the province of Liège has provided a flood plan canvas to the communes on its territory, and this has been rather well received by the Planu who took part in this research. "*We're part of the Province of Liège, and we're going to draw up a communal flood emergency plan based on the model. We think it makes sense within the current structure of crisis management in Belgium*." (Planu - Wallonia). "*The province of Liège gave us a copy of its special flood plan, which can be used as a template for our own communal plan. Personally, given my workload, I haven't yet been able to get down to the task. Still, it's a great relief to be able to rely on a text that already exists, with a whole range of useful information already collected*". (Planu - Wallonia).

Others, such as those in the Netherlands, are also in favor of **sub-basin management**. "*For hydrologists and forecasters, the watershed approach is essential. The left bank of a river may be on commune X, and the right on commune Y. Similarly, a commune may be on the left bank of a river. Similarly, one commune may be located in two completely different watersheds (the Meuse and the Berwinne, for example). It's very difficult to talk about risk by commune... Communes must therefore translate basin forecasts into risks on their own territory. What's more, when it comes to major floods, we quickly reach the provincial phase. So, apart from localized storms,*

[34] An analysis of the crisis management system in Germany suggests that similar pooling difficulties may have arisen. However, this research does not reveal this, which may be a consequence of the low participation rate in Germany.

the provincial approach seems to be a priority". (Water management - Wallonia). But, as we have seen, this approach is favored in the Netherlands by the superposition of the province and the water authority, which acts on a sub-basin scale. In Belgium, this approach is hampered by the difficulty of matching sub-basins to the scale of the communes that make them up. Indeed, "As a *sub-basin manager, we don't even bother to mobilize the communes that are concerned by our zone*" (interview with a water manager), given that some communes have only a tiny part of their territory concerned by the sub-basin. In Germany, we can also see the emergence of a sub-basin authority with the potential to take over communal competencies. However, the inability of wasserverbands to take ownership of river management at present is preventing the development of this approach.

Next, we looked at the different communication schemes within the Euregio and the difficulties that may be associated with them. But in addition to the problems linked to the structure of these schemes in the institutional landscape, our research also reveals a need for clearer communication, and this within all the regions. In the Netherlands, for example, some call for "*Avoid jargon, be clear. Make sure the person you're talking to understands what you mean.*" (Water Management - Netherlands). To reinforce communication reflexes, the players we met insist on the importance of **setting up drills**, not forgetting to include not only water managers, but also the general public. However, our survey also highlighted a **lack of resources for emergency planning** to achieve these objectives.

"At the moment, we're involved in solving day-to-day problems [...] *I realize that given our limited resources, we're more useful at the level of operational coordination. You can only be strategic if you have enough resources. It's the same thing for floods. My theory is to strengthen coordination at local level, because these are the only resources we have, and once a day to hold a meeting between all the managers to see what can be shared. The technical resources are there, we just need to find the staff*". (Healthcare - Wallonia).

Finally, it's worth pointing out that new initiatives such as the CELEX set up in Wallonia seem to suit the various players. "*Since the implementation of Celex in Belgium, we have seen a clear improvement in terms of information exchange and possible consequences*. (Firefighter - Wallonia). However, even if such initiatives help to bring the various managers together, the division between them is further reinforced by private players proposing 'miracle solutions', the consequence of which is to prevent relations between water and crisis managers from lasting. The federal services of the province of Liège, for example, report that "*there are private firms offering to draw up plans for communes for 60,000 euros*" (interview with the SFDG of the province of Liège). We might also ask whether initiatives such as Google's AI, which aims to replace flood alerts (*Flood Hub*, n.d.), might not also widen the gap between water and crisis managers.

Relations between regions

As we have just discussed, relations between different managers within a region are sometimes complicated, and can be an obstacle to the development of inter-regional relations. But before highlighting the difficulties in inter-regional relations, we need to clarify the distinction between inter-regional and international relations. Even if there is a stronger link between the province of Liège and Flemish Limburg, part of the

In view of the fact that all four regions of the world work in the same country (same legislative framework, share the same field realities in terms of disciplines and local level, share common coordination tools such as ICMS, etc.), we have not focused on this aspect for the purposes of this report. We will therefore refer to all relations between the four regions studied, whether international or not, as inter-regional relations.

Most of the people we spoke to in the course of our survey pointed to a lack of inter-regional collaboration in terms of flood risk management. In addition, a large number of participants in our DELPHI survey said they were not concerned by the issue, reflecting a lack of reflection on the subject. Nevertheless, before addressing the obstacles we were able to identify, we should point out that we were also able to highlight functional networks that could serve as a basis for strengthening inter-regional relations. We'll come back to these networks and the potential reasons why water and crisis managers fail to take them into account.

In the first place, institutional difficulties are the first obstacle put forward by the participants in our survey. Indeed, many lamented the difficulty of reaching their namesakes in other regions, underlining the **need for precise contacts**. "*A single point of contact is ideal. It's fine if that point of contact has other contacts. But we in the field should only have one contact. Why not have an application that would allow us to have information according to the location of an event?*" (Planu - Wallonia). "*As part of my job, I have daily or weekly contact with colleagues in other countries and/or other partners. It's usually the same people who are freed up from their organizations to shape international cooperation. Not all organizations are equally active in this respect. If structural staff members were designated to shape international cooperation in order to maintain the 'short lines of communication', this would certainly lead to improved cooperation.*" (Firefighter - Netherlands). *"Me, I'd rather have just one point of contact in the EMRIC network that refers us to the person we need than have to maintain everyone's numbers myself" (crisis manager interview).*

Secondly, the lack of representation within a network also poses problems for the development of inter-regional relationships. "*We're not part of the EMRIC network. We have little involvement in regional or international exercises. For barriers: the stakes are sometimes different, crisis regulations (hierarchy, players, definition of alarms and risks...) as well as culture. Language is a critical issue, especially during a crisis*. (Water management - Wallonia). Here, too, we find language-related barriers. Finally, we again find difficulties linked to crisis managers' lack of resources. "*We already have a lot of trouble organizing exercises within our region, so I'll leave you to imagine how we'd organize them with the others" (interview with a crisis manager).*

In addition to these difficulties, there is also a lack of concrete input from European projects and networks. "*European-funded projects often seem irrelevant to us, because they're too general, not very pragmatic, not very sustainable, very HR-intensive and time-consuming, with few useful results? Not to mention the effort required to set up the projects*". (Water management - Wallonia). "*I don't do it anymore because I can't exploit the results anyway, out of pragmatism, I try to focus on what we can improve at home.*" (Healthcare - Wallonia). However, several respondents show a willingness to participate in international collaborative initiatives, "*I don't often take part in this type of initiative, although they are interesting. The organization of relief zones should enable more active participation in these initiatives.*

initiatives. (Firefighter - Wallonia). "*I don't often take part in international cooperation initiatives, but I want to. I find it very interesting, especially in the context of emergency planning.*" (Planu - Flanders).

Many respondents also point to **existing but limited collaboration**. Highlighting certain limited networks, either in terms of time or participants, that could be developed or consolidated. "*In terms of crisis communication, I'm not aware of any official international collaboration. When crises occur outside Belgium and have an impact in Wallonia (e.g. toxic cloud), I obtain information through procedures and exchanges between crisis managers in the countries concerned, in liaison with the authorities (including political authorities). In the context of my job (communications), it's more a question of exchanges or training in crisis communications via existing networks (association of French public communicators - CapCom-, for example). It's also contacts with other countries (I'm thinking of Quebec) through study or university projects*". (CRC- W).

Among the networks where collaboration seems to be working, we find EMRIC :
"For example, as part of the Emric network's monitoring project, we present the tools we use, such as Be-Alert or ICMS. Managers in other countries do the same with their own tools. As for the 'operational' ones, such as the fire brigades, they undoubtedly have more concrete collaborations" (SFDG - Wallonia). "*We have mandatory meetings with the EMRIC network twice a year, and we try to maintain contact with the other managers in the country, but in the end we see more of those from other countries because we have more obligations with them" (interview with a crisis manager)*. Or watershed committees. "*Other regions are regularly consulted by the various water managers. This is the case within the international committees for the Scheldt and Meuse rivers. But crisis management is not a subject for discussion, as it does not fall within the remit of these committees. There are also often bilateral, more operational contacts between the different regions.*" (Water management - Flanders). Last but not least, citizen support networks seem to have been set up in the wake of the 2021 floods, at both local and international levels.

SWOT analysis: issues surrounding public participation in flood risk management.

In the course of our research, we worked with the various participants to assess the positive and negative aspects of public participation. These aspects are summarized in the following SWOT analysis.

> "It is a tool for auditing an organization and its environment, as part of a strategic planning approach. This tool helps to focus on the essential questions: the strengths and weaknesses (internal analysis of the organization) which structure the organization's strategic capacity - the opportunities and threats (external analysis of the environment) which constitute the key factors for success - in order to help the manager formulate the actions to be taken." (*SWOT Analyses*, n.d.)

Forces

Firstly, since the floods of July 2021, there has been an increase in the recognition of the importance of public participation in crisis management. "There are *plenty of people and resources available who can and want to help. Indeed, the civil protection services and the army need a certain amount of time to be ready to intervene in the field. Nor can they handle everything in serious situations. So civilians can fill this time gap and provide shelter for those who don't have room in shelters (in fact, it should be the other way around: most people should be able to stay with family or friends, and shelters and emergency aid should only be there for those who can't rely on their own network).*" (NCCN). Respondents to our survey emphasize, for example, **the great capacity for action** of the population in crisis. "*I was stricken, there were over 200 volunteers on my street for 0 public service ... it's obvious to me (even though I'm a firefighter) that the emergency service doesn't have the capacity to mobilize citizens, on the other hand it's essential to FRAME this mobilization in advance and organize, structure things.*" (Firefighter - Wallonia). They also point out that **the population generally knows the terrain better** than crisis managers. "*The citizen is the first actor in his environment*" (interview with a firefighter in Wallonia). "*The local population often knows the situation very well. They also have a rich history that can be useful.*" (Planu - Flanders). In the Netherlands, for example, crisis managers have "*called on citizens who [they] usually mobilize to search for people to keep us informed of water levels in different places*" (interview with a firefighter in the Netherlands). Finally, some also identify with citizen participation a **strong communication capacity**, to which we'll return later in this report. "*Citizen participation is certainly an interesting way of obtaining a great deal of information quickly. Ideally, however, these processes/systems should be designed in advance.*" (Water Management - Flanders).

Secondly, it is important to emphasize that there is a demand for **coordination and structuring of initiatives by the population**. "*During the floods of 2021, many citizens spontaneously offered to help out in our area. This willingness to help is very gratifying at local level. If necessary, the commune could also have called on associations and solicited their support. However, it seems difficult to organize a group of citizens specifically for certain aid services. Floods, in particular, only occur in our area in isolated cases, so the work involved in applying, managing contacts, exercising, etc. would be very extensive and would not achieve the objective set.*" (Planu - Wallonia). "*Yes, it is necessary and imperative to be able to count on the help of citizens. But above all, this help needs to be organized beforehand, otherwise it could lead to even more complicated situations. It would be useful to determine*

who coordinates this citizen help". (Firefighter - Wallonia). "*We need to develop and encourage citizen participation, as they are the ones on the front line who can help or provide crucial information. However, it is* ***essential that*** *this participation be officially* ***structured and framed****, both from a legal point of view and in terms of the missions entrusted to them. Citizen participation must remain under the aegis and management of a competent public service. Citizens need to get involved, receive training and information, and get to know each other on a neighborhood/village/city scale. The creation of a citizens' reserve, as in France, is a very good example of this*". (Extreme rainfall expert). There is therefore a great deal at stake in terms of coordination between crisis managers and public participation.

Most respondents also called for raising **public** awareness **of the risks present in the region**. "*Still at my level (water management), the main point to emphasize seems to me to be* ***raising people's awareness of the risks*** *and educating them on how to react in the event of a crisis. In the event of flooding (in Wallonia at any rate), risk awareness and good individual reflexes often make it possible to avoid human damage.*" (Water Management - Wallonia). "*Make citizens aware of risks, for example through websites such as Waterklaar.nl, and encourage self- and co-responsibility. You can prepare and facilitate citizen participation.*" (Water Management - Netherlands). "*It would be enough to give a few hours in schools for basic reflexes [...] children talk with their parents and we reach more people for less money*" (interview with a firefighter in Wallonia).

Some respondents also emphasize the fact that **networks already exist** and could be mobilized, as we pointed out at the end of the first part of this report. In Belgium, for example, defense and civil protection are regularly cited. "*A citizens' reserve makes sense. However, the army should also be involved. Through its "pioneer units", the army has machines and specialists who can be mobilized quickly. The army also has logistical resources, mobile kitchens, ... which are important in the event of a crisis.*" (Planu - Wallonia). "*We're not inventing anything; historically, this is the role of civil protection. The Red Cross is a private organization with its own interests and a sometimes highly unreliable partner, the only advantage being that it's cheaper than others*" (Soins de santés - Wallonie). Others stress the importance of the existing associative network. "*In Belgium, we have a strong network of associations on which we could rely*" (**interview** with a non-profit organization promoting the inclusion of the population in crisis management).

Weaknesses

Public participation is not achieved without conditions. Our research has shown that certain elements are essential:

First and foremost, public participation **needs to be prepared in** advance of the crisis in terms of emergency planning. "*Roles and responsibilities are also very important for public participation. Here again, coordination must be done in advance, because in the event of a crisis, this information often arrives too late.*" (Water management - Flanders). This ties in with what was said earlier about the need to professionalize the players in the field. The **need for assurances for and in relation to the population** thus emerges. "*The availability of people can be a problem. They're volunteers, so insurance, liability, etc. are a problem*". (Planu - Wallonia). Respondents therefore suggested setting up a coordination structure. "*If people provide assistance as part of a public involvement, we should consider a description of their role, recognition, but also insurance on which these people can rely in the event of damage or accident during their service.*" (Firefighter - Netherlands). "*Some*

Some initiatives are legitimate, others intrusive. Volunteers need to 'put themselves at the service' of a larger organization managed by the local authorities, rather than taking personal initiatives outside any framework, which become unmanageable. And that's very complicated! Ill-intentioned people get in the way of good will! Bottles of water generously donated have been taken and resold in a neighboring commune, for example" (Planu - Wallonia).

Some respondents once again emphasized the **extra workload** for managers, who are already overworked at the time of a crisis, due to the need for organization, but also to the risk of overaccident. Indeed, it was noted that the public "*believe themselves to be stronger than the firefighters, and take unnecessary risks, which represents a risk of overaccident. If the firemen don't act, it's because it's too dangerous*" (extract from a focus group, see below). "*In July 2021, citizens placed sandbags on a dike to raise it, which actually weakened it due to the weight of the sandbags on a saturated dike...*" (Water Management - Netherlands).

Some respondents also identify **communication-related risks**, mainly in terms of misinformation. "*I think we need to be very careful when it comes to involving the public in crisis situations. The speed at which information circulates and the expectations of citizens in terms of communication are often out of sync with the time required to manage a crisis (obtain data, validate it and finally pass it on). Rumors and fake news then take up the space left empty by the authorities' communication. It is then very difficult and time-consuming to correct erroneous information*". (CRC-W). "*This needs to be supervised: there's a risk of misinterpretation, of adding risk to risk (unnecessary evacuation, panic effect, heroic actions that end up being suicidal, etc.). Beware of fake news, which spreads very quickly (tik tok)...*". (Water management - Wallonia). "*During the floods, some neighborhoods were not alerted, and in others the information circulating was contradictory. In the end, we weren't asked to evacuate, and that was the result. Nor were we told what was happening with the roadblocks. If this were to happen again tomorrow, I still wouldn't trust them*. (**Excerpt from** an intervention by a victim of the 2021 floods)

Opportunities

As we saw in the 'strengths' section, public participation has many advantages. Developing a culture of risk awareness among audiences such as schools/communities could be an opportunity, according to the people we met. This more active participation of the population and the reinforcement of the associative network will create a greater sense of legitimacy for the population to take action. Aside from participation at the time of the crisis, it is also important to note that the population has a detailed knowledge of its territory, the risks and vulnerabilities that make it up. Several scientific studies have also highlighted the need to collaborate with local populations in identifying and analyzing risks. The population has an important role to play at every stage of the risk cycle. During the floods of July 2021, the population was particularly active in the recovery phase.

Many of the people we met during our survey spoke out in favor of public participation, stressing its **positive impact on risk awareness**. "*We need to develop this risk culture as much as possible, and as early as possible, in schools, and the help of associations would be invaluable* [...] *Improving the risk culture is probably the most effective and least expensive measure. We also need to maintain this knowledge of*

risk, even if it's a once-in-a-lifetime experience. These 'réflexes' need to be present in the population especially in the face of the unpredictable like in 2021 when the whole crisis system is out of date." (Water management - Wallonia). "*Above all, raising people's awareness of risks, learning to live with and anticipate them rather than relying on 'my provident commune' at all costs*." (Planu - Wallonia).

Developing this risk culture would thus be a way of **legitimizing the population's role as whistleblowers**. In the Netherlands, for example, during the floods of 2021, there "*were citizens in 2021 who were in charge of alerting us, but who didn't dare, saying it wasn't their role*" (**interview** with a director of a water authority). In Belgium, there's a big
There are "a *lot of brush fires that can be stopped with just a shovel",* but *"citizens put them out with the fire department once they're there*" (**interview** with a firefighter in Wallonia), reflecting a weak sense of legitimacy on the part of the population.

To achieve this, as we have already seen, the proposal is to **mobilize existing networks** such as the school or associative networks, mainly in Belgium. "*Neighborhood committees (which are active!), which already know their 'territory' well, are invaluable. It's important to list resource persons who, through their network, can mobilize other players*". (Planu - Wallonia). "*Indeed, associative life is highly developed in Belgium. However, these associations tend to operate independently of one another. It wouldn't be a bad idea, as we've already mentioned, to create "village councils" that maintain regular contact with the various associations AND to let the village councils also liaise with the local authorities.*" (Planu - Wallonia). "*It would be enough to give a few hours in schools to get the basic reflexes [...] children talk with their parents and we reach more people for less money*" (interview with a firefighter in Wallonia).

Last but not least, he emphasizes the importance of people **knowing their local area and being able to act quickly**. "Of *course! knowledge of the area and the population is a plus, and we need to be aware of that.*" (Planu - Wallonia). "*Certainly and especially for local water systems, where a rapid response is required. If citizens' autonomy is assured, this already represents a major gain in preventing or limiting damage*." (Water Management - Netherlands). "I *totally agree with these comments. It's true that while we talked above about the help of volunteers in following up a crisis, a role can also be played upstream, e.g. by helping the authority to identify risks and by disseminating conduct and good reflexes in the event of a crisis. Schools can be a good relay, but also the associative sector (sports clubs, youth movements, etc.). Difficult to find concrete examples, as not yet very developed in Belgium.*" (SFDG - Wallonia). "*Clearly, the participation of the population during the planning/preparation and reconstruction/réflexion phases is an added value (invaluable very local knowledge, specific point of view, etc.). Risk awareness and training in the right reflexes and reaction are also undeniable and unavoidable avenues for reducing risk at the very moment of crisis. To a lesser extent, raising awareness of public services and the 'right way' to interact with their representatives would also be of interest.*" (Water management - Wallonia). Risk culture is also important in terms of measures to protect the population. During the floods of July 2021, evacuating the population was a complex task in some cases. Today, crisis managers recognize that prior information and awareness-raising work is essential at the emergency planning stage. Involving the population right from the emergency planning phase could help to make the measures provided for in emergency plans more operational as far as the population is concerned.

Threats

Our research highlights several threats. Firstly, the **risk of over-accident,** insofar as the population "*thinks it's stronger than the fire department and takes unnecessary risks that represent a risk of over-accident. If the fire department doesn't act, it's because it's too dangerous*" (**interview** with a crisis manager). In this respect, some say that "we need to strengthen public participation, but there are limits. They have to understand that even if it's good to have initiatives, we won't always be able to help them. [...] Citizen initiatives need to be structured with referents or that sort of thing" (interview with a crisis manager). On the other hand, **the difficulty of putting in place the resources needed** to get the population involved, particularly in exercises: "*When we do exercises, we rarely include citizens*" (**interview** with a crisis manager). The same applies to training the population.

What emerges is the **need to structure people's actions**, both to protect them and to improve efficiency. "*It's very important to channel the population, because that's the only way they'll be able to do work that's safe but useful. There will always be people who overestimate themselves and want to do the fire department's job, because the fire department won't come.*" (Planu - Wallonia). "*Over-accidents are of course a major risk. I believe that the culture of risk should be oriented towards one's own protection or immediate perimeter (geographically). Simple (reflexes) procedures on what you can and can't do.*" (Water management - Wallonia).

Finally, some respondents insist that public participation **is not enough**. **It must not be a replacement for existing crisis management services. The** public must not be used as a solution to the lack of funding for crisis management operations. "*We need to frame things and use the population as a support and not as the only resource in a given field*" (Planu - Wallonia). "*It must be a plus, but without taking anything away from the emergency services. the whole question of insurance*, *too.* (Firefighter - Wallonia). Indeed, as we have already discussed, the development of public participation must take place within crisis management structures - and not to their detriment - in order to ensure the real development of a risk culture.

Conclusions

The floods of July 2021 mark a major event in crisis management, and we need to learn from them: "*We need to prepare for emerging crises that respect no borders. Discontinuity, ignorance, unreadable radar screens and the unthinkable are becoming normal difficulties*" (Lagadec, 2009). Today, our societies are faced with crises that no longer correspond to our working assumptions or the operational scripts written in the last century: crises and disasters are changing in nature and impact (Guilhou & Lagadec, 2006). Such changes can be seen in the Euregio, for example, with the introduction of CELEX, the development of legislation in Belgium and the evolution of communication between the Wasserverband and crisis managers in Germany.

Nevertheless, as we have seen in our analysis of the different flood management systems in the Euregio, the large number of players and the institutional peculiarities linked to each country are an obstacle to the development of collaborative relationships between managers not only between the different regions of the Euregio, but also within each region. In Belgium and Germany in particular, complicated institutional structures have been highlighted as an obstacle to collaboration. Crisis managers and water managers do not share the same collaboration networks. As we saw in the first part of this report, however, a "culture of risk" needs to be reflected in the development of a shared collaborative attitude[35] and the establishment of cooperation structures between various players, necessarily based on mutual trust-building objectives (Mandell and Keast, 2007). This requires the creation of partnerships with a wide range of players. These partnerships can be horizontal (with non-hierarchical players) or vertical. They must, of course, involve classic crisis management players, but must also include external public (government departments) and private players (businesses, non-profit organizations, the voluntary sector), as well as the general public[36] . These partnerships need to be developed over the long term, so as to establish joint working habits and avoid communication/collaboration problems during crises.

We propose to conclude this report by returning to two lines of thought in order to ***concretely strengthen the flood risk culture in the Euregio*** :

The first area for consideration is **(1) the need to strengthen our emergency planning and crisis management infrastructure**. Indeed, to ensure that emergency planning is both effective and appropriate, governments must first invest resources in terms of means, skills and coordination. The floods of July 2021 highlighted the lack of political interest in investing in emergency planning, a syndrome that affects most systems of government (Boin, 2021). In Belgium, we are thinking in particular of emergency planning coordinators (planu), who all too often encounter obstacles in freeing up time and resources outside times of crisis. "*We prepare scenarios, we try to prepare for situations that may never occur in a commune*". This means investing in training, exercises and the creation/reinforcement of networks between professionals who will be on the front line of crisis/disaster management (rescue zones, police zones, municipalities, governors' departments, civil protection, emergency medical aid, etc.). It is important that this

[35] Kapucu defines the collaborative approach as: "any joint activity by two or more agencies that is intended to increase public value by their working together rather than separately" (Kapucu, 2010).
[36] To achieve this, it is necessary to develop a register of players and their resources/means available in the event of a crisis.

preparation takes place, upstream of crisis management. As we have pointed out several times in this report, the strong division between water and crisis managers, mainly in Germany and Belgium, leads to difficulties at the time of a crisis. The most telling example is that of a dam manager who explains that he "*has handling procedures to preserve the dam [...] but no real crisis management tool [...] we are not prepared as managers*" (interview extract). As we have seen in our study of the structure of flood risk management in the various regions, there are sometimes players who can play the role of liaison between crisis managers and water managers, whether at the level of hydraulic channels or less imposing streams. In the Netherlands, for example, there are specialized agents within water management administrations to liaise with crisis managers. Such roles also seem to exist in Flanders, but with less pronounced institutionalization. In Wallonia, the role played by river contracts could be strengthened to give them greater legitimacy in the face of crisis managers, given that they are the closest organization to the field, at the sub-basin level. Finally, it's also important to remember that networks such as EMRIC and river basin committees are already in place and could be developed further.

The second area for reflection concerns **(2) the need to involve the population in crisis management and emergency planning.** The floods of July 2021 demonstrated that the state alone cannot manage such crises. However, in the 3 regions analyzed, the population is an unthought-of aspect of crisis management and emergency planning. The population is only considered from the point of view of information.
We must inform the population of the measures taken by the authorities in a crisis situation". Today, the top-down approach of crisis managers is too rigid, and the framework for action needs to be rethought. Public participation needs to be considered at the various stages of the risk cycle (risk identification and analysis, contingency planning, crisis management, recovery and feedback). A fundamental challenge is to ensure that public participation is **coordinated** with the actions of crisis managers. To this end, the people interviewed emphasized the role that could be played by the large network of associations in Belgium (focus group). Indeed, non-profit organizations such as BeFaid aim to link crisis managers and volunteers in times of crisis. Some respondents highlighted the value of creating citizens' reserves "*that can be mobilized to support the public authorities in preventing and managing the major risks present in the municipality*" (CEPRI, n.d.). While the creation of a communal reserve[37] implies an investment in terms of training and organization for a commune, it also makes it possible to organize the citizens' response. As we have seen with the counter-example of citizens who dare not sound the alarm in the Netherlands, it is important for the population to feel legitimate in order to play an effective role in sounding the alarm. Methods such as hybrid forums (Callon & al, 2001) can be used to maximize collaboration with the public. The aim is to bring together the local population, who are specialists in their area, and 'experts', in a forum where they can discuss a particular uncertainty (the management of crises linked to extreme rainfall, for example). Setting up "serious games" can also be an interesting tool for bringing different groups together to discuss the same task. One example is the work of the Saint-Etienne Ecole des Mines, with their Cit'in Crise game. However, it's important to stress here that serious gaming should not be used as a unilateral process for communicating risks to the public, but rather as a platform for discussion and co-constructed learning between the various stakeholders.

[37] If this approach is not widespread in Belgium, it could be implemented through the use of existing associations and on the basis of a register of available means and resources.

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Appendices

Guide

- What are your institution's missions?
- What are your specific missions within this institution?
    - Building flood emergency plans: who does what?
        - Scenarios or generic plans?
- Crisis communication
    - How do you communicate with water authorities/managers?
    - How do you communicate with the public?
    - What is your flood warning system?
- Communication with other regions
    - How are the Meuse and cross-border rivers with Belgium managed?
    - How can we communicate with upstream communities?
        - What could be better? What could be improved in communication?
    - Do you take part in international projects?
    - What are the cooperation/communication and collaboration agreements with crisis managers and authorities in other regions?
- Crisis management
    - How to detect flood risks
    - How evacuation/sheltering is organized
    - What role do local authorities play in crisis management?
    - Do you involve the public in drawing up your plans?
        - Strengths/weaknesses
        - Threats/opportunities
    - Can you give us an example of crisis management with a ramp-up?
- Do you know anyone else who would like to talk about this subject?

Focus group proceedings Wallon

PROGRAM SUMMARY

09H00: Start 09H15:

Activity 1

10H15: Presentations

11H00: Break

11h10: Activity 2

11H40: Presentations

11H55: Round table

12H15: End of session

OBJECTIVES

- Be part of a learning dynamic.

- Conduct a participatory meeting where everyone is invited to take part in the discussion.

- Present an initial thematic analysis of the research carried out.

- Reflect with the group on possible solutions and improvements for future flood management.

- Identify with participants the interest and avenues for developing a culture of risk through greater inclusion of the population.

- Draw up the first lines of an action plan to include citizens in the risk cycle.

- Identify best practices for a guide to citizen inclusion.

THE PARTICIPANTS

Participants are divided into sub-groups, paying particular attention to the presence of a citizen in each group. The groups will be divided as shown in the following table:

1	CITIZEN
2	FIRE SERVICES
3	WATER MANAGEMENT
4	UNIVERSITY EXPERT
5	CITIZEN
6	EMERGENCY SERVICE
7	SFDG
8	CITIZEN
9	POLICE DEPARTMENT
10	COMMUNE

PROCEEDINGS OF THE MEETING

Recordings and note-taking during workshops.

Materials: Post-it notes (3 colors); A3 Risk Cycle with writing space; SWOT analysis chart

Period 1: presentation of the morning's objectives with a thematic presentation (**Duration: 15 min**)

- Presentation of the animation **5min**
- Researchers explain the purpose of focus groups **5 min**
- Researchers present the skeleton of crisis management in the country where the focus group takes place. **5 min**

Period 2: Identification of best practices for including the population **(Duration: 105 min)**

- Around 30 images evoking public participation throughout the risk cycle are placed on a table. Participants observe them and choose an image that inspires them. They then go to their table according to their group. **10 min**
- Two-colored post-it notes (green and red) are placed on the table, along with a simplified risk cycle divided into four stages. Participants present their image and discuss good practices for including the populations linked to it, noting them on a green post-it. They then place their post-it at a stage of the risk cycle. At the same time, they note the difficulties they identify with each practice on a red post-it. **50min**
- Then each group presents the images they have chosen, and the other participants can ask questions. **45min (10min presentation + 5min question / group)**

BREAK (10 min)

Period 3: SWOT analysis (Duration: 45 min)

- The participants have the risk cycle at their disposal, with the post-it notes they have put down, as well as a table for carrying out a SWOT analysis. As a group, they choose an example of good practice or a part of the risk cycle and carry out a SWOT analysis of it. **30 min**
- Each group then briefly presents its SWOT analysis. **15 min**

Period 4: Final round of discussions general discussion on the points raised by the other teams and what may have marked them (**10 min**)

END: sandwiches

- At the same time, A3 sheets are laid out with post-it notes so that speakers can note down what struck them and any criticisms they may have.

Focus group proceedings Flamand

PROGRAM SUMMARY

10H00: Period 1 - Introduction
10H15: Period 2
11:05am: Break
11:15am: Time 3
11:50am: Time 5
12:00pm: End

OBJECTIVES

- Be part of a learning dynamic.
- Conduct a participatory meeting where everyone is invited to take part in the discussion.
- Present an initial thematic analysis of the research carried out.
- Reflect with the group on possible solutions and improvements for future flood management.
- Identify with participants the interest and avenues for developing a culture of risk through greater inclusion of the population.
- Draw up the first lines of an action plan to include citizens in the risk cycle.
- Identify best practices for a guide to citizen inclusion.

THE PARTICIPANTS

Participants will be divided into sub-groups, paying particular attention to the presence of a citizen in each group. The groups will be divided as shown in the following table:

1	**FIRE SERVICES**
2	**NCCN**
3	**NCCN**
5	**WATER BOARD (nl)**
6	**WATER BOARD (nl)**
7	**SFDG**
9	**POLICE DEPARTMENT**
10	**POLICE DEPARTMENT**

PROCEEDINGS OF THE MEETING

Recording and note-taking during workshops. Provide nominettes. Materials: Post-it notes (3 colors); A3 risk cycle with space for writing.

Period 1: presentation of the morning's objectives with a thematic presentation (**Duration: 15 min**)

- The Dutch-speaking moderator explains the marhetak project and the objectives of the focus groups **5 min**
- CRC-W presentation **5min**
- Presentation of the program by the Dutch-speaking host **5min**

Period 2: Identification of good practices for including the population **(Duration: 50 min)**

Part 1: Images **(Length: 10 min)**

- Around thirty images evoking public participation throughout the risk cycle are placed on a table. Participants observe them and choose an image that inspires them. **5 min**
- Round the table, everyone presents the card they have chosen, why they chose it and what it evokes in them in terms of their crisis management practice. Reaction time after each image presentation **5 min**

Part 2: Post-it notes **(Length: 25 min)**

- Two-colored post-it notes (green and orange) are on the table, and the risk cycle is projected on the power point. Based on your discussions, note down the positive and negative points relating to public participation. **5 min**
- Round the table, everyone presents their post-it notes and explains their choice. With time for reaction/discussion after each image presentation **20 min**

Part 3: The snail of recovery **(Length: 15 min)**

- The 'snail of recovery' is projected on the power point.
- Together, participants answer and discuss the following questions **15 min**
    - What do you see as the biggest challenges?
    - How can the public take part in these phases?

BREAK- 10 min

Period 3: Reflection on the white paper **(Duration: 35 min)**

- Participants divide into two groups and read part of the 'risk culture' chapter of the white paper. **5 min**
- In sub-groups, they answer two questions displayed on the power point **20 min** :
    - What do you think of what you've read? Does it resonate with your business, or do you see areas for improvement?
    - If you had to implement these recommendations in the province of Limburg, how would you go about it?
- The two sub-groups present the point they have read and their thoughts to the whole group. **10 min**

Period 5: Final round general discussion on the value of what we've done and areas for improvement (**10 min**)

END: sandwiches

- At the same time, speakers receive a feedback sheet to fill in.

Questionnaire Delphi

Question 1: Collaboration within the same region

Here are a few excerpts from interviews recounting the difficulties encountered in the relationship between water and crisis managers:

- *"We have handling procedures to preserve the dam [...] but no real crisis management tool [...] we're not prepared as crisis managers" (interview with a water manager).*
- *"It's very difficult to work with people who are in administrations where they're not used to being mobilized at all hours of the day or night" (interview with a crisis manager).*
- *"As a sub-basin manager, we don't even bother to mobilize the communes concerned by our zone" (interview with a water manager).*
- *"We wanted to develop a simple protocol to improve the management of small crises with local residents, but the authorities stopped that" (interview with a water manager).*

1. How do you feel about this? Do you face difficulties in collaborating within your region outside times of crisis? Please feel free to illustrate your answer with a concrete example.
2. How is emergency planning (flood contingency plans, preparation meetings, drills, etc.) carried out in your region? Is there collaboration between crisis and water managers? Identify areas of tension? Please feel free to illustrate with an example.
3. In your opinion, what could be improved?

Question 2: Collaboration with managers in different regions

Apart from the relationship between water and crisis managers, there are also organizational difficulties between different regions, within and outside the same country.

- *"We have mandatory meetings with the EMRIC network twice a year, and we try to maintain contact with other managers in the country, but in the end we see more of those from other countries because we have more obligations with them" (interview with a crisis manager).*
- *"It's hard enough to organize drills within our region, so I'll leave you to imagine how it would be with others" (interview with a crisis manager).*

1. How do you position yourself in relation to these two extracts? Do you also identify any difficulties in making contact with managers in other regions/countries? In your opinion, what is the biggest barrier to the development of collaborative processes?
2. Are you often in contact with managers in other countries? How does this collaboration work? Please feel free to illustrate your answer with a concrete example.

Question 3: International cooperation initiatives

The MARHETAK project is an example of international and interregional cooperation aimed at drawing transnational lessons to improve preparedness and risk culture in different regions. It is therefore a form of collaboration in which you are invited to participate.

1. Do you often take part in international cooperation initiatives, in this or another form?
   Do you find these initiatives interesting?
   Have you ever taken part in an inter-regional debriefing? If so, was it an enriching experience?
   What were the main lessons you learned?

2. In your role, what is being done to maintain international collaboration?

Question 4: Collaboration with managers in the region

We were also able to identify difficulties in collaborating at the time of the crisis, as illustrated by the following extracts:

> • *"We didn't really have a privileged contact among water managers, so we asked the regional crisis center, which sent us someone" (interview with a crisis manager).*
>
> • *"During the floods, some neighborhoods were not alerted, and in others the information circulating was contradictory. In the end, we weren't asked to evacuate, and this was the result. Nor were we told what was happening with the roadblocks. If it happened again tomorrow, I still wouldn't trust them" (interview with a flood victim).*

1. What do you think? Are you facing difficulties in your region at the time of the flood crisis? Please feel free to illustrate your answer with an example.
2. Do you have dedicated contacts who can assist you in the event of a crisis? Are these exchanges planned in advance (via a specific platform or certain channels, for example)?
3. In your opinion, what could be improved in your region to enhance communication and information exchange between different managers at the time of a crisis?

Question 5: Collaboration with managers in different regions

> • *"I tried to reach the province many times, but it was impossible to get forecasts for their side of the territory" (interview with a crisis manager).*
> • *"The Belgians didn't understand why their Dutch neighbors across the street were evacuating, when they weren't [...] the Dutch just had more pessimistic forecasts" (interview with a manager from crisis manager)*
> • *"I'd rather have a single point of contact in the EMRIC network that refers us to the person we need than have to maintain everyone's numbers myself" (interview with a crisis manager).*

1. What do you think about this? In your opinion, and based on your experience, is inter-regional collaboration at the time of a crisis well developed? What is in place to ensure inter-regional information exchange and communication?
2. Do you have specific channels dedicated to international communications during a crisis?
3. What do you think could be done to improve this collaboration?

Question 6: SWOT analysis

Strengths: Positive aspects of current public participation

The population has a major role to play throughout the risk cycle. As pointed out by a non-profit organization that promotes the inclusion of the population in crisis management, during the floods of July 2021 "we quickly realized that without the citizens, help would be slow. [...] The first few days, it was the citizens who fed the victims" (interview with a non-profit organization). It was also pointed out that during the floods of 2021, "the population was the first and last to help the victims" (interview with a crisis manager). It emerged that "the citizen is the first actor in his environment" (interview with a crisis manager). Indeed, they are the most local level, and can take action in the most effective way.

to problems that could get worse, or alert the authorities. There are many examples of public participation. In the Netherlands, for example, crisis managers have "called on citizens who [they] usually mobilize to look for people to keep us informed of water levels in different places" (interview with a crisis manager), illustrating a possible avenue for including the population in crisis management. In France, too, citizens' reserves have been set up. These can "be mobilized in support of public authorities to prevent and manage major risks present on the territory of the commune" (CEPRI, N.D.). In the Netherlands, too, the Red Cross is proposing to set up a citizens' reserve within its services.

1. What's your opinion? Do you agree with the strengths of public participation highlighted here? Do you see other examples of strengths? Please feel free to illustrate your answer with an example.
2. In your role, what are some concrete examples of where public participation has been a strength?

Weaknesses: Negative aspects of current public participation

However, public participation also has its limits. There is a lack of legitimacy on the part of citizens. In the Netherlands, for example, during the floods of 2021, "there were citizens [...] who were in charge of alerting us but who didn't dare, saying it wasn't their role" (interview with a water manager). We were also able to detect a certain resentment on the part of crisis managers following the reactions during the floods of 2021. This resentment is also found towards "citizens [who] automatically grumbled because they didn't have all the information right away" (interview with a water manager) in the Netherlands. A non-profit organization promoting public participation also points out that "there were people everywhere, and it wasn't always easy to keep track of who was going where [...] Some people had strangers in their homes" (interview with a non-profit organization).

1. What's your opinion? Do you agree with the weaknesses in public participation highlighted here? Can you think of other examples of weaknesses? Please feel free to illustrate your answer with an example.
2. In your role, what are some concrete examples where public participation is a weakness?

Opportunities: Positive points if we develop public participation

As we saw in the 'strengths' section, public participation has many advantages. Developing a risk culture among audiences such as schools/communities could be an opportunity, according to the people we met. For example, "it would be enough to give a few hours in schools to get the basic reflexes [...] children talk with their parents and we reach more people for less money" (interview with a crisis manager). In addition to schools, associations are being set up to promote the inclusion of the population at all stages of the risk cycle, arguing that "in Belgium, we have a strong network of associations on which we could rely" (interview with a non-profit organization). This more active participation of the population and the strengthening of the associative network will thus result in the population creating a more greater feeling of legitimacy to to act. Aside from participation at the time of a crisis, it is also important to note that the population can develop a detailed knowledge of its territory, the risks and vulnerabilities that make it up. Several scientific studies have also highlighted the need to collaborate with local populations in identifying and analyzing risks.

1. What's your opinion? Do you agree with the opportunities for public participation highlighted here? Do you see other opportunities? Please feel free to illustrate your answer with a concrete example.
2. Concretely, if you were to develop public participation in collaboration with your function, what opportunities would you see?

Threats: Negative points if we develop public participation

Our interviews revealed two main threats. On the one hand, the risk of over-accident, insofar as the population "thinks it's stronger than the fire department and takes unnecessary risks that represent a risk of over-accident. If the fire department doesn't act, it's because it's too dangerous" (interview with a crisis manager). In this respect, some say that "we need to strengthen public participation, but there are limits. They have to understand that even if it's good to have initiatives, we won't always be able to help them. [...] Citizen initiatives need to be structured with referents or that sort of thing" (interview with a crisis manager). On the other hand, the difficulty of putting in place the resources needed to get the population involved, particularly in exercises: "When we do exercises, we rarely include citizens" (interview with a crisis manager). The same applies to training the population. In Belgium, there are volunteer firefighters, who are citizens trained in operational crisis management.

1. What's your opinion? Do you agree with the threats to public participation highlighted here? Do you see other threats? Please feel free to illustrate your answer with a concrete example.
2. If public participation were to be implemented in collaboration with your function, what threats would you identify?

Question 7: Relations with local

- *"We don't have communal flood PPUIs. In Limburg, we are developing provincial PPUi for the various watersheds, one for the Demer and its tributaries and the other for the Meuse. In the event of flooding, we quickly activate the provincial phase. So it's the governor who's on the front line of flood management" (interview with a river basin of crisis manager)*
- *"The veiligheids' regio develops specific emergency plans. There are no general emergency plans. For the South Limburg security region, we have 4 special emergency plans which are developed on the basis of the risk analysis we have carried out. For floods, we have an emergency plan for the Meuse river basin. In the event of flooding, the veiligheids' regio takes the lead. The mayor has a more limited role" (interview with a crisis manager).*
- *"In Liège, we have developed a special flood emergency plan to establish procedures in the event of flooding in the province of Liège. It also serves as a basis for the development of flood emergency plans by the communes. Indeed, the communes are also responsible for developing these plans according to the reality of their territory" (interview with a crisis manager).*

1. What do you think of these different approaches? In your opinion, what are their advantages and disadvantages? Please feel free to illustrate your answer with a concrete example.
2. What are your needs in terms of emergency planning and flood management preparedness?
3. What kind of relationship do you currently have with higher-level crisis managers (provincial for Belgium, veiligheids' regio for the Netherlands and Kreis for Germany) regarding flood emergency planning? And with river (and dam) managers, if you have any on your territory?

4. In your opinion, what kind of relationship do municipalities have with higher-level crisis managers (provincial in Belgium, veiligheids' regio in the Netherlands and Kreis in Germany) regarding flood emergency planning?
   Could these relationships be improved? If so, how?
5. In your opinion, what type of relationship do local authorities have with river (and dam, if you have any in your area) managers regarding water-related risk management in your area?
   Could these relationships be improved? If so, how?
6. What kind of relations would you like to have with higher-level crisis managers (provincial for Belgium, veiligheids' regio for the Netherlands and Kreis for Germany) regarding flood emergency planning?
   What about river (and dam, if you have one in your area) managers?
7. In terms of communication with crisis managers at other levels, what are your needs in terms of emergency planning and flood risk management?
8. In terms of communication with water managers, what are your needs in terms of emergency planning and flood risk management?

Question 8: Opinion on the drafting of a guide

As explained in the introduction, the aim of our study in the MARHETAK project is to produce a guide for local authorities to help them develop a culture of risk. The aim of this guide is to provide local authorities with the tools they need to develop plans to cope with flooding on their territory, by giving them food for thought and best practices.

1. Do you think that a guide for local authorities is an appropriate approach to developing a risk culture?
2. In your opinion, if there were only one practical tip in our guide, what would it be?

Summary of the analysis SWOT

Forces • Great capacity for action • Increased local knowledge • High communication capacity • Existing networks • *Population expertise* • *Access to off-grid people*	**Weaknesses** • Need for preparation • *Coordination difficulties* • Risk of overaccidents • Work overload for managers • Risk of misinformation • Excessive demands
Opportunities • Developing a risk culture • Legitimizing the population in a crisis and warning situation • Existing and available networks • Better knowledge of the terrain • *Material resources and expertise* • *Communication potential*	**Threats** • Risk of overaccidents • Mobilization difficulties • Need for structure • Risk of weakening operational powers • *Empowering citizens to relieve the state*