Strengthening and Redesigning European Flood Risk Practices
Towards Appropriate and Resilient Flood Risk Governance Arrangements

Analysing and evaluating flood risk governance in Belgium

Dealing with flood risks in an urbanised and institutionally complex country

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List of acronyms

ANB	Flemish Agency for Nature and Forests
CBA	Cost-benefit analysis
CIW	Flemish Coordination Committee on Integrated Water Policy
CRC-W	Crisis Centre of the Walloon Region
CCVO	Crisis Centre of the Flemish Government
CWATUP	Walloon code of spatial planning, urbanization and cultural heritage
DGO2	Walloon department for mobility and waterways
DGO3	Walloon department for agriculture, natural resources and environment
DGO4	Walloon department for spatial planning, housing, energy and cultural heritage
DIWP	Decree on Integrated Water Policy
FD	European Floods Directive
FRG	Flood risk governance
FRGA	Flood risk governance arrangement
FRM	Flood risk management
FRMP	Flood risk management plan
FRMS	Flood risk management strategy
GEIP	General emergency and intervention plan
GTI	Walloon Interdepartmental Flood Group
HIC	Flemish Hydrological Information Centre
MLWS	Multi-layer water safety
MOW	Flemish department of mobility and public works
PARIS	Integrated and Sectorised Action Plan (of Walloon government)
RBMP	River basin management plan (in framework of WFD)
SDER	Strategic spatial plan for the Walloon Region
SEIP	Specific Emergency and Intervention Plan
SETHY	Hydrological information institute of Walloon Government
VMM	Flemish Environment Agency
WFD	European Water Framework Directive
W&Z	Waterways and Sea Canal

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Preface

This report is the third deliverable of the EU 7th Framework Project STAR-FLOOD (see www.starflood.eu for an outline of the project). STAR-FLOOD focuses on Flood Risk Governance. The project investigates strategies for dealing with flood risks in 18 vulnerable urban regions in six European countries: England, Belgium, France, The Netherlands, Poland and Sweden. The project assesses Flood Risk Governance Arrangements from a combined public administration and legal perspective, with the aim to make European regions more resilient to flood risks.

This report constitutes deliverable D3.4[1], a country report on Belgium. Whereas Work Package 1 provided an extended problem analysis related to Flood Risk Governance in Europe, Work Package 2 focuses on how Flood Risk Governance in Europe can be researched. Work Package 3 forms the empirical core of the project, in which analyses, explanations and evaluations of each country, including three case studies, have been performed. This report centralises the findings from research conducted in Belgium at the national scale (Flemish and Walloon Region) and from three case studies: Antwerp, Geraardsbergen and Lessines.

Belgium is an interesting country for studying flood risk governance. One of the interesting aspects of flood risk management in Belgium is the multi-level governance setting, as competences with regard to, amongst others, the environment, water management, spatial planning have been transferred to the Regions. The policies and legal frameworks for flood risk management, with the main exceptions hereto being insurance and crisis management, are thus different in the three Regions.

The six country reports, including case studies, of WP3, together with D3.1, the report on the case study workshops in each country, form the main input for the last two Work Packages of STAR-FLOOD, being WP4 and WP5. WP4 focuses on a systematic comparison between the STAR-FLOOD consortium countries; WP5 on the identification of design principles for appropriate and resilient Flood Risk Governance.

We trust that the current report is of interest for a broad readership with an interest in Flood Risk Management and governance. The content of this report may inspire researchers and professionals with an interest in social scientific and legal research into Flood Risk Management, Disaster Risk Reduction or climate change adaptation.

Yours sincerely,

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	Authors		

[1] D3.2 is the country report, including case studies on The Netherlands; D3.3 is for England; D3.4 is for Belgium; D3.5 is for Sweden; D3.6 is for Poland; D3.7 is for France.

Overview of key findings

1. Introduction

What makes Belgium an interesting research subject in terms of flood risk management is not merely its flood risks, but also its specific government system. In the federal state of Belgium, competences on water management and spatial planning have been transferred to the regions (Flemish, Walloon and Brussels-Capital Region).[2] In each of these, flood risk management (FRM) is thus subject to different legal frameworks and policies. In contrast, responsibilities on crisis management and insurance issues have remained at the federal level. This makes Belgium a valuable case to study flood risk governance in a multi-level governance setting.

The Belgian research team has investigated the flood risk governance arrangements of Flanders and Wallonia as if it were two different countries. Considering the fact that the two regions stem from the same historical political structure but have in the last 25 years developed independently, they offer interesting material for 'cross-country' comparison and the identification of good practices. Because of its highly specific situation, we have opted not to report on the Brussels-Capital Region in this report.

Since the analysis addresses changes and stability in flood risk governance, we had to delineate the focal period of research. The focus is on the period between 1995 and 2015. During this period of time, a number of significant flood events took place and important legislative and policy related initiatives were taken, both at EU and national level.

2. Flood risks in Belgium

During the 20th and 21st century, a number of severe flood events took place, of which the most disastrous ones were in 1953 and 1976. Whereas the most harmful floods of the 20th century had a tidal cause, more recent events were rather caused by fluvial and pluvial flooding.[3] Belgium has a very high degree of land sealing, which decreases its rainwater infiltration capacity, thereby making it more vulnerable to these types of floods. In the future, the amount of built-up area is expected to increase even further. Also climate change is predicted to increase the likelihood of floods, especially in summer. The basins that are most susceptible to flood risks are the basins of the Dender and the Senne, two rain-fed rivers which discharge water from the middle-high southern part of Belgium to the low-lying north.

3. Main characteristics of the flood risk governance arrangement

Five Flood Risk Governance Arrangements: some regional, some federal

[2] Analogue to many other competences, such as employment, energy, agriculture, *etc.*
[3] Namely, the floods in 1993/95, 1998, 2002/03, 2010.

Belgian flood risk governance cannot be subsumed under one arrangement because of its complex government structure, as mentioned in the section above. Instead, **five separate Flood Risk Governance Arrangements (FRGAs[4]) can be identified** (see Figure 1). The first three of them encapsulate the strategies of prevention, mitigation and defence and are referred to as the **Water System Arrangement**. Competences related to these strategies belong to the regional governments; therefore, this allows us to discern separate arrangements for the Flemish, the Walloon and the Brussels-Capital Regions. The arrangement in the Brussels-Capital Region is not addressed in this report, as explained above. The fourth FRGA is the **Flood Preparation Arrangement**, which focuses on emergency planning and crisis management. Unlike the Water System Arrangement, the Flood Preparation Arrangement is mainly governed at the federal level.[5] The fifth FRGA is the **Flood Recovery Arrangement**, which mainly concerns insurance related issues and is also primarily governed at the federal level.[6] Chapter 2 of this report elaborates on the characteristics of these five arrangements.

[4] The FRGAs are formed by a cohesive combination of actors, rules, resources and discourses.
[5] As there is a tendency towards regionalisation of crisis management in Belgium, the regional approaches are also discussed in this country report.
[6] Although recent events have led to tendencies of regionalisation.

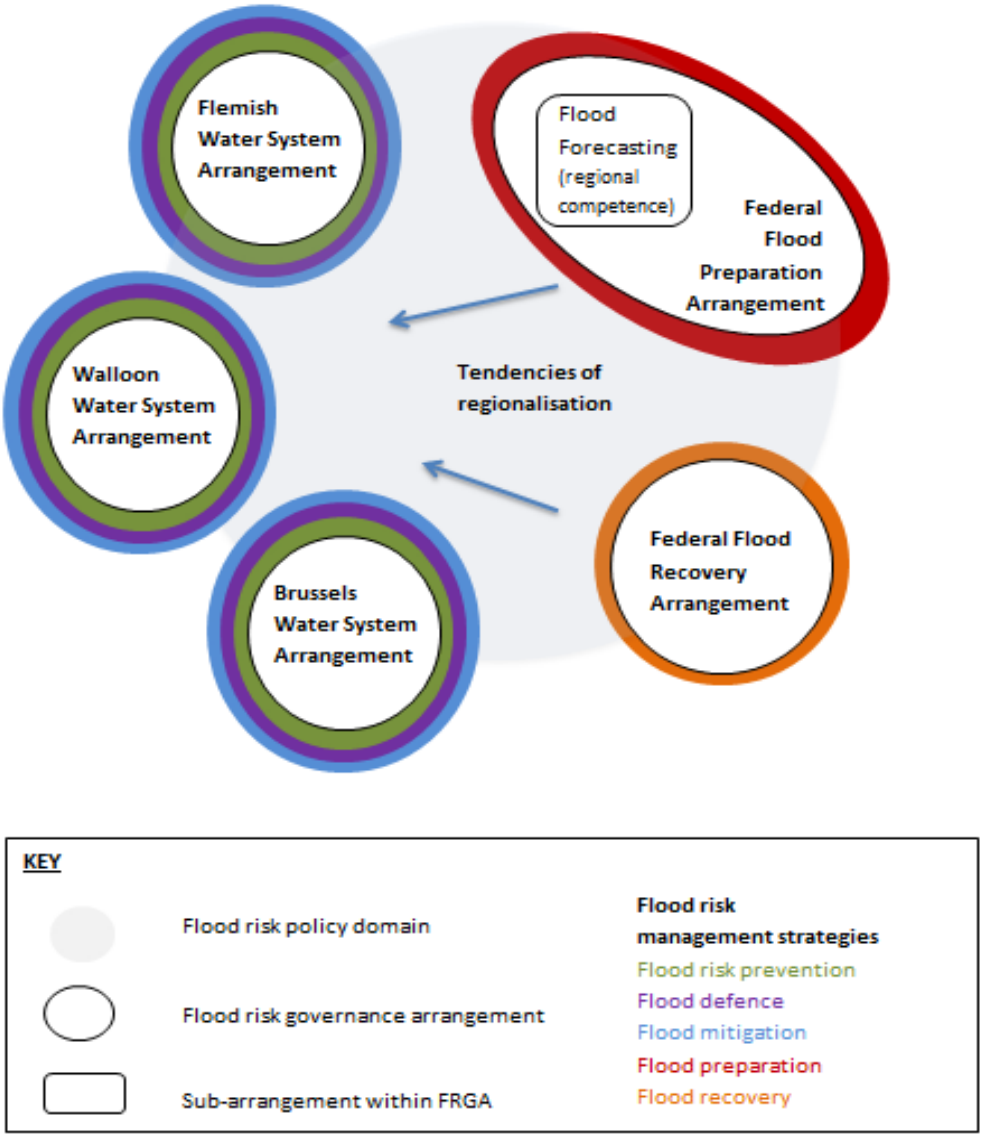

Figure 1: Flood Risk Governance in Belgium

The regional Water System Arrangements are highly fragmented in terms of actors. Competences are divided over four categories of watercourses, each of which has different water managers. In order to increase the coordination between them and with the Flemish Department of spatial planning, the Flemish government installed a Coordination Committee on Integrated Water Policy (CIW) in 2003. In the same year, the Walloon government took a similar initiative with the Interdepartmental Flood Group (GTI). At basin level, integrated water management is pursued by the sub-basin boards in Flanders and the river contracts in Wallonia.

Diversified strategies – A wide array of instruments

All Flood Risk Management Strategies (FRMS), as discerned in the STAR-FLOOD project, are present in Belgium. The table below illustrates the most important measures and instruments for each of the strategies.

Table 1: Flood Risk Management Strategies and related Instruments in Belgium

	Prevention	Defence	Mitigation	Preparation	Recovery
Flemish Region	DIWP			Royal Decree 2006: emergency planning & alarm phases; flood warning	Inclusion of flood damage in fire insurance 2005
	water assessment; signal areas; duty to inform; financial instruments	Sigma plan; dike elevations; watercourse maintenance	Sigma plan; rainwater regulations; awareness-raising on flood resilient building; flood control areas		
Walloon Region	water code; plan PLUIES				
	article 136 CWATUP; financial instruments	dike elevations; watercourse maintenance	awareness-raising on flood resilient building; flood control areas; financial instruments		

The principal legislation for water and flood risk management in Flanders is the 2003 Decree on Integrated Water Policy (DIWP), which forms the umbrella framework for the implementation of the Water Framework Directive (WFD) and the Floods Directive (FD). In Wallonia, the relevant rules are embedded into the 2004 Water Code and the (non-binding) 2003 Plan PLUIES. Also article 136 CWATUP is important as it contains the Walloon equivalent of the Flemish water assessment.[7] At the federal level, the 2006 Royal Decree on Emergency Planning and the 1992 Insurance Act are the primordial frameworks for respectively the Preparation and the Recovery Arrangement.
The tables below provide an overview of the principal instruments used at the different governmental levels.

Table 2: Principal FRM instruments/tools in Flanders (Water System Arrangement)

Instrument	Date	Explanation
Expropriation	1962 and 2003	Possibility for water managers to expropriate in the general interest.
Water assessment	2003 and 2006	Obligation for authorities to ask advice from the water manager on the impact of a permit, plan and programme on the water system. The advice is non-binding but authorities have to motivate when deviating from it in the final permit, plan or programme.
Duty to inform	2013	Obligation for property owners to state the property's flood vulnerability in real estate advertisements.

[7] The CWATUP will be replaced by a new "Territorial Development Code" (CoDT) on 1 January 2016. The new Code will, for example, simplify public participation procedures and procedures for the adoption of the Sectoral Plans are amended. The reference to art. 136 remains the same.

Signal areas	2014	Procedure to determine for every flood-prone area with a hard, yet undeveloped destination, whether a change in land destination or adaptive measures are necessary.
Re-parcelling with land swap	2014	Instrument of Decree on Land organisation with which the ownership and building destination of parcels in flood prone areas is exchanged with parcels not prone to flooding.

Table 3: Principal FRM instruments/tools in Wallonia (Water System Arrangement)

Instrument	Date	Explanation
Expropriation	1962 and 2004	Possibility for water managers to expropriate in the general interest.
Art. 136 CWATUP	1997	Possibility for authorities to ask non-binding advice from water managers on the impact of a building permit on the water system and subsequently refuse the permit or include conditions into it.
Flood risk maps	2007-2009	Supportive tool for local authorities to estimate the flood risks of a certain area.

Table 4: Principal instruments/tools of FRM at the federal level (Preparation & Recovery Arrangements)

Instrument	Date	Explanation
General and Specific Emergency Intervention Plans (EIPs and SEIPs)	2006	Plans should contain information on alarm phases, accommodation of the victims in case on evacuation, description of the risks, data of persons involved in the risks, *etc.*
Insurance with maximum tariffs not applicable to high risk zones	2007	Automatic inclusion of flood coverage in the fire insurance with maximum tariffs set by public Tariff Office that exclude high risk zones. Fall-back mechanism provided by the public disaster fund.

Implementation of the European Floods Directive

In both Regions, **the FD has been implemented in the same legal framework used for the implementation of the WFD**, namely, the Flemish DIWP and the Walloon Water Code. Prior to the implementation of the Directive, the DIWP addressed FRM already, *e.g.* through the water assessment, but the FD implementation has strengthened its instruments. The FD has had similar effects on Walloon legislation: measures existed prior to the FD but the implementation of the Directive into the Water Code resulted in a clearer legal basis for FRM. The requirement to promulgate flood risk management plans (FRMPs) has also induced the regions to further develop FRM policies and strategies.

Different FRGAs at national and local level

Whereas at the level of the regions, the strategies of prevention, defence and mitigation are integrated into one arrangement, this integration is less apparent at the local level. Consequently, in the cases studies (see chapters 3 and 4), the regional Water System Arrangement is split into **separate sub-arrangements on *urban water management* and on *river management***.

4. Explanation of stability and change

The Belgian FRGA is on the move in terms of actors, rules and discourses. The dynamics are primarily reflected in a changed relationship between the population and water, *e.g.* in creating more space for water. In addition, Belgium shows tendencies to regionalise aspects of FRM competences and to redistribute FRM responsibilities between water managers, other governmental bodies and citizens.

The most visible shift in water management is **the increased attention to creating space for water**, in contrast to the classical flood defence approach. Creating space for water frames into the pursuit of integrated water management, in this context meaning the coordinated and integrated manner in which quantitative and qualitative aspects of water policy are tackled. This discourse was legally institutionalised in 2003-2004 with the DIWP in Flanders and the Water Code and Plan PLUIES in Wallonia. In practice, the new approach has been widely applied since the start of the century with the instalment of flood control areas and river restoration projects. In Flanders, the dominant discourse of creating space for water has moved further towards a discourse on multi-layer water safety, which advocates attention for prevention, protection as well as preparation measures in FRM. The discourse brings along a higher importance of cost-efficiency and shared responsibilities in flood risk governance.

A new point of view emerged in the 1990s, which considered that flood management should be the **shared concern of water managers and spatial planners**, while in the past it was perceived to be the watercourse managers' responsibility exclusively. The emerging discourse was reinforced by the floods in 1998 and 2002-03, which demonstrated that floods could no longer be prevented by flood defence measures alone. With the DIWP, the Water Code and Plan PLUIES the discourse reached institutionalisation. In the meantime, the awareness of spatial planners for water concerns is said to have improved significantly. Formal cooperation between these two policy domains was established at the regional level with the Coordination Committee on Integrated Water Policy (CIW) in Flanders and the Interdepartmental Flood Group (GTI) in Wallonia.

Flood preparation and recovery have remained under the competence of the federal government. However, several initiatives were taken recently which reveal an increased interest of the regional governments in the Flood Preparation and Flood Recovery Arrangement, *e.g.* the Walloon and Flemish crisis centres, the regionalisation of the disaster fund, *etc.* These developments reflect the pursuit of integrated water management but also a general **tendency towards regionalisation**. The regionalisation of Belgian FRM[8] cannot be understood as a decentralisation process, as has been observed in the UK and France, but rather as a re-centralisation at regional level. Within the regions, a trend exists to upscale municipal FRM competences or strictly supervise them. The clearest example of this process can be found in Flanders, with the possibility of the transfer of 3rd category watercourses from the municipal to the provincial level in 2014, for which a large majority of municipalities have opted.

[8] The process of regionalisation is caused by a series of state reforms, which are exogenous to the FRGA.

Next to sharing flood risk responsibilities with different governmental actors (*i.e.*, spatial planners, emergency planners), a more recent discourse questions the exclusive role of the government in flood risk governance. Whereas this discourse remains rather latent among Walloon government officials, Flemish water managers openly express the opinion that citizens living in flood-prone areas share **co-responsibility** in protecting their property. It remains to be seen to what extent, and with which instruments, the government will pursue this new approach in practice. A first step in this direction is the duty to inform (2013) (see Table 2).

- **Factors of change**

Table 5: Exogenous and endogenous factors of change in Belgian FRG

Trend	Exogenous factors	Endogenous factors
Towards integrated flood management (in terms of objectives, responsibilities and coordination)	• Water Framework Directive • Floods Directive • International discourse of integrated water policy	• DIWP and Plan PLUIES in 2003 • Floods in 1998, 2002/03 and 2010 • General awareness-raising
Regionalisation of competences	• State reform	

With the introduction of the water assessment and the Coordination Committee on Integrated Water Policy, the **Decree on Integrated Water Policy** has formed a large step forwards towards integrated water management in Flanders (see Table 5). In Wallonia, the **Plan PLUIES** had a similar effect, with the development of flood cartography and the instalment of the Interdepartmental Flood Group (GTI). These pieces of legislation have by themselves been influenced by a number of other driving forces, most importantly the floods in 1998 and 2002/03 and European legislation.

Concerning **European legislation**, this research has shown that the WFD had the most important impact on Belgian FRG, despite its focus on water quality issues. The WFD forced the regions to rethink their water management structure in order to be able to implement the obligations imposed by it. In combination with increased flood awareness, caused by recent flood experience, the WFD became a powerful driver for integrated water and flood management. The FD has mainly impacted the FRGA through the introduction of the risk-based 3P-approach – Prevention, Protection and Preparation – which is today highly advocated in both regions. Also the compliance with the procedural requirements of the FD contributes to change the respective arrangements in Belgium, as measures for FRM are structured along the three phases of the FD.[9].

[9] Namely (i) the preliminary flood risk assessment, (ii) flood risk maps and flood hazard maps and (iii) flood risk management plans

Whereas the Directives constituted an important driver for the respective arrangements at the regional level, the **floods in 2010** functioned as an eye-opener for authorities at municipal level. Our case studies have shown that, until then, the water assessment and art. 136 CWATUP had not always been correctly and coherently applied. The flood event gave room to a discourse pleading for a more strict application of the already existing regulation.

- **Factors of stability**

Despite important changes that took place, a number of inertia is still impeding the further development of the FRGA. These are caused by path dependencies in terms of physical conditions, legislation and organisation. The most important bottlenecks are addressed below.

5. Evaluation of the Belgian FRGA and design principles

Evaluation of resilience, efficiency and legitimacy

A clear broadening of strategies can be observed both in the Flemish and the Walloon Region. The traditional flood defence approach has been replaced by a flood management mechanism that combines prevention, defence and mitigation measures. Important steps have also been made in flood preparation and recovery. These two latter strategies have, until now, developed separately from the strategies of prevention, mitigation and defence. Potentially, the trend of regionalisation might contribute toward the further alignment of flood risk management strategies. The fact that the disaster fund, namely the fund that operates as a compensation mechanism in case of floods, has been transferred from the federal level to the tri-region level, presents a further **opportunity for better alignment** between the prevention strategy and the recovery strategy.

In Flanders particularly, **innovative spatial planning tools were introduced** to increase the attention for water concerns in granting of permits, *etc.* These tools are well embedded in the legal framework. In Wallonia, a similar role was played by the development of flood cartography and art. 136 CWATUP. Compared to Flanders, however, these measures remain largely dependent on the willingness of local politicians and citizens for their implementation.

A bottleneck in both regions is the **lack of enforcement of FRM measures in the spatial planning domain**. The legal frameworks promulgating the FRM's instruments often fail to provide for solid follow-up and enforcement mechanisms to safeguard their effective implementation, both at the national and the case study levels. Our case studies have also shown that local authorities lack the resources necessary to control whether the imposed building conditions have been implemented in the field.

Despite recent important improvements, **spatial planning remains the Achilles' heel of the Belgian FRGA.** The fact that an ambitious policy is pursued today has come about through the need to compensate for ill-considered spatial planning choices made in the past. The water assessment, signal areas, flood risk zones, *etc.* help to limit, although not entirely avoid, further construction in flood prone areas but they do not change anything about the existing situation. Today, 220,000 people in Flanders are at risk of being impacted by flooding (CIW, 2014). Consequently, the FRGA will have to find a solution for its existing spatial planning problem as well.

A persistent bottleneck is the **FRGA's high fragmentation level**. The number of water managers involved in Flanders and Wallonia remains high, even though significant efforts have been made to reduce it. This situation threatens the FRGA's efficiency and resilience because different projects in the same water basin influence one another, watercourses are neglected or over-maintained, different monitoring systems are used, *etc.*

In both regions, steps have been made to improve the coordination between the different water managers but further integration could still be useful. Also between the two regions, coordination in the field of FRM remains very ad hoc.

Both regions have well-developed knowledge institutes on flood management, and there is an intense cooperation with universities in Wallonia particularly. However, the arrangement suffers from a problem of **fragmentation in terms of expertise**. Insufficient informational exchange takes place between the different knowledge institutions, which comprises a barrier to resilience and efficiency.

Traditionally, flood risk management in Belgium is regarded as being a governmental responsibility, both by governmental actors as well as by citizens. Within the Flemish government, however, a discourse is emerging which emphasises the necessity to share responsibilities concerning FRM with the population at large. If the government chooses to pursue this new approach, it will have to convince its citizens of this message as well. Otherwise, this **gap in the perception of responsibilities** might lead to a legitimacy crisis in the future.

The Flemish government has become an ardent user of cost-benefit analyses (CBA) in order to increase the efficiency of the FRGA, which is in keeping with its discourse on sharing responsibilities. By calculating the societally optimal resource allocation, they also intend to raise the legitimacy of the arrangement. However, at the same time, the use of CBA involves a very technocratic manner of decision-making. Among local authorities, complaints are heard that they have too little insight into the methods used in the calculations made. An **overly rigid use of CBA methods, therefore, might come at the expense of the arrangement's legitimacy**. Unlike Flanders, cost-benefit analyses have not been applied in Wallonia at present.

6. Good practices of Belgian flood risk governance

The most eye-catching good practices are the water assessment, signal areas and duty to inform in Flanders, the river contracts in Wallonia, the integrated water management approach in both regions and the insurance mechanism at federal level. What makes the Flemish water assessment more effective than its Dutch counterpart is its requirement to be applied not only in the planning phase, but also when granting permits. Although the assessment only prohibits construction in exceptional cases, it does foster adaptive building in floodplains. The river contracts in Wallonia are effective tools to increase coordination at basin level and to enhance community resilience. The integrated legal framework of quantitative and qualitative aspects of water management facilitates the pursuit of win-win situations. Finally, the inclusion of flood damage in the general fire insurance, whereby buildings constructed in flood prone areas after the date of 23 September 2008 are not

constrained by maximum insurance tariffs, offers promising opportunities for reinforcing the flood risk prevention strategy.

When defining good practices, one needs to keep in mind that the proper functioning of certain instruments is highly dependent upon their physical and institutional contexts. Both the water assessment and the signal areas are a response to the lack of attention paid to water issues in Belgian spatial planning in the past, while the river contracts aim to remedy the arrangement's high fragmentation level. The duty to inform, in turn, seems to be a more versatile tool, which could be easily applied in other countries.

7. Recommendations for Belgian flood risk governance

A first recommendation we can give is that expertise developed in the different FRGAs should be exchanged more between the regions. As has been explained above, both Flanders and Wallonia have developed useful practices, which could potentially improve the other region's flood risk governance as well, *e.g.* spatial planning instruments, river contracts, *etc.*
In addition, also within the regions knowledge exchange could be strengthened between different water managers, FRGAs, *etc.*

Secondly, we recommend policy-makers to create more opportunities for citizen input in the decision-making and delivery. Instead of restricting decision-making to a technocratic, top-down process, more attention should be paid to developments present at the non-governmental side of the arrangement, *e.g.* action groups of flood-affected citizens, river contracts, *etc.*

Interesting developments have recently taken place in the domain of spatial planning but the already existing spatial structure in law and practice forms a threat for a resilient FRG. We therefore prompt the regional governments to develop additional instruments and practices to deal with this bottleneck as well.

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1. Introduction

1.1 Introducing flood risk governance in Belgium

With its location at the North Sea and its low to middle-high relief, Belgium is a country vulnerable to floods. Throughout the 20th and 21st centuries, a number of significant flood events have taken place, of which the most disastrous ones occurred in 1953 and 1976. Particular to the Belgian situation is the fact that various aspects of flood risk management (FRM) belong to the competences of the respective regions, resulting in flood risk governance arrangements (FRGAs) operating independently from one another in the Flemish and Walloon Regions. The Belgian arrangement has shown itself to be very dynamic in the period investigated of 1995-2015. This report will demonstrate that this has resulted in an ambitious policy and discourse concerning flood risk management. On the other hand, flood risk governance in Belgium has several bottlenecks, the primary examples of which include the fragmentation of competences, the lack of enforcement in the field and the lack of flood awareness among the Belgian population. The chief lesson to be learned from an assessment of flood risk governance in Belgium is that the two Belgian regions face very similar challenges. Consequently, they can learn a lot from one another by sharing their best practices.

In the subsequent paragraphs, the research aims and questions set forth in the report will be explained, as well as the research methodology that has been used to steer our analysis.

1.2 Research aims and questions

This report is a deliverable of the EU 7th Framework project STAR-FLOOD (see www.starflood.eu for an outline of the project). STAR-FLOOD focuses on flood risk governance. The project investigates how current flood risk governance arrangements can be strengthened or redesigned to enhance societal resilience to flooding. To this end, the extent to which governance arrangements support or constrain the diversification of flood risk management strategies is assessed, as well as the extent to which such a diversification of strategies enhances societal resilience to flooding. Empirical research has been carried out in six European countries – England in the UK, Belgium, France, The Netherlands, Poland and Sweden – and in eighteen vulnerable regions in these countries. The project assesses flood risk governance from a combined public administration and legal perspective.

This report is deliverable D3.4 of the third Work Package of STAR-FLOOD. While the first Work Package provided an extended problem-analysis, related to flood risk governance in Europe, and the second Work Package focused on how flood risk governance in Europe should be researched, Work Package 3 reports the main results of the empirical research carried out. It does so through six country-specific reports, each of which identify the architecture of flood risk governance, analyse flood risk governance and evaluate current arrangements of governance in terms of *resilience, legitimacy* and *efficiency*. These findings have been supported by inter-disciplinary research conducted at the national and case study scales.

Box 1.1 below lists the research questions that are being addressed in this report. Similar research questions will be addressed in Work Package 4, but from a more comparative perspective.

Box 1.1: Research questions of the STAR-FLOOD project

National level research questions

1. How is the national flood policies and regulations system (NFPRD) structured? To what extent is there cohesion between sub-flood risk governance arrangements?
2. To what extent are the 5 flood risk management strategies distinguished within STAR-FLOOD (see below) embedded in the NFPR? Is there evidence to suggest efforts are being made to diversify flood risk management strategies and measures employed within these strategies?
3. In what ways are the national flood policies and regulations domains linked to other relevant policy domains? In what ways do these enable or constrain flood risk governance?
4. How has the NFPR changed over time? What explanatory factors account for periods of stability and/or change?
5. To what extent can the current NFPR be characterised as resilient, efficient and legitimate? How has this changed over time?

Case study research questions

6. To what extent do the governance arrangement(s) in selected case studies reflect those evident in the NFPR?
7. To what extent are the 5 FRMSs embedded in the governance arrangement(s) in selected case studies?
8. How have arrangements for flood risk governance evolved over time? What are the driving forces for stability and/or change? In what ways do these compare to those seen at the national scale?
9. To what extent can the governance arrangement(s) in selected case studies be characterised as resilient, efficient and legitimate?
10. To what extent do the governance arrangement(s) in the NFPR enable or constrain innovative initiatives in selected case studies?

1.3 Research approach and methods

1.3.1 The Policy Arrangements Approach

To analyse stability and change in Flood Risk Governance Arrangements, the STAR-FLOOD project draws on the Policy Arrangements Approach (PAA). Policy arrangements have been defined as "a temporary stabilisation of the content and organisation of a policy domain" (Van Tatenhove et al., 2000). The degree of stability or dynamics in these arrangements can be analysed by studying the development of these policy arrangements over time. The PAA claims to link up all relevant dimensions of a policy domain (actors, discourses, rules and resources) and hence enable a study of the policy arrangement as a whole to be carried out. The approach has been applied in previous studies of environmental policies, nature conservation and water management (Van Tatenhove et al., 2000; Arts et al. 2006; Wiering and Arts 2006). Two features make the approach particularly useful for analysing FRGAs. First, the approach combines and integrates different concepts within frameworks of policy analysis (*e.g.* policy network models, discourse analysis, the advocacy coalitions framework and regime theory in international relations) and includes both structure and agency—related elements of institutional analysis, thus choosing a more sociological approach (Giddens,

1984). Other approaches are less comprehensive in terms of the dimensions that are included. Second, the four dimensions of the PAA allow for the inclusion and integration of legal factors in the analysis.

Flood risk governance arrangements (FRGAs), as depicted in the figure below, can be defined as institutional constellations resulting from an interplay between actors and actor coalitions involved in all policy domains relevant to flood risk management — including water management, spatial planning and disaster management – their dominant discourses; formal and informal rules of the game; and the power and resource base of the actors involved (Hegger et al. 2013). FRGAs can be analysed at different levels, including local, regional, national and international.

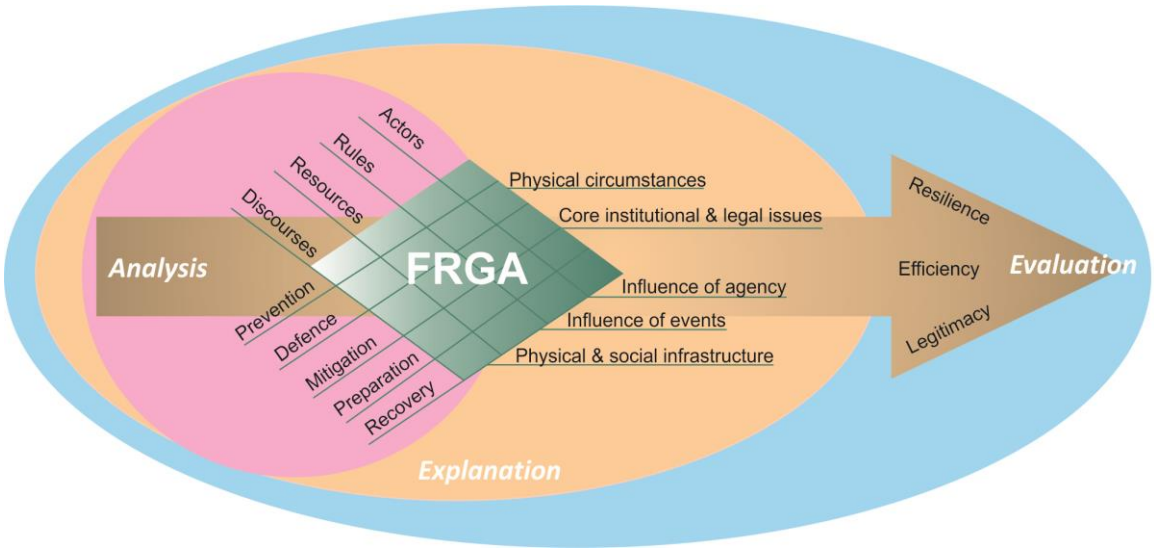

Figure 2: Analytical process of FRGAs

1.3.2 Flood risk management strategies

To help us identify FRGAs, the STAR-FLOOD project refers to the notion of flood risk management strategies (FRMSs), which are categorised as prevention, defence, mitigation, preparation, and recovery. A number of flood risk management measures can be grouped into these strategies. In this way, insights can be gained into the extent to which flood risk governance in Belgium utilises a variety of measures and strategies. This is important, not least because one of the starting assumptions of the project is that a diversification of strategies leads to more resilient FRGAs. Furthermore, once it has been established whether or not a diversified set of strategies and related measures are applied, the level of alignment between the five strategies can be identified and analysed.

Figure 3: overview of the five Flood Risk Management Strategies identified within STAR-FLOOD

1.3.3 Methodology

- **Data collection**

STAR-FLOOD is a coproduction between legal and policy scholars, which makes use of qualitative research methods. Our data collection has been constructed on three pillars: document analysis, interviews and workshops, held at both the national and case study levels. By conducting the data collection in tandem, each data source was approached from both the legal and policy-driven perspectives.

The first pillar, namely document analysis, involves analysing legislation (including preparatory works), doctrines and case law, which has a bearing on FRM at the appropriate scales; namely, the Walloon Region, Flemish Region, the federal level and their case studies, were investigated. Moreover, the document analysis comprised other documentation, such as soft law sources, guidelines, policy visions, circulars, *etc.* In the first case study of Antwerp the documents consulted were the actualised Sigma Plan 2005 and the Master Plan Antwerp Quays, extracts of municipal council discussions, relevant spatial plans, amongst others. For the case studies of Geraardsbergen and Lessines the documents consulted included decisions of the municipal councils of Geraardsbergen and Lessines, spatial plans, which have an impact upon, or which stem from, Geraardsbergen and Lessines, circulars concerning public participation with respect to Lessines, amongst others.

A wide range of stakeholders have acted as respondents for the second pillar, namely interviews, as indicated in annex 2. 70 interviews took place in total, of which 41 took place in the Flemish region, 26 took place in Wallonia, one in the Brussels-Capital region and two at the federal level. The interviewees comprised of public officials at the national and case study levels and a small number of non-governmental stakeholders. The respondents were selected based on a stakeholder analysis, mapping the most important actors of each arrangement at the national and case study levels.

The third pillar of the data collection is made up of the workshops organised we organized. In total three workshops were held: one at the national level and two workshops at the case study level (one for Antwerp and one for the case studies of Geraardsbergen and Lessines combined). The workshop for the case study of Antwerp was attended by eight officials from relevant administrative bodies. The participants were asked to conduct a Strengths Weaknesses Opportunities and Threats-analysis of the Antwerp flood risk management and to react to propositions based on the research conducted. 21 representatives from the organisations interviewed were represented at the workshop related to the case studies of Geraardsbergen and Lessines. Among the participants was an equal spread between Walloon and Flemish organisations, sub-arrangements and governmental echelons. Similar to the workshop in Antwerp, the first results of the case studies were presented and debated by the participants. Finally, one national workshop was organised, in which the focus was put on information dissemination. By presenting the STAR-FLOOD-results to the principal actors, this workshop also allowed to test these results and to identify possible gaps in the research results.

In terms of document analysis, sufficient access to relevant information was publicly available, with the exception of case law, as not all case law is made available through legal databases, and building

permits, which are also not publicly available for consultation. As for interviews, the stakeholders that have been interviewed generally are reliable representatives of the relevant organisations. Only by way of exception, certain stakeholders were not available for the requested interviews. In these cases, the interviews were conducted with their direct subordinates.

- ***Selection of case studies and base line year***

Three case studies, respectively Antwerp, Geraardsbergen and Lessines were selected because of several reasons (see Table 6).

- **Antwerp** is Flanders' biggest city and lies along Belgium's longest waterway, the Scheldt, which has been historically the cause of major flood disasters. At present, it has also been realised that the current protection measures might not be sufficient to protect the city from future floods. The proposed solutions are interesting for researching the potential of creating win-win solutions between flood defence and flood mitigation measures. The presence of the Scheldt also adds an additional international dimension to the Flood Risk Governance of the case.
- **Geraardsbergen** and **Lessines** are two small cities located along the same river, the Dender, but while the former is located in the Flemish Region the latter belongs to the Walloon Region. Consequently, they form interesting cases for comparison between the two regions and for evaluation of the implementation of the Flemish water assessment and the Walloon article 136 CWATUP. They also illustrate the importance of a good combination of urban mitigation measures, population warning systems and efficient flood recovery.

Table 6: Key characteristics of selected case studies and research motivation

	Case study 1: Antwerp	**Case study 2: Geraardsbergen**	**Case study 3: Lessines**
Region/county/province	Flemish Region	Flemish Region	Walloon Region
City population	512.000	32.830	18.448
River basin (including river length)	Scheldt (350 km)	Dender (51 km in Flanders)	Dender (18 km in Wallonia)
Types of flooding	Tidal, pluvial	Pluvial, fluvial	Pluvial, fluvial
Elevation	3-10 m TAW (0,67-7,67 m NAP)	17-110 m TAW (14,67-107,67 m NAP)	23 m TAW (20,67 m NAP)
Research motivation (reasons for including the case studies; what should they add to the analysis at national level)?	Scheldt estuary is most populated basin on Flemish territory, major floods 1953 and 1976, innovative policy approach	Cross-regional comparison with Lessines, vulnerability, lessons from spatial planning	Cross-regional comparison with Geraardsbergen, vulnerability, lessons from spatial planning

The year 1995 was chosen as a baseline year for this report, so that flood risk governance in Belgium for a period of 20 years could be studied. During this period of time, a number of important flood events took place and important legislative and policy related initiatives were taken, both at EU and national level. The analysis takes into account developments until 30th April 2015.

- ***Analysing stability and change and evaluating FRGAs***

The analysis of our research includes the following steps at the country and case study levels: (i) analysis of flood risk governance, including stability and change therein; (ii) explanations of the dynamics (both stability and change) found; and (iii) evaluations thereof:

- For the **analysis** of flood risk governance, the four dimensions of the flood risk governance arrangements approach (actors, discourses, rules, resources) have been used. Details on the operationalisation of the four dimensions and the indicators used can be found in Larrue et al. (2013).
- **Explanations** have been offered by looking into five types of explanatory factors (research question 4 and 8): (i) physical circumstances; (ii) physical and social infrastructure; (iii) structural factors; (iv) characteristics of agency and (v) shock events. We have borne in mind that these five factors may be found *within* but also *external* to flood-relevant policy domains (an example of the latter concerns *e.g.* major developments in political culture at the national level) and that each factor may also contribute both to stability and to change (see also: Larrue et al. 2013).
- **Evaluations** of flood risk governance have been made based on the following desired outcomes (research question 5 and 9): *societal resilience*, *efficiency* and *legitimacy*. The outcome of resilience has been used to address the question of whether and to what extent (i) the arrangement is resistant, meaning that it has the ability to prevent flood hazards from occurring (ii) the arrangement shows the ability to absorb and recover, which is exemplified by diversity of measures and institutions; and (iii) there is a proven capacity to learn, innovate and improve responses to flood risks. The outcome of resilience is linked to the other criteria in various different ways. The outcome of efficiency implies that the Belgian FRGA uses resources efficiently, in terms of both economic efficiency and resource efficiency. Most notably, effectiveness (*e.g.* of strategies, measures) in terms of problem solving and goal achievement is seen as being a necessary precondition for resilience and efficiency. Finally, legitimacy has been identified as a desired outcome, setting forth a range of criteria such as social equity, accountability, transparency, participation, *etc.* Several other relationships between the evaluation criteria have been conceptualised, both in terms of synergies and trade-offs.

1.4 Outline of the report

The outline of this report is as follows. Chapter 2 focuses on providing an understanding of the national flood policies and regulations domain (NFPR) in Belgium through the use of the flood risk governance arrangement (FRGA). This provides insights into the main features of the governance of flood risks at the country level. After elaborating on relevant context-related variables, a review is provided of current flood risk governance arrangement and the extent to which flood risk management strategies (FRMSs) have been embedded in this arrangement. To understand how and why governance has formed in this way, section 2.4 aims to provide explanations for the outlook of the current flood risk governance arrangement including the stability and change in the national

arrangement and relevant legal factors. In order to provide sufficient insight into these factors, a baseline year of 1995 has been selected, as this shortly follows the occurrence of heavy floods and this has allowed us to glean interesting insights in terms of how FRM has operated over a twenty-year span. Chapter 2 raises interesting questions to be taken up at case study level. Chapters 3 and 4 analyse, explain and evaluate developments in the case studies of Antwerp, Geraardsbergen and Lessines respectively. Geraardsbergen and Lessines are two self-standing and fully fletched case studies, but have both been included in chapter 4. Indeed, Geraardsbergen and Lessines are both situated along the Dender River, but whereas the former in situated in the Flemish Region, the latter is located in the Walloon Region. Including the analysis of how both municipalities have tackled flood risks in one chapter thus allows for an optimal comparison. Based on chapters 2-4, chapter 5 provides overarching explanations and chapter 6 provides overarching evaluations of the developments studied. Chapter 7 concludes this report by providing suggestions for strengthening and redesigning flood risk governance in Belgium.

2. Analysis of national flood risk governance

2.1 Introduction

This chapter focuses on providing an understanding of the national flood policies and regulations currently in effect in Belgium, so that insight into the main features of the governance of flood risks at the national level might be generated. After elaborating upon the relevant context-related variables (2.2), an overview is provided of the national flood risk governance and the main features of stability and change therein since 1995 (2.3). Explanations for this will be provided (2.4), followed by an evaluation at the national level (2.5). Section 2.6 concludes this chapter.

2.2 The context level

Belgium is a small country in the North-West of Europe, with a surface of 30.528 km² and a population of 11.150.516 inhabitants (Belgian Federal Government, 2013).

2.2.1 Physical circumstances

The Belgian territory is divided into two international river basins: the Scheldt and the Meuse (CIW 2011a), with the Scheldt mainly located in Flanders and the Meuse in Wallonia (see Figure 4).[10]

Figure 4: Belgian river basin districts. *(Source: ec.europa.eu)*

The Scheldt flows across an area that is mainly flat and heavily urbanised. The average population density in the basin is 352 inhabitants/km^2 (ISC, 2013). The river is an important infrastructure axe in Flanders: it links the Port of Antwerp to the North Sea and inland waterways. The Meuse flows through a more elevated, less populated and less industrialised region. The population density of the Walloon Meuse basin is 178 inh./km^2 and in the small Flemish part 257 inh./km^2 (ICBM, 2015). The Meuse serves an important function in providing the country's drinking water.

Rivers, such as the Meuse, Dender and Demer are typically rain-fed rivers: their flow discharges vary largely, depending on the amount of precipitation. As a consequence, floods in Belgium have mostly pluvial causes. The Scheldt on the other hand is a tidal river, which means flood risks can come from both up- and downstream. The Scheldt estuary has a large tidal amplitude, with a maximum range of 5,5 m.

[10] The Flemish Scheldt basin is separated into 11 catchments: Yser, Bruges Polder, Ghent Canals, Lys, Lower-Scheldt, Upper-Scheldt, Nete, Dender, Dyle, Demer and Senne. In the Walloon region, the river is divided into 5 sub-basins: Dendre, Dyle-Gette, Escaut-Lys, Haine and Senne (SPW 2013a). Apart from the Meuse East and North catchment in the Flemish Region, the Meuse is comprised of 8 sub-basins in the Southern part of the country: Amblève, Lesse, Lower-Meuse, Upper-Meuse, Ourthe, Sambre, Semois-Chiers and Vesdre (SPW 2013b).

Belgium has a moderate sea climate, with mild summers and wet winters (KMI 2013). On average, about 800 mm of rainfall per year is measured in Low- and Mid-Belgium and up to 1400 mm in High-Belgium. Precipitation measurements in Belgium show a cyclical pattern, with wet peak periods in 1910-1930, 1960s and 1990-2010 (Willems et. al 2010, see Figure 5).

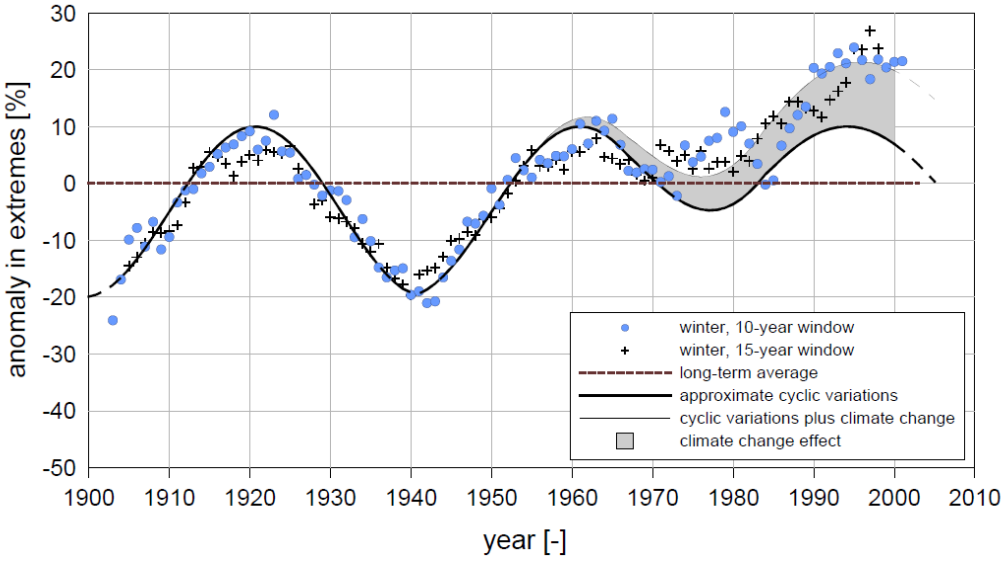

Figure 5: Rain Graph Belgium 1900-2010 *(Willems et.al., 2010).*

Concerning the impact of climate change, a report by the Flemish government predicts a primary increase of floods in tidal rivers and in summer due to heavy rainfall. Yet, dry periods and increased evapotranspiration are expected to decrease the water level of rivers by 20-70% by 2100 (Flemish Government 2012).

Whereas the exact impact of climate change is characterised by uncertainty, the role of urbanisation on flood risks is more clear-cut. 26% of Flanders' and Brussels' territory already consists of built-up area (Poelmans & Van Rompaey, 2009). By 2050, the percentage of built-up land is expected to rise higher to 30-50% of land use (Poelmans et al., 2010). Between 1976 and 2000, the urbanisation process caused an increase in surface runoff of 20% and a decrease in evapotranspiration and groundwater recharge. This distortion will only increase with future developments.

Flood risk management also has to take the rise of the sea level into account. The Flemish Climate Adaptation Plan expects a rise of 0.30 m in sea level by 2050 (Flemish Government, 2012).

2.2.2 General characteristics of the demographic and socio-cultural context

The majority of people live in the Flemish Region (see Table 7). The average household income is higher here than in the Walloon and Brussels-Capital Region.

Table 7: major demographic characteristics of Belgium, the Flemish Region, the Walloon Region and the Brussels-Capital Region: number of residents, households, population density/km² and average age, life expectancy, household income (Belgian Federal Government, 2013).

	#Residents 2009	#Households 2009	Population density/km² 2009	Average age 2011	Average life expectancy 2011	Average household income (€) 2009
Belgium	10.753.080	10.753.080	352	40,84	80,4	40.998
Flemish Region	6.208.877	6.208.877	459	41,24	81,2	42.596
Walloon Region	3.475.671	3.475.671	206	40,24	78,7	39.205
Brussels-Capital Region	1.068.532	1.068.532	6.621	37,48	80,6	38.060

2.2.3 Major socio-economic developments

The Belgian economy is concentrated primarily in the densely populated Flemish Region (see Figure 6), taking advantage of its dense transport network and port facilities.

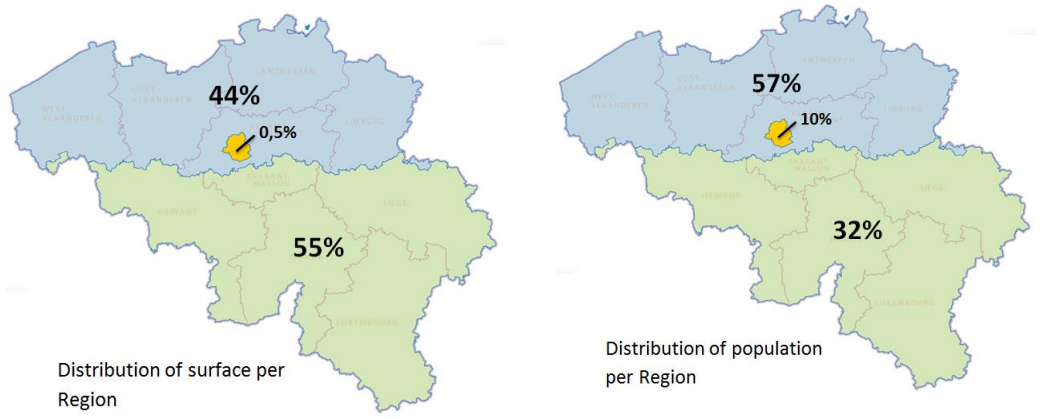

Figure 6: Distribution of surface and population per Region. *(Source: DG Statistics of Belgian Federal Government, 2013; www.eutrio.be).*

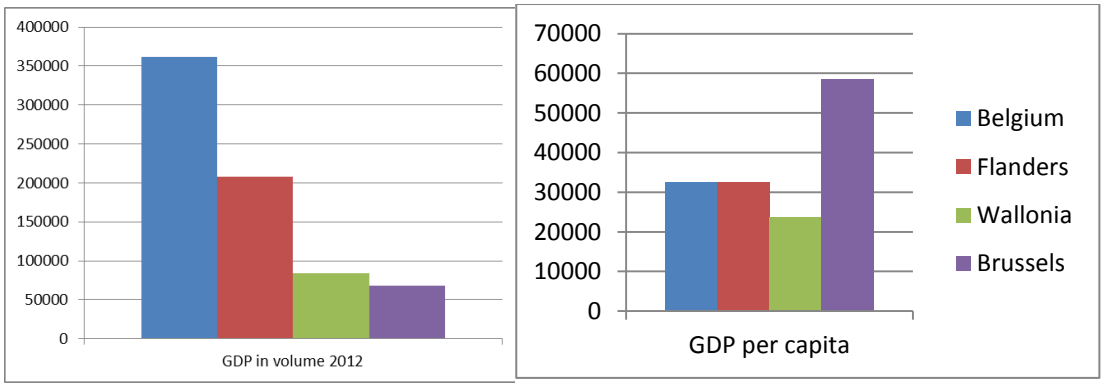

Figure 7: Regional spread of Gross Domestic Product. *(Source: IWEPS, 2014).*

Belgium's GDP per capita and tax level are among the highest of the STAR-FLOOD consortium members (see Figure 8).[11] The spread of income in the country is less equal than is the case in Sweden but is more than in the other STAR-FLOOD countries.

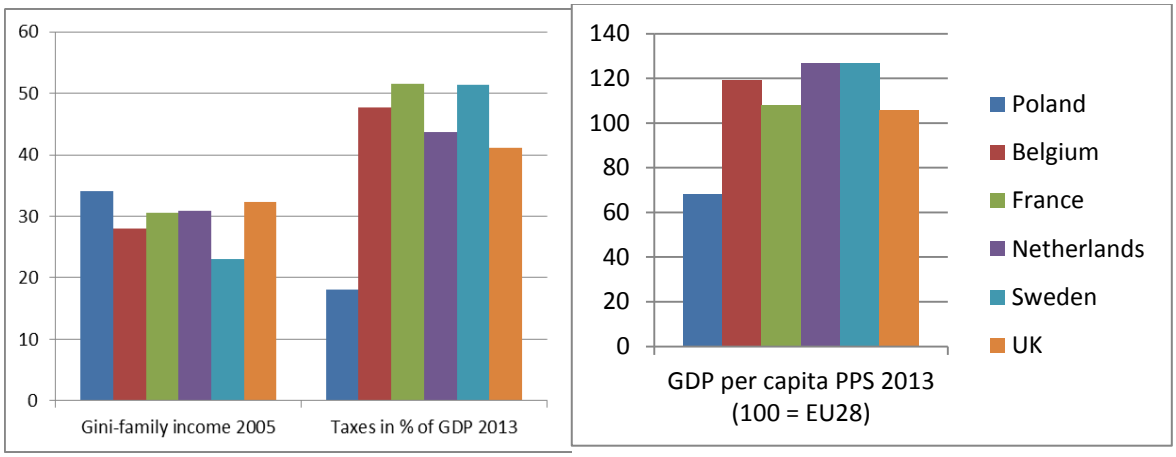

Figure 8: Economic characteristics of the STAR-FLOOD countries. *(Source: CIA World Factbook 2013 and Eurostat 2013)*

The Belgian economy was severely stricken in 2009 by the international financial crisis. A second, smaller depression followed in 2011. For 2014, growth rates of 1,7 and 1,8% were predicted (see Figure 9) (Hermreg, 2014).

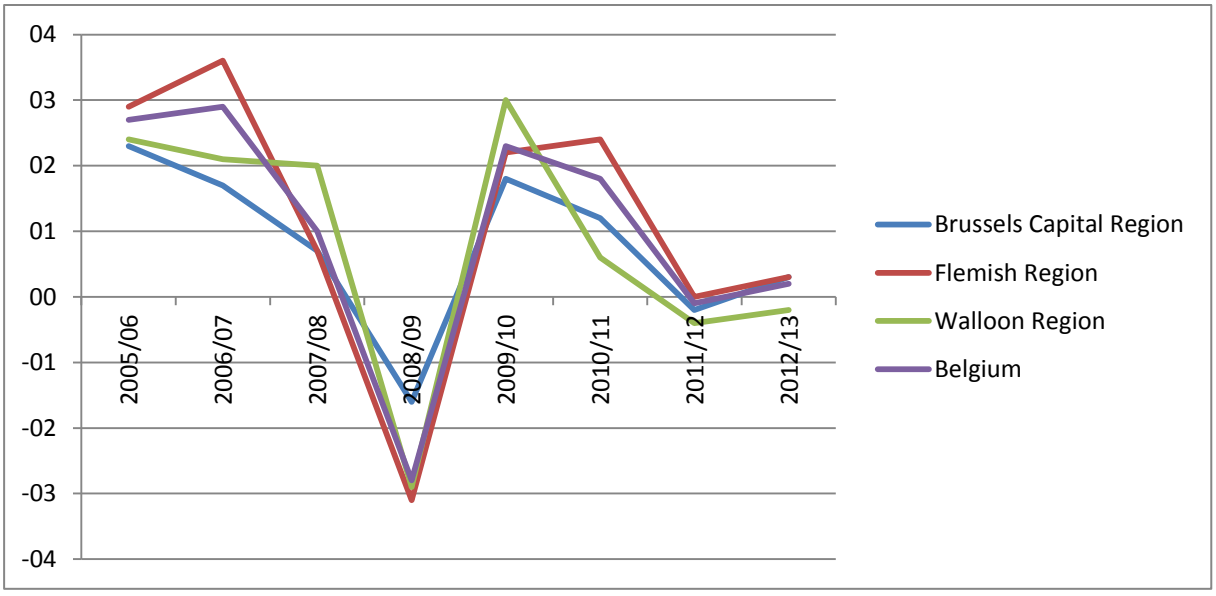

Figure 9: Yearly growth rate of GDP in volume. In percentage. *(Source: Hermreg, 2014)*

2.2.3 Administrative structure

Belgium is a federal State, composed of communities and regions (see Figure 10). The communities and regions are competent over different subject matters, although their territorial jurisdiction partly

[11] This figure includes personal and corporate income taxes, value added taxes, excise taxes, tariffs, social contributions - such as payments for social security and hospital insurance - grants, and net revenues from public enterprises (CIA, 2013).

overlaps. They only have assigned competences, which are laid down in Special Majority Acts. (Alen and Haljan, 2015).

- ***Federal level***

Although a lot of competences have been shifted to the federated entities, the federal level still remains competent in many cases, including coastal waters among others. These competences extend to the whole territory of the Belgian state.

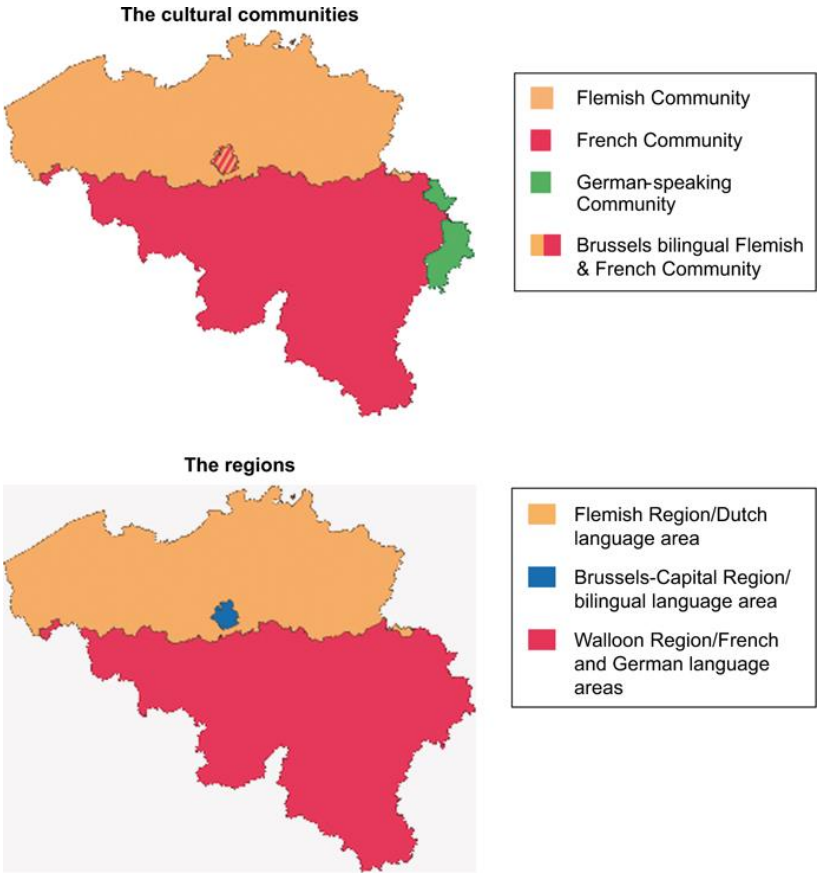

Figure 10: Belgian communities and regions. *(Source: en.wikipedia.org)*

- ***Regions and communities***

The communities (the Flemish, the French and the German-speaking Community) are federated entities, based on language. Their competences include cultural matters and the use of languages among others. The regions (The Flemish, the Walloon and the Brussels-Capital Region) are territorial entities, with a focus on economic issues. Their competences include water policy, spatial planning and protection of the environment among others.

In the legal hierarchy, the regions and communities take place at the same level as the federal level, thus above the lower levels of provinces and municipalities.

- ***Provinces and municipalities***

There are ten provinces in Belgium: five of them are located in the Flemish Region and five in the Walloon Region (see Figure 11). The territory of the Brussels-Capital Region does not belong to any province. In addition, Belgium is divided into 589 municipalities.

Figure 11: Overview of Belgian provinces *(Source: NGI Brussels, 2001).*

2.2.4 Political and administrative structure

- ***A consensus-based decision-making regime;***

The political system is characterised by a great number of parties in parliament, representative elections and broad government coalitions. As a result, Belgian decision-making follows an incremental path, with many veto-players involved.

- ***Rather pluralist, state-oriented decision making process in water management***

In the decision-making process for water-related decrees or regulations, the regional governments are obliged to consult advisory boards and councils that formally represent civil society groups. Within the councils, stakeholders are represented by umbrella organisations.

2.2.5 Legal context

- ***Civil law system***

The Belgian legal system has the written, codified law as its primary source of law. There is no system of legal precedents, except for the judgments of the Constitutional Court, which are binding upon all. Not all rules have the same status in Belgium. Lower-level rules should never conflict with higher-

level ones. The Constitution is the highest internal norm in Belgium. It governs the separation of powers and the way in which these powers are executed.

- ***Legal protection***

Courts and tribunals exercise the judiciary power in Belgium. Which court has jurisdiction to hear the case depends on several factors: the nature of the dispute, the capacities of the parties, *etc.* The highest court is the Court of Cassation. An appeal against decisions of administrative governments can also be filed with administrative courts.
The Constitutional Court watches over observance of the Constitution by the Belgian legislative authorities. It can declare laws, decrees and ordinances unconstitutional and consequently annul and suspend them.[12]

- ***Legal status of watercourses***
  - *Division between navigable, non-navigable and unclassified watercourses*

In Belgium, there is a division between navigable and non-navigable watercourses. Both the non-navigable and the navigable watercourses (including their banks) fall under the competence of the regions.

In accordance with case law of the Belgian Court of Cassation, 'navigability' presupposes that the watercourse can support ships or fleets, which is viewed as a matter of facts.[13] If a watercourse is not classified as 'navigable', then it is a 'non-navigable watercourse.' This last category of watercourses is managed by the Act of 28 December 1976 related to non-navigable waterways.

Furthermore, some small watercourses, namely those with a basin of less than 100 hectares, do not fall within the scope of the Act of 28 December 1976, and are considered unclassified watercourses. They are governed by other legislative instruments, such as the Civil Code, the provincial rules with regard to unclassified watercourses, *etc.*

  - *Governance of the watercourses*

Both the navigable and non-navigable watercourses are managed by different water managers. These actors will be further discussed in the section on the Water System Arrangements applicable in the Flemish (see 2.3.1. The Flemish Water System Arrangement) and Walloon Region (see 2.3.2 The Walloon Water System Arrangement). Concerning the non-navigable watercourses, it is important to notice that these are further divided into three categories of governance (see Table 8).

Table 8: Categories of non-navigable Watercourses.

Category	What?
First	Downstream from the point where their basin is at least 5.000 hectares
Second	Neither classified in the first, neither in the third category

[12] In terms of enforcement, as environmental matters pertain to the competences of the Regions, so does the enforcement thereof. The legislative frameworks in the three Regions place emphasis on the instrument of the administrative fine and other penalties with a pecuniary character.
[13] Court of Cassation, 19 December 1955 Pas. 1956, 382. See Filip Van Dievoet, de onbevaarbare waterlopen revisited, *CDPK* 2013, 137.

Finally, the management of the unclassified watercourses is in the hands of the owner of the adjacent bank.

- ***Legal principles in water legislation***

The Decree Integrated Water Policy takes up twelve principles[14] that should be taken into account when preparing, determining, executing and evaluating the integrated water policy. Several of these principles are of importance in the context of flood risk management, *e.g.* the principle that the water system is one of the ordering principles in spatial planning. This principle will have an effect on the licensing and planning in spatial planning by ensuring that the water system will be taken into account when developing an area.

2.2.6 Historical events and related responses

Table 9: Overview of historical events and related responses

Date	Event	Reponses
1926	Flood in Meuse basin	Large flood defence constructions in Meuse basin
1953	Large storm-surge in Scheldt basin	Only recovery, no structural measures
1976	Large storm-surge in Scheldt basin	Sigma Plan 1977
1993/95	Fluvial floods in Meuse basin	Ad-hoc flood defence measures
1995	**Baseline year of our research (see 0)**	
1998	Fluvial and pluvial floods in Scheldt basin	Discourse shift to 'space for water', start flood cartography in Flanders
2000	European Water Framework Directive	Decree on Integrated Water Policy (DIWP) in Flanders 2003 Decree 2004 creating the Water Code in Walloon Region
2002/03	Fluvial and pluvial floods in Scheldt and Meuse basin	Plan PLUIES 2003 → start flood cartography in Wallonia
2007	European Floods Directive	Decree September 2010 modifying the DIWP in Flanders Decree February 2010 modifying the Water Code in Walloon Region
2010	Fluvial floods in Scheldt basin	Flemish Parliamentary Commission on Flooding → action plan Flood related measures in Walloon Scheldt basin

[14] Stand-still principle, Prevention principle, Source principle, Precautionary principle, Polluter pays principle, Cost recovery principle, Recovery principle, Participation principle, Principle of high protection level, Principle that the water system is one of the ordering principles in spatial planning, Principle of evaluation ex ante.

2.3 Flood Risk Governance: analysing the arrangements

Because of its complex governmental structure, Belgian flood risk governance cannot be subsumed under one arrangement. Instead, five separate flood risk governance arrangements can be identified, of which three FRGAs are governed separately at the level of the Flemish, the Walloon and the Brussels-Capital Region (see Figure 12). The other two FRGAs belong primarily to the competence of the federal level.

- ***The first two analysed FRGAs*** are named the Flemish and the Walloon Water System Arrangement. The Brussels Water System Arrangement is not explained in this report. Due to its very specific characteristics, an analysis of this region would significantly complicate the comparison of the Belgian FRGA with other countries. The word ***'Water System Arrangement'*** indicates the arrangements' focus on the prevention of floods in built-up areas. This in contrast to other arrangements who stress the mitigation of damage created by floods. The Water System Arrangements are governed at the level of the regions, as opposed to being governed at the federal level. The Water System Arrangement mirrors the three flood risk management strategies of "prevention", "defence" and "mitigation". These three strategies are included in the same arrangement, due to the fact that these strategies share main policy-making actors and rules.
- ***The third analysed FRGA*** will be referred to as the **"Flood Preparation Arrangement"**, with regard to which the regionalisation is not as progressive as for the Water System Arrangement. Indeed, the Flood Preparation Arrangement is mainly governed at the federal level, and it will be analysed how the federal initiatives are reflected in the Flemish and the Walloon Region. It should be noted that there is a tendency towards regionalisation of crisis management in Belgium. Therefore, the regional approaches are also important. The Flood Preparation Arrangement mirrors the strategies of "preparedness and response".
- ***The fourth analysed FRGA*** will be referred to as the **"Flood Recovery Arrangement"**, and mainly focuses on insurance related issues. Analogue to the previous FRGA, the federal echelon is the main level of governance. However, important aspects of the Recovery Arrangement have recently been regionalised, i.e. the governance of the disaster fund. This evolution shall be subject to an in-depth review. The Recovery Arrangement fully encapsulates the strategy "recovery".

Although they all fit under the umbrella of the Belgian flood risk governance, the arrangements are not more than loosely coupled with one another. Each of them has their own actors, rules, discourses and resources.

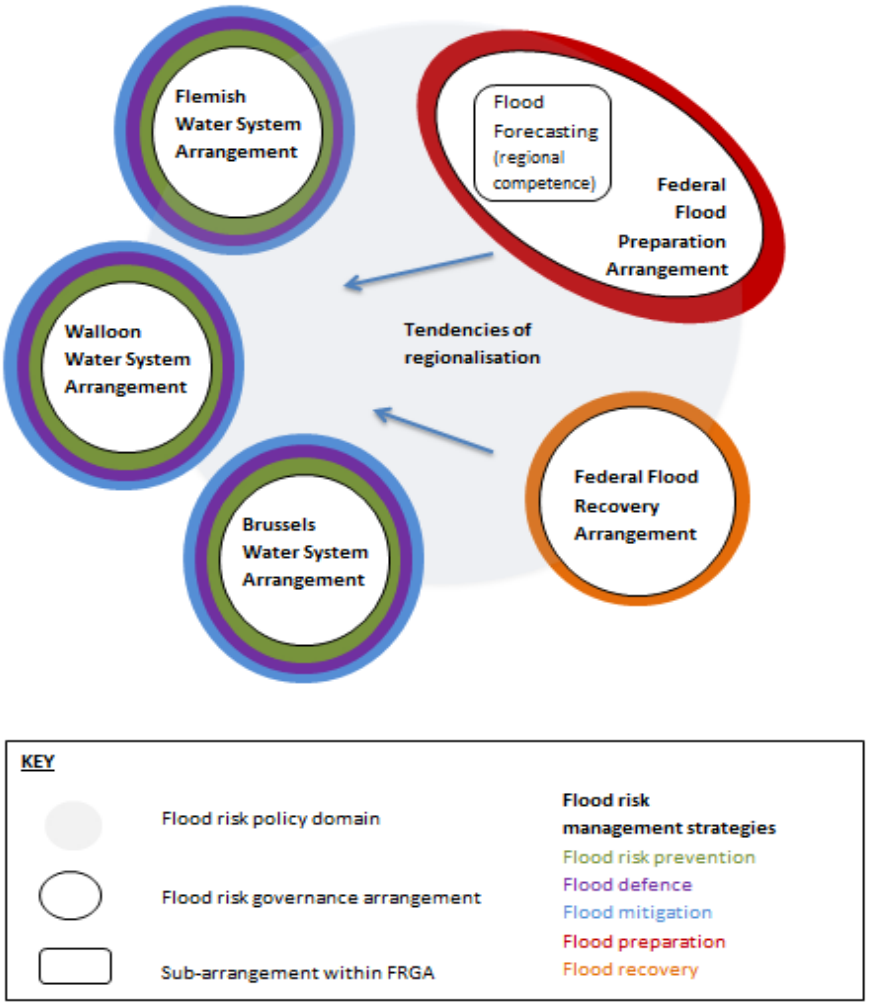

Figure 12: The five flood risk governance arrangements of Belgium

Before focussing more specifically upon each arrangement separately, a table with the different strategies and their most important tools and instruments has been provided below.

Table 10: Flood risk management strategies in Belgium: policy and legal instruments

	Prevention	Defence	Mitigation	Preparation	Recovery
Flemish Region	DIWP			Royal Decree 2006: emergency planning & alarm phases; flood warning	Inclusion of flood damage in fire insurance 2006
	water assessment; signal areas; duty to inform; financial instruments	Sigma plan; dike elevations; watercourse maintenance	Sigma plan; rainwater regulations; awareness-raising on flood resilient building; flood control areas		
Walloon	water code; plan PLUIES				

Region	article 136 CWATUP; financial instruments	dike elevations; watercourse maintenance	awareness-raising on flood resilient building; flood control areas; financial instruments		

2.3.1. The Flemish Water System Arrangement

An arrangement, as we conceptually operationalise it, is formed by a cohesive combination of actors, rules, resources and discourses. Hereafter, we characterise the arrangements by systematically describing the features of the actors, rules, resources and discourses dimensions of the arrangement.

A. Actors

The current Water System Arrangement in Flanders is characterised by a large number of governmental actors. Competences in water management and spatial planning are divided between the regional, provincial, municipal and sub-local level.

- ***Regional level***

Table 11: Governmental actors at Flemish level

	Actor
Navigable watercourses	Department of Mobility & Public Works ➔ Waterways and Sea Canal ➔ De Scheepvaart ➔ Agency of Maritime Services and Coast ➔ Maritime Access
Non-navigable watercourses 1st Category	Flemish Environment Agency
	Department Space Flanders
	Agency for Nature and Forests

Flood policy competences are mainly located at the Flemish level (see Table 11). Navigable watercourses belong to the responsibility of the Department of Mobility and Public Works (MOW). Their actual management is, however, executed by four separate governmental actors, namely Waterways & Sea Canal (W&Z), De Scheepvaart, the Agency of Maritime Services and Coast and Maritime Access[1]. The former two have been 'externalised' and thus operate with a high degree of autonomy vis-à-vis MOW. Besides management tasks, they also support policy-making by contributing expertise, relevant information and analytical results.

Non-navigable watercourses of 1st category are in hands of the Flemish Environment Agency (VMM).[15] Besides managing its own watercourses, the VMM is as well active in the development of the flood risk maps, preparation of the river basin plans, creation and propagation of new

[15] As an Internal Independent Agency, VMM is still part of the governmental structure but it operates with a high degree of independence.

instruments, *etc.* Its competences also extend to water quality related issues. Non-navigable watercourses of 2nd and 3rd category pertain to the responsibility of local actors (see below).

Next to the water managers, also other governmental actors play a role in flood risk management. The Department Space Flanders (RWO) is for instance responsible for the policy concerning spatial planning. The Agency for Nature and Forests is the competent authority for conserving natural habitats along Flemish rivers.

- ***Supra-local, local and sub-local level***

Table 12: Actors of the Flemish FRGA at supra-local, local and sub-local level

	Actor
Non-navigable watercourses 2nd (& 3rd) Category	Provinces
Non-navigable watercourses 3rd Category	Municipalities
Non-navigable watercourses 2nd & 3rd Category under their charge	Polders & Wateringues

In general, provinces are responsible for the management of watercourses of the 2nd category and municipalities for the 3rd category (see Table 12). Since 1 July 2014, however, municipalities have the possibility to transfer the management of their watercourses to the provinces. The majority of municipalities have decided to do so.
Provinces and municipalities also play an important role in spatial planning: municipalities (i.c. the College of Mayor and Aldermen) can deliver building permits (which one can appeal to with the provincial deputation), while the provinces must give advice for their watercourses in the context of the water assessment. Both actors can also draw spatial plans (in accordance with higher plans).

At locations where a polder or wateringue is still active, the management of 2nd and 3rd category watercourses is under their charge. During the investigated period, the amount of polders and wateringues has decreased from over 100 to 63 (VVPW, 2014).

- ***The Coordination Committee on Integrated Water Policy and Sub-Basin Boards***

In order to increase coordination within the highly fragmented actor structure, the DIWP established the Coordination Committee on Integrated Water Policy (CIW) in 2003. The CIW assembles representatives from all relevant organisations and departments, *e.g.* sub-basin boards, department Space Flanders, Waterways & Sea Canal, *etc.* Members of the CIW have a power benefit over actors who are excluded, since all water policy is deliberated in this forum. The CIW is now considered the principal actor for water policy-making in Flanders.

At sub-basin level, coordination between authorities involved in water management is provided by the sub-basin boards. These have been installed by the Flemish government in 2003 and have a legal basis in the DIWP.

- ***Civil society actors & citizens***

Citizen participation to flood risk management is rare in Flanders. Participation possibilities in decision-making are mostly limited to the official public enquiry and citizens hardly contribute to FRM delivery, *e.g.* flood-proof building, *etc.* More intensive cooperation exists with organised stakeholder groups. The Flemish Council for the Environment and Nature, the Social and Economic Council of Flanders and the Strategic Advisory Council on Spatial Planning are asked for advice in preparation of water-related decrees. These advices are non-binding but decisions deviating from them must be motivated. In addition, extensive deliberation can take place in specific projects, *e.g.* the Sigma Plan.

Civil actors active in FRM are, amongst others, the *Boerenbond* (Farmers' Union) and the organisations *Natuurpunt* (Nature point) and *Grenzeloze Schelde* (Scheldt without Borders).[16]

B. Rules

The Flemish legal framework regarding FRM has undergone substantial changes over the years. From a longitudinal perspective and legal point of view, three eras can be identified. Firstly, the pre-FD era, in which measures were already taken to tackle floods, but were not yet embedded into a coherent legislative package concerning FRM. The second era is marked by the implementation of the FD and the third by a substantial reform of the DIWP in July 2013.

The main legal framework for FRM in the Flemish Region is provided for by the Decree on Integrated Water Policy (DIWP) of 18 July 2003. It contains the bulk of relevant instruments. However, legislative instruments and frameworks arising from other sectors, particularly from spatial planning, also influence FRM.

The Decree on Integrated Water Policy

- ***The pre-FD era***

With its enactment in 2003, the DIWP consolidated several legal instruments for water management, which were previously scattered across various sectorial legal frameworks. In so doing, the Flemish legislator made an explicit choice for an integrated water management approach by implementing the whole WFD (and the FD thereafter) through this DIWP.[17] Changes regarding water quality management thus unequivocally trigger changes in water quantity management and vice versa.

The DIWP contains several instruments, which aid in the carrying out of FRM, *e.g.* expropriation[18], right of pre-emption and duty to buy. The most important and prominent instrument is the water assessment.[19] It is (perceived as being) a preventive instrument.[20] This assessment namely allows the

[16] Natuurpunt is the biggest nature conservation organisation with Flanders, regularly concluding cooperation agreements with water managers to create win-wins for flood protection. Grenzeloze Schelde is active in the whole Scheldt basin, and pleads for integrated water resources management.

[17] Integrated water management, in the sense of the DWIP, relates to the development, management and recovery of water systems in a coordinated and integrated way, with the goal of achieving the conditions necessary for the preservation of this system as such, while promoting multifunctional use, taken the needs of the current and future generations into account. Article 4 DIWP.

[18] Expropriation is the forced, definitive and complete transfer of a good (or rights in rem relating thereto) from a private owner to a government, for reasons of public utility, and provided a fair and prior compensation. (Dirix et al., 2010).

[19] Article 8 DIWP.

competent authority that decides upon a permit, plan or programme, *e.g.* a spatial implementation plan or a building permit, to take into account the impact thereof on the water system. As the figure below shows, a hierarchy of steps is followed when applying the water assessment.[21] In practice, this hierarchy makes that a building prohibition is only imposed in very limited cases.

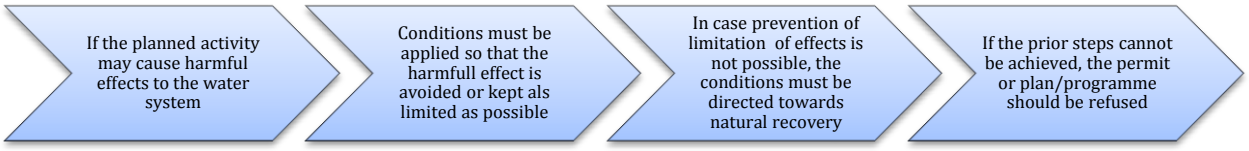

Figure 13: Water assessment: hierarchy of steps

In order to be fully informed about the possible effects on the water system, the competent authority must source advice from the water managers. The outcome of the water assessment is included as a 'water paragraph' into the permit, plan or programme.

- ***Implementation of the FD***

In 2010, the FD was implemented into the DIWP. The Flemish legislator opted to skip the first phase of preliminary flood risk assessment.[22] The second phase was executed in time.[23] The flood risk and flood hazard maps[24] can be consulted on www.waterinfo.be.[25] The draft flood risk management plans 2016-2021 have been published in July 2014 for public consultation. Following the integrated water managed approach, these Flemish FRMPs are integrated into the second generation of river basin management plans. The river basin management plans (thus including the flood risk management plans) conduct an analysis of flood risk, taken into account the historical context of floods in Flanders. In the RBMPs, the watercourses with a potentially significant flood risk are identified on the basis of a combination of analytical data provided by the disaster fund, information on cadastral buildings and modelled flood zones (RBMP Scheldt, 2014). Furthermore, in the plans, the methodology for the cartography is explained. This is important for *e.g.* the instrument of the water assessment.

The RBMPs hold the 3-step approach 'capture, drainage and storage' as the core of water quantity management in Flanders. They also refer to infiltration measures to maximally detain water at the

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[20] Explanatory Memorandum to the DIWP, Flemish Parliament, Session 2002-2003, nr. 1730. The water assessment mechanism is inspired by a similar instrument, the Nature Test, which is included in article 16 of the Decree Nature Preservation.
[21] In case prevention or limitation of effects is not possible and the harmful effects pertain to the infiltration of rainwater or the reduction of space for the water system, compensation in another area within the same basin or sub-basin must be applied.
[22] In accordance with art. 13 FD.
[23] As to flooding probabilities the DIWP has, in accordance with the Floods Directive, identified three categories with different flooding probabilities: (i) a limited chance of flooding or scenarios of extraordinary character, (ii) a moderate chance of floods and (iii) a big chance of flooding, if applicable. For the Flemish watercourses, i.e. both navigable and unnavigable, this approach coincides with floods with a recurrence period of respectively 10, 100 and 1000 years.
[24] These have been drawn before the expiration of the deadline indicated by the Floods Directive, i.e. 22 December 2013.
[25] There has been case law with regard to the concept of "floods", namely the question as from what point floods represent "grave disadvantage" to people in the sense of justification of a retraction of a building permit. In this particular case brought to the Council of State (*Council of State nr. 47.014, 25 April 1994*), the Council of State stated that the circumstance that the lower lying part of the park would occasionally, i.e. a couple of times a year, be flooded, does not constitute a great disadvantage to the Claimant.

source. The 3-step approach with a focus on detaining water at the source also forms the basis for the spatial planning Regulation on Rainwater of 2013 (see below).

- ***The reform of 2013***

Since 2003, the Flemish legislator has made conscious efforts to enhance the effectiveness of the DIWP. With an Order of 14 October 2011 the water assessment was simplified, both content-wise as in terms of formal aspects. The most important aspects of this reform were: (i) evolution towards obligatory advice sourcing, (ii) elaboration of the list of permits and plans subject to the water assessment, (iii) no application to works subject to notification requirement, and (iv) stricter motivation requirements in the water paragraph. The cartography for applying the water assessment was also updated. However, even after this modification, enforceability in the field and the lack of a comprehensive scheme concerning compensation remain important bottlenecks for the application of the water assessment.

The most substantial reform of the DIWP took place in 2013.[26] The main driver for reform was the urge to simplify the planning structures and cycles[27], which were namely very complex at the time, with four different planning levels and related plans: (i) the river basin management plans for the river basin district, (ii) the water policy note for the Flemish Region, (iii) the river catchment management plans for the sub-basin (11) and (iv) the sub-river catchment management plans for the sub-sub-basins (103). The procedures for the plans of each of these planning levels were not synchronised, resulting in efficiency losses throughout the process. The reform of 2013 integrated the planning cycles of the river basin and sub-basin level. At present, there are only two plans: one RBMP for the river Meuse and one RBMP for the river Scheldt, with sub-basin specific parts in each case. These sub-basin specific parts therefore replace the previously applicable river catchment management plans and the sub-river catchment management plans. This integration of plans leads to a simplification of public consultation procedures, as this now takes place simultaneously at the different scales.

The modification of 2013 also introduced a new instrument into the DIWP, the 'duty to inform'. Since citizens are often unaware that their building or parcel is located on a flood prone area, persons[28] who are selling their immobile goods or renting it out for a period exceeding nine years must now apprise their candidate buyers or tenants thereof.[29] The information regarding floods should be included in all authentic and private contracts, as well as in publicity related to the good. This instrument is considered to be a very positive step in the direction of the further integration of FRM and spatial planning. Actors in the Walloon Region have expressed interest into this instrument. It remains however to be seen whether a similar instrument will be developed there.

[26] *Belgian Official Journal* 1 October 2013.
[27] Resolution of 7 July 2011 of the Flemish Parliament, Flemish Parl. Nr. 1221 (2010-2011)
[28] More specifically, the following persons are subject to the duty to inform: (i) everyone who is selling an immobile good, (ii) anyone who is renting out an immobile good for a period exceeding nine years, (iii) anyone who brings in real estate into a company, (iv) anyone who transfers usufructs, leasehold, superficies. The real estate broker, the notary and the owner are subject to the duty to inform.
[29] Decree of 19 July 2013 modifying various provisions of the Decree of 18 July 2003 related to the Integrated Water Policy, *Belgian Official Journal*, 1 October 2013.

Other instruments for Flood Risk Management

The historical context of spatial planning plays an important role in the Flemish FRM. For a long time, there was less attention for water issues in spatial plans and building permits. This led to negative evolutions, which still have an impact today, in particular building in valley areas that lie in a flood-prone area.

Nowadays, spatial planning has become more attentive to FRM. At present, the most important spatial planning instrument in this context is the spatial planning regulation on rainwater, which is a clear illustration of the legal anchoring of the 3-step approach 'capturing – storing – draining'. It mandates that when building or rebuilding, one should take measures to ensure that rainwater is not immediately drained, but instead is (i) optimally used and (ii) the remaining part is infiltrated / buffered. The remaining limited amount of water should be slowly drained.

Another instrument, which is at the intersection of spatial planning and FRM, are the so-called signal areas. These are areas in which a contradiction can occur between the spatial development perspectives and the interests of the water system. It concerns, in particular, currently undeveloped plots with a hard destination (*e.g.* residential) in flood areas. The Flemish government hopes to avoid a substantial increase of potential risks by controlling the development of these areas. In this regard, a circular[30] was directed to the competent authorities to adapt plans and to grant permits. This circular of 28 June 2013 not only gives guidelines for the application of the water assessment in areas that have already been subject to a follow-up trajectory, but also provides for a possible "preservative" policy for those signal areas in flood prone areas for which the Flemish Government has not yet approved of a follow-up trajectory (wherein there is a chance that it might be necessary to re-designate to a softer land use).

Finally, the Flemish Government has recently adopted three decrees, which might have an impact on the Flemish FRM in the future. Firstly, a new procedural decree that integrates the environmental permit and the building permit. This decree is expected to enter into force in 2016. From that point on, only one competent authority will take the decision to grant the (integrated) permit, and the permit will be of an indefinite duration. The period of decision-making is also made shorter. Secondly, the Decree on Complex Projects tries to accelerate and improve the process of realising complex investment and infrastructure projects by providing an integrated, optional procedure for projects that require both a change of spatial destination and one or multiple permits or authorisations. Finally, the Decree on Land Organisation aims to optimise the organisation and management of space in Flanders by integrating a large amount of (new and already existing) legal instruments for the practical realisation of plans and projects. These instruments can be used separately or in combination with instruments of other legislation *e.g.* the instruments mentioned in the DIWP.[31] In either case, their use can potentially be very important for FRM in Flanders. Re-parcelling under force of law with planning exchanges can for instance provide a solution for badly

[30] Omzendbrief LNE/2013/1. This Circular of 28 June 2013 applies to signal areas that (partially or fully) overlap with the flood prone areas designated in the context of the water assessment or with regard to which the Flemish Government has approved a follow-up trajectory.
[31] Article 1.1.4, §2 Decree on land organisation.

located (*e.g.* in a flood prone area) residential areas. The decree's added value lies in its integrated approach. Therefore, its application is most desirable and useful for complex projects in which several partners are involved and several goals are being pursued.[32]
Due to the recent nature of these decrees, their effect on the current Flemish Water System Arrangement cannot be evaluated.

C. Resources

Financial and human resources

Flood risk measures in the Water System Arrangement are funded by general tax income. The Flemish government's spending on water management takes the form of grants to VMM, W&Z and De Scheepvaart. The water managers are also allowed to collect additional resources, *e.g.* by Public-Private Partnerships, EU funds, *etc.*

Although they vary per water manager and location, investments have, in general, been constant. In contrast, a human resources deficiency has been mentioned at all governmental levels. This deficit is primarily felt by the sub-basin boards, of which most do not have the staff required to develop an effective deliberation structure. At the municipal level, a lack of personnel forms a barrier for enforcing legislation. With the start of the economic crisis in 2008, many administrations faced a recruitment stop, the impact of which is still felt today.

Following the pursuit of more efficient government spending, cost benefit analysis has become an important decision-making criterion. This is clearly illustrated by the development of the Sigma Plan and in the preparation of the FRMPs.

Also in the context of the spatial planning, financial considerations form an important factor. Spatial plans for instance may give rise to easements of public use and can include restrictions on property, including a building ban. To compensate this loss in value, plan damage compensations are awarded. The plan damage compensation is allowed when, on the base of an operational spatial implementation plan, a lot is no longer eligible for a permit to build or to parcel, while the day prior to the coming into force of the plan it was eligible for a permit to build or to parcel.[33] There are however strict conditions attached to this compensation and, compensation is not always due: *e.g.* in case of a delimitation of a riparian zone or a flood area in a spatial implementation plan, the owner/user of the immobile good must then choose between the plan damage compensation or the duty to buy/duty to compensate of article 17 DIWP.

Plan damage compensations are also important in the context of the signal areas, since the assessment of these areas might indicate that it is necessary to give certain parcels another destination. Keeping in mind the financial burden this can involve, the Flemish Government has reoriented the Rubicon-fund so it can be used to provide resources to municipalities and provinces

[32] Parl. St., Vlaams Parlement, 2013-2014, nr. 2361/1, p. 33.
[33] The plan damage compensation is due by the authority that made up the spatial implementation plan that causes the plan damage. The sum amounts to 80 % of the loss in value.

for compensating owners with parcels located in signal areas.[34] The Flemish Region namely reimburses the provinces and municipalities for 60 % of their issued payment of the plan damage compensation.[35] Yet also here, there are strict procedural requirements.[36]

Measures, such as plan damage compensations and expropriation, thus form a heavy financial burden for many authorities. This can be clearly illustrated by the fact that there is approximately 11.000 hectare not yet developed building parcels in effective flood prone areas in Flanders. At a land price of € 200/m^2, a budget of € 22 billion would be necessary to take the necessary measures (expropriation, plan damage compensations, *etc.*) (personal communication). Consequently, the financial burdens can be a restraining factor to take certain measures.

Expertise

Expertise is mainly generated within the government agencies themselves. A primary source of expertise is Flanders Hydraulics Research, which is a governmental scientific institute specialising in water dynamics. As well as their own expertise, governmental actors can also rely on experts from a variety of knowledge institutes outside of the government, such as universities and consultancy firms.

The expertise available within municipal administrations is limited compared with that of supra-local water managers. Local officials are, therefore, supported by the VMM, which organises information sessions and trainings on various topics.

Unique expertise is also offered by the sub-basin boards, which render a holistic view on the flood problems in their basin.

D. Discourses

The core of the official discourse is the 3-step approach 'capture, storage and drainage, which has been formalised through legislative tools, such as the Regulation on Rainwater. This means that water needs to be captured at its source primarily, redundant water needs to be stored and only in the final phase can it be slowly drained downstream.

Alongside this concept, two other terms are widely applied by water managers, namely space for water and integrated water management. The latter concerns both the link between water quality and water quantity, the combination of different flood strategies and the coordination between different water managers. Water managers must, thus, take a broader view into account.

In 2013, VMM introduced a new concept to pursue integrated flood management, namely multi-layer water safety (MLWS). The term has been adopted from the Netherlands but content-wise, it remains more loyal to the European FD than its Dutch counterpoint does (see Kaufmann et al., submitted). MLWS pleads for equal attention for flood prevention, protection and preparedness and for sharing responsibilities among actors active in these different domains. These include both

[34] See supra in the section of signal areas.
[35] See Order of the Flemish Government of 20 June 2014, Belgian Official Gazette 25 September 2014.
[36] *Ibid*.

governmental and non-governmental actors. With its adoption in the Second Water Policy Brief, MLWS has become part of the official discourse on FRM in Flanders. Not all actors, however, share the Flemish government's enthusiasm. Some water managers question the strong focus of the approach on cost-efficiency and the responsibility shift towards citizens. The population itself also does not seem to be ready to shoulder the responsibility for FRM. Among citizens, the belief that FRM is a government responsibility currently remains dominant (Tempels et al., submitted).

2.3.2 The Walloon Water System Arrangement

A. Actors

Table 13: Overview of principal actors of the Walloon Water System Arrangement

		Policy development	Implementation
Navigable watercourses		DGO2	DGO2
Non-navigable watercourses	1st category	DGO3	DGO3
	2nd category	DGO3 River Contracts	Provinces
	3rd category	DGO3 River Contracts	Municipalities Wateringues
Spatial Planning		DGO4 Municipalities & provinces	DGO2, DGO3 Provinces Municipalities

Water management in Wallonia, like the situation in the Flemish Region, is divided into different categories of watercourses and structured according to administrative boundaries rather than hydrological units (see Table 13). Within the Walloon government, 3 Operational General Directorates (DGOs) are involved in FRM. Navigable watercourses are managed by DGO2, which is also the DGO responsible for transport issues. Non-navigable watercourses 1st category are maintained by DGO3, the DGO for Agriculture and Environment. This DGO is also responsible for water quality management, flood risk maps and the river contracts. The final DGO involved is DGO4, the DGO for Spatial Planning and Energy. Non-navigable watercourses of 2nd category are managed by the provinces and those of the 3rd category by the municipalities. In areas where a wateringue is operative, the management of 2nd and 3rd category watercourses is under their charge.

River contracts have been created at basin level in order to coordinate this wide range of flood managers. The first river contracts were established in 1993, inspired by the French model. In 2008, the structure of the mechanism was reformed and a river contract was installed for each basin. These local negotiation platforms are composed of representatives from municipalities, provinces, regional administration (DGO2 and DGO3) and local non-governmental organisations.

The precise role of the river contract varies depending on the basin. To establish a river contract, its members have to agree on an action programme. In some cases, the river contract takes a very proactive role in flood management. In the Senne basin for instance, the river contract even carries out own actions in the field in cooperation with the local water managers. In most basins however, they concentrate on other water issues than flood risks, *e.g.* invasive species.

Besides the river contracts, in 2003 the Interdepartmental Flood Group (*Groupe Transversal Inondations*, GTI) was installed to improve the coordination in FRM at regional level. Principal task of this group is to coordinate the follow-up of the Plan PLUIES (see below) and of flood zone mapping. In addition, it serves the function of a forum or meeting place for actors from different governmental levels and policy domains to exchange ideas, to address specific bottlenecks and to reflect on the further development of flood policy. The GTI is comprised of representatives from regional and provincial administrations (spatial planning, environment, transport & infrastructure, agriculture, local authorities) and university experts.

Finally, DGO3 is obligated, on the basis of Circular 71, to organise information meetings for stakeholders and citizens for all types of water related projects. The new chapter 4 of the Water Code will extend the scope of this Circular and related requirements to all water managers of non-navigable watercourses, i.e. the provinces and the municipalities as well.

B. Rules

- **Plan PLUIES & SDER: Policy visions for Walloon FRM**

The most important document for FRM in the Walloon Region is the non-binding Plan PLUIES.[37] This global plan for Wallonia, adopted in 2003, integrates all dimensions of the regional policy concerning floods, thus ensuring coordination between the administrative departments concerned and coherence in the adopted measures. The plan puts forward five specific objectives of management and reduction of risks:

i. improving knowledge of flood risk,
ii. reducing and slowing down surface runoff of water in catchment areas,
iii. improving riverbeds and alluvial plains,
iv. reducing vulnerability in flooding areas and
v. improving crisis management of disasters.

These objectives have been translated into thirty concrete actions, such as the drawing up of charts of flood zones and the adaptation of a regional planning regulation. Most actions have are already been implemented or are currently in their preparation phase.

Besides the Plan PLUIES, the currently revised[38] policy document Strategic Spatial Plan for the Walloon Region (SDER)[39] forms an important initiative for Walloon FRM.[40] The revised SDER

[37] Global Plan for the Prevention and the Fight against Floods and their Effects on the Victims.
[38] In 2012, the Walloon Government initiated the process of revising the SDER. On 7 November 2013, the revised SDER was provisionally approved. The public participation procedure was held from 29 November 2013 until 13 January 2014.
See the non-technical resume of the revised SDER, available on the internet at: http://spw.wallonie.be/dgo4/sder/dwnld/SDER_RNTEvaluation_20131107.pdf, last accessed 2 June 2014.

maintains a focus on FRM, whereby the importance of spatial planning for FRM is recognised. Emphasis has been put on limiting the impermeability, leaving certain lands unoccupied so rivers can overflow and implementing suitable construction techniques, among other things. Furthermore, it is stated as a principle that spatial plans and permits must take natural risks, including flooding, into account. Maps indicating perimeters of natural risks and their vulnerability level must help form a basis on which spatial plans are established and permits are delivered. Priority must hereby go to preventive measures. Depending on the level of vulnerability, different types of concrete measures should be taken.

- **Legal framework for Walloon FRM**

The Water Code codifies the whole water regulation for the Walloon Region into one text. In this way, it adopts an integrated approach to water management, as both water quantity and water quality are included. Both the WFD as the FD have also been implemented into the Water Code. However, the concept of integrated water management has not been followed through for the flood risk management plans and the river basin management plans. Although their respective timelines have been tuned to one another, they are issued separately.

The content of the FRMP for the Walloon Region will be, once finally approved, included in the Plan PLUIES. The FRMPs for the Walloon Region have been issued for the Meuse, Scheldt, Rhine and Seine. In the FRMP, five of the six operational goals have been adopted from the Plan PLUIES. The sixth goal relates to decreasing the financial and social consequences for the citizens by ensuring the insurability of their properties. The FRMP has adopted the 3P approach – Prevention, Protection and Preparation –, but also adds the post-crisis dimension with respect to the recovery strategy.

In the future, these plans will be combined at the local level by the PARISs.[41] These PARISs are a new type of management plans, which strive for an integrated and sustainable development of water resources. To implement these PARISs, the Walloon watercourses were divided into 6000 sectors, wherein one main management objective will be appointed for each sector in the future: flood protection, nature conservation, fluvial transport or recreation. Because this is an extremely labour-intense activity, currently only one PARIS has been developed as a pilot project, namely for the Lesse sub-basin. The river contracts have, to their own surprise, not been consulted on the development of the PARISs.

The Water Code also provides for the instrument of expropriation of immobile goods where this is necessary in the context of FRM.[42] This instrument has been applied in the Walloon Region on several occasions. However, in contrast to the Flemish DIWP, the Water Code does not give a legal

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[39] The SDER has no regulatory value: it is a document with an indicant character. The competent authorities must in principle integrate the options of this plan into their plans and permits decisions. Though an authority can deviate from the SDER, provided a good justification.

[40] SDER stands for *Schéma de développement de l'espace régional*. The first SDER dates from 27 May 1999, and sets out eight objectives and thirty-two measures. With regard to flood risk management, the thematic fiche "natural risks and technologies" is the most relevant. SDER, Thematic Fiche 17 "Risque naturels et technologiques", Available on the Internet at: http://sder.wallonie.be/Dwnld/Fiches/Fiche%2017.pdf, last accessed on 2 June 2014.

[41] PARIS stands for *Programme d'Actions pour Rivières au sens large par une approche Integrée et Sectorisée* (Integrated and Sectorised Action Programme for Watercourses).

[42] Article D.53-11, § 1 Water Code.

basis to the provinces for expropriation.[43] Consequently, these provinces often find themselves restricted in their policies where implementing FRM on their territories is concerned, *e.g.* in the context of the construction of retention basins. Expropriation is still characterised by a long procedure, ranging from the negotiations on the price to the procedure before the Peace Court. In both regions, practices are applied to circumvent the cumbersome expropriation procedures. In the Walloon Region, the non-navigable water manager DG03 has developed a practice whereby the property is expropriated, but exploitation agreements are concluded with the landowners on the basis of which the latter may continue to carry out their activities under favourable conditions. In the Flemish Region, there is a practice whereby those parts of the property upon which the relevant infrastructure is being placed, are expropriated, and other parts are not, but are subject to a compensation mechanism, *e.g.* when floodplains are being activated.

Apart from the Water Code, the spatial planning Code (the CWATUP) sets forth provisions relevant to FRM. The most important one is article 136 CWATUP, upon whose basis actions, works and licenses related to immobile goods that are exposed to a natural risk, such as floods, may be prohibited or made subject to special conditions. The competent authority is not obligated to refuse the license. It can use its own discretion. Authorities granting a permit can seek the advice of the water managers in the context of this article. The advice they receive, however, is non-binding, which weakens the case for a municipality that wishes to base its refusal of a permit thereupon. In comparison to the Flemish water assessment, article 136 CWATUP is less institutionalised and less structurally set forth. The provision does *e.g.* not relay the details on the threshold for advice and which elements it should include. It can, however, be expected that this article will be further developed in the future.

An instrument closely related to article 136 CWATUP is the Circular Foret.[44] This Circular of 9 January 2003 encourages the municipalities to set up a precise cartographical inventory of flooded zones. The Circular also sets out guidelines for issuing permits, for instance obtaining the prior positive advice of the water manager.

- **Cartography**

Cartography plays a central role in the Walloon Water System Arrangement. The original SDER already stipulated the objective that flood areas and areas susceptible to flooding will be delineated.[45] Within the perimeters of the risk areas, restrictive provisions must be taken, whereby only actions and public works to limit the dangers due to these risks are allowed. A regional planning regulation should set the applicable rules for risk areas that have been already urbanised. However, to this day, this planning regulation has not yet been approved. Maps indicating perimeters of natural risks and their vulnerability level are also along the proposed measures in the revised SDER (see above).

[43] Interview with actors of the Province Brabant Wallon, 3 September 2014.
[44] Circulaire relative à la délivrance de permis dans les zones exposées à des inondations et à la lutte contre l'imperméabilisation des espaces, Belgian Official Journal 4 March 2003.
[45] One of the criteria for the delineation of such zones shall be to take into account floods with a recurrence period of 25 years. SDER, Thematic Fiche 17 "Risque naturels et technologiques", Available on the Internet at: http://sder.wallonie.be/Dwnld/Fiches/Fiche%2017.pdf, last accessed on 2 June 2014, 1.

The plan PLUIES, in its turn, contained the action to draw up cartography of flood zones. This course of action has resulted in two maps: the 'map of dangers related to river floods', which was adopted in 2007 and the 'partial map of the risk of damages due to river floods', which was adopted in 2009. These maps cover the entire territory of the Walloon Region.[46] One of the merits of the map of risks related to river floods is that it can be used as an instrument in the context of article 136 CWATUP. Moreover, the flood risk zones indicated by this cartography correspond to the risk areas within the meaning laid out in the Act on the Land Insurance Contracts, on the basis of which insurers may refuse to provide coverage to those buildings located in a flood risk area.[47] The draft FRMPs refer to the cartography, which is explained below.

The transposition of the Floods Directive formed a new important step for the development of cartography in the Walloon Region. Since the relevant information already existed, the preliminary flood risk assessment has not been carried out for the Walloon territory (a situation similar to the one existing in the Flemish Region).[48] The totality of the Walloon territory is considered to be subject to a potentially grave flood risk, which is also explicitly confirmed in the Water Code.[49]

The second phase of the FD has been carried out in time. The Walloon Region namely adopted a final set of cartography on 19 December 2013.[50] This cartography was published on the 'Géoportail de la Wallonie'.[51] There are now three types of maps in the Walloon Region. In accordance with the FD, flood hazard maps and flood risk maps have been developed. The flood hazard maps show the flood zones and the concentration axes runoff for four scenarios (return period of (1) 25 years, (2) 50 years, (3) 100 years and (4) extreme circumstances). The flood risk maps have been drawn up by cross referencing the map of flood prone areas (for each scenario) with a package of geographical data related to, amongst others, economic activities, population and protected areas.
In addition to the above, the flood dangers map, drawn up in 2007 as part of the plan PLUIES (see above), was updated in 2013. It gives in one map a summary of the four scenarios of the flood areas.

By 22 December 2015 at the latest will the Walloon Government establish flood risk management plans (FRMPs).[52] The public inquiry for the FRMPs, together with the RBMPs, is currently ongoing.

C. Resources

Financial and human resources

[46] Geoportal Wallonie, Technical note Aléa d'inondation, zones inondables, risques d'inondation, méthodologie de la cartographie, 15 October 2013, Available on the Internet: http://geoportail.wallonie.be/files/docs/Inondations/AleaEtZi_2013/Note_methodo_carto20131015_Final.pdf, 7, last accessed on 17 February 2014.
[47] *Belgian Official Journal*, 20 August 1992.
[48] Interview civil servant Department non-navigable watercourses Walloon Region.
[49] Geoportal Wallonie, Technical note Aléa d'inondation, zones inondables, risques d'inondation, méthodologie de la cartographie, 15 October 2013, Available on the Internet: http://geoportail.wallonie.be/files/docs/Inondations/AleaEtZi_2013/Note_methodo_carto20131015_Final.pdf, 7, last accessed on 17 February 2014. ; Article D.53-1 Water Code.
[50] *Belgian Official Journal*, 9 January 2014.
[51] The website can be accessed through the following link: http://geoportail.wallonie.be, last accessed 28 February 2014.
[52] Article D.53-3 and article D.53-6, §5, 2nd section Water Code.

Similar to the Flemish Region, flood risk measures in the Walloon Water System Arrangement are funded by general tax income. Several water managers claim that their financial resources are insufficient. This deficit is primarily felt in terms of personnel: in many organisations departing staff members have not been replaced. Some water managers also claim to have insufficient resources concerning investments, which forces them to work on a reactive basis solely. Most water managers, however, point out that recent flood events (*e.g.* 2010 and 2014 in Ittre) have helped them to receive additional funding. These budgets are reallocated from other departments, or, in some cases, by a new prioritisation within the investment programme.

The conclusion, made in the context of the Flemish Water System Arrangement (see above), that measures in the context of flood risk management – for instance exploitation agreements with landowners – (can) form a financial burden for authorities, equally applies to the Walloon Water System Arrangement. Consequently, financial considerations may be a restraining factor in this context as well.

While cost-benefit analysis is popular among Flemish water managers, this instrument is rarely applied in Wallonia.

Expertise and competences

While Flemish water managers primarily generate knowledge through their own research institutes, Walloon managers tend instead to cooperate with universities and knowledge is often produced from the bottom-up (*e.g.* by provincial water managers). As a result, expertise on flood management is even more fragmented than is the case in Flanders. The Interdepartmental Flood Group aims to act as a platform for information exchange but this exchange remains suboptimal.

The participation in Interreg- and Life-projects, *e.g.* AMICE or AQUADRA, is important for the acquisition of expertise, but also for additional budget.[53]

D. Discourses

The official discourse of the Walloon government pays much attention to the 3Ps. Focus is put on the preparedness-strategy, among other things, which is remarkable since the Walloon Region does not possess formal competences in this domain.

Most non-navigable water managers apply a discourse of natural flood management, with attention being paid to dual-benefits for water quality and biodiversity. However, water managers who operate in more densely populated areas consider the potential of this approach to be limited.

Various actors, at different governmental levels, use a stringent discourse of spatial planning. Compared to Flanders, where the justification of such measures seems to be a bigger concern, there is more support in Wallonia for a strict building cessation in flood-risk zones.

[53] AMICE stands for Adaptation of the Meuse to the Impacts of Climate Evolutions and was carried out between 2009 and 2012 by governments and research centres from France, Belgium and Wallonia. Those same countries were involved in the AQUADRA-project (2009-2013), which aimed to generate win-wins for water quality and quantity through natural flood protection.

While in Flanders the transferring of competence of 3rd category watercourses to the provinces is generally perceived as being beneficial, no similar consensus exists among Walloon actors. Several respondents do not believe a transfer would improve the effectiveness of management since the supra-local water managers might lack an overview of the local bottlenecks or might be less willing to invest in them. In general, concerns about actor fragmentation are less frequently articulated than in Flanders. Some respondents indicate, however, that coordination could be optimised.

Also the Walloon managers consider FRM to be a shared responsibility between the government and citizens, even though it is less clearly pronounced than in Flanders. A first action in this direction is the issuing of an information brochure on individual protection measures, published by DGO4.

2.3.3. The Flood Preparation Arrangement

A. Actors

Emergency planning and crisis management is a shared responsibility of the federal government, the federal services of the provincial governor and the municipalities. Officially, regional governments take no part in emergency planning. However, other authorities rely on them for flood forecast information and their hydrological expertise.

Crisis management and emergency planning

The Federal Minister of the Interior plays a crucial role in civil protection: he is responsible for developing a crisis policy and for the general regulation and support of crisis management. The most important actions and developments however take place at the lower governmental levels. The ministry provides guidelines and a number of obligations to which the local authorities must conform. Within this framework, these authorities are, however, free to create an emergency planning fit to the local situation.

At present, crisis response in Belgium is divided into three phases: a municipal, provincial and federal phase. Several elements (i.a. the nature of the emergency, the need of coordination, the means to deploy, *etc.*) determine which phase is proclaimed. Generally, crisis response starts at the municipal level and is then uplifted to the provincial or federal phase if necessary. The order does not need to be followed chronologically. Where necessary, a disaster can immediately be upgraded to a higher level.[54]

- ***Municipal phase***

The municipal phase is applicable when the adverse effects of the emergency situation or the threat of such is limited to the territory of the municipality concerned. An additional condition is that the management of the emergency situation can be handled with the existing resources and

[54] The decision to proclaim a phase is a policy decision that falls to the mayor, the governor or the minister. It cannot be delegated. The authority competent for the proclamation of a phase also decides over its lifting. The management of the emergency situation does not necessarily end with the closing of the acute control of it. The competent authority must make sure that the victims are being helped further by referring them to more adequate forms of help, *e.g.* the intervention of the disaster fund.; Ministerial Circular of 26 October 2006.

reinforcements of the municipality or with those that other services and organisms normally make available.[55] Table 14 lists up the principal actors of this phase.

[55] Article 7, 1° of the Royal Decree of 16 February 2006.; Ministerial Circular of 26 October 2006.

Table 14: Principal actors in a municipal emergency phase

Municipal Phase			
Plan	Competent authority	Assisted by	Tasks
Municipal Emergency and Intervention Plan	Mayor: Responsible for municipal emergency plans	Municipal emergency planning official	Drafting the municipal EIP, keeping contact list for emergencies up to date, …
		Safety Cell: mayor, representative from every discipline and official responsible for emergency planning	Assisting in the development, update and distribution of the emergency and intervention plans, organizing exercises to test and evaluate the emergency plans, …
		Municipal Coordination Committee: mayor, representative from every discipline and official for emergency planning	Assisting the mayor during an emergency situation in the municipal phase

- ***Provincial phase***

The governor can proclaim the provincial phase in two cases: Firstly, when the magnitude of the emergency situation requires the management of the governor (*e.g.* due to the complexity of the emergency situation or the number of victims), and secondly when the direct consequences of the emergency situation affect more than one municipality.[56] The principal actors of this phase are presented in Table 15.

The involvement of the provincial level not always requires a provincial phase. Often, the emergency planning department of the governor offers its services for coordination to one or more concerned mayors without officially upscaling the crisis management. With the 'provincial support', the official lead remains in hands of the mayor, but he can make use of the expertise and resources of the provincial level.

[56] Article 7, 2° of the Royal Decree of 16 February 2006.; Ministerial Circular of 26 October 2006.

Table 15: Principal actors in a provincial emergency phase

Provincial Phase			
Plan	Competent authority	Assisted by	Tasks
Provincial Emergency and Intervention Plan	Governor: Responsible for provincial emergency planning Offers support during municipal phase[57]	Department of Emergency Planning	Supporting the governor, assisting municipalities in the development of their emergency planning (*e.g.* training sessions), …
		Safety Cell: governor, representative from every discipline and official responsible for emergency planning	Assisting in the development, update and distribution of the EIP's, organizing exercises to test and evaluate the emergency plans, …
		Provincial Coordination Committee: governor, representative from every discipline, official for emergency planning and the mayors of the municipalities involved	Assisting the governor during an emergency situation in the provincial phase

- ***Federal phase***

The federal phase concerns an emergency situation in the sense of article 4.1 of the Royal Decree of 31 January 2003, in other words whenever the emergency situation has one of the features that require the applications of the 'national emergency plan' (see B. Rules). The management and the proclamation of this federal phase is carried out by the Minister of the Interior (see **Error! Reference ource not found.** Table 16).[58] Also here, an upscaling can be avoided by offering 'federal support' to governors or mayors. Throughout the period of our investigation, the federal phase has not been proclaimed in case of flooding even once.

[57] The Governor must also help municipalities in the development of their emergency planning and approve the municipal emergency plans.
[58] Article 7, 3° of the Royal Decree of 16 February 2006.; Ministerial Circular of 26 October 2006.

Table 16: Principal actors in a federal emergency phase

Federal Phase			
Plan	Competent authority	Assisted by	Tasks
National Emergency Plan	Minister of the Interior: Coordination and organisation of the means and measures that are necessary for the whole territory	Government Coordination and Crisis Centre	Developing national emergency plans[59] Responsible for alarming and coordination in national emergency cases

- **Crisis management and emergency planning in the field**

In the field, emergency planning is organised among five disciplines (see Table 17). Each discipline has to draw up a mono-disciplinary intervention plan (MIP), which can contain specific provisions regarding floods.

Currently, the fire brigade is under reform. Since 1 January 2015, it is no longer organised by municipal boundaries but by the supra-local assistance zones.

Table 17: The five disciplines of emergency planning

Discipline	**Actor**	**Tasks in case of floods, among others:**
D1: Relief workers	Fire brigade	Strengthening an embankment, bringing people into safety, …
D2: Medical Relief	Services urgent medical aid Services in MIP	Taking care of the victims and organising their transport, …
D3: Police	Local / Federal Police	Restoring and maintaining public order, traffic measures, evacuation of the population, …
D4: Logistics	Fire department Operational units of the civil services Army	Providing provisions and drinking water to relief workers and victims, supplying aid materials, …
D5: Information	Communication officials	Giving information (*e.g.* concerning Disaster Fund) to the population and the media both during as after a flood

The operational coordination at the scene of the emergency normally lies with the highest fire officer present. He is assisted by an operational command post, composed of, at least, the directors of each discipline involved.[60] The policy coordination of the necessary measures lie with the competent

[59] The Minister must also approve the provincial emergency plans.
[60] Article 15 and 16 of the Royal Decree of 16 February 2006.

authority: thus the mayor, the governor or the Minister of the Interior respectively.[61] The mayor/governor is assisted by a municipal/provincial coordination committee, which he chairs (see tables 15 and 16).[62]

- **Regional Crisis Centres**

To anticipate on the high amount of actors at the regional level, the Walloon Government decided in 2007 to establish a single point of contact for crisis managers. This Walloon Crisis Centre (CRC-W) is not a crisis manager as such, but it bundles the expertise and competences within the Walloon government administration in case of emergencies. It thus serves as a single point of contact for crisis managers to coordinate the Walloon actors involved. The CRC-W is not only active during crisis situations but also has responsibilities in emergency planning (SPW, 2014): *e.g.* it coordinates the development of flood damage maps and offers assistance for crisis evaluation, debriefing of population, *etc.*

A Flemish Crisis Centre (CCVO) was founded in 2011. Following the Walloon example, it was decided in 2014 that, in future, the CCVO should become the central contact point for crisis entities on the Flemish regional level. Yet, the exact scope of the CCVO remains unclear.

- **Flood warning, flood forecasting & hydrological expertise**

Two actors handle flood forecasting in Flanders: the Hydrological Information Centre (HIC) and the VMM. The main instrument of the HIC is the Hydra database, which collects real-time information of all navigable waterways in Flanders. The VMM, in turn, collects data for all non-navigable watercourses. The Flemish government has integrated the data of these two separate flood forecasting systems into one website (www.waterinfo.be), available for local authorities and citizens. This platform does not only give current information for navigable and non-navigable watercourses but also includes flood risk maps used for the water test and the duty to inform. Twice a day, a message is published on expected flood events over the next 48 hours. When a certain alarm level is reached, the warning system contacts water authorities and crisis managers with an automatic SMS-message. Local citizens are informed through the website, other media and by local authorities.

For tidal rivers and coasts, a separate storm alert system is operational. As is the case for other Flemish watercourses, the storm alert system sends an automatic SMS or telephone message to water authorities, local governments and crisis managers after which precautionary and surveillance measures are taken. A yearly brochure is also published, containing the procedures followed in case of storm predictions and a list of persons to be contacted (W&Z, 2013a).

In Wallonia, SETHY, the hydrological department of DGO2, has two complementary tools for flood prediction: Hydramax, which measures the discharge levels at the Meuse and its principal tributaries, and Hydroaxe, which predicts water levels and expected flood plains (Dal Cin et. al., 2005). Also non-navigable watercourses are equipped with measurement tools for flood prediction. (SPW, 2011). With the AQUACRUE software, DGO3 receives an hourly message from stations that exceed the

[61] Article 19 and 20 of the Royal Decree of 16 February 2006.
[62] Article 21, §1 of the Royal Decree of 16 February 2006.

alarm level. The data of both systems are automatically transmitted to SETHY and processed together, resulting in one integrated hydrological message (SPW, 2011). In case of a pre-alarm, the responsible water authorities and the National Crisis Centre are alerted. In the alarm phase, a message is sent to several actors, among which are the water authorities, the relief services and the federal and local authorities responsible for crisis management.
Infocrue.wallonie.be offers a similar tool as www.waterinfo.be, but it is less regularly updated and less user friendly than its Flemish counterpart.

- **Citizen involvement**

Although many crisis managers indicate a well-coordinated citizen involvement could form a valuable asset, the use of volunteers in crisis management is currently underdeveloped. With exception of the volunteers of the fire brigade and the Red Cross, Belgium does not have a tradition of community-involvement in crisis management. However, significant variations between municipalities are easily observable. Whereas in larger cities citizens rarely spontaneously present themselves as a volunteer in case of flooding, it is a more common practice in small municipalities.

B. Rules

Emergency planning

Civil protection, covered by the Law on civil protections of 31 December 1963, aims to assist people and to protect goods at all times in case of 'calamities, catastrophes and damages'.[63] However, the most important piece of legislation concerning emergency planning is the Royal Decree of 16 February 2006 (and related ministerial circulars). It draws a distinction between 3 different types of plans: multi-disciplinary emergency and intervention plans (EIP's), mono-disciplinary intervention plans and internal emergency plans (see Figure 14). These plans are put in practise whenever an (imminent) emergency situation emerges.

[63] Article 1 of the Law on civil protection.
Article 1 of the Royal Decree of 23 June 1971 on the organisation of the tasks of civil protection and the coordination of operations during calamitous events, catastrophes and damages.
"*Article 1. For the application of this Decree should be understood by:*
a) calamities: among others a cyclone, a hurricane, a tidal wave, an earthquake as well as ***a fairly heavy flooding*** *or a fairly severe water shortage, which affects a significant area;*
b) catastrophes: amongst others a railway accident, the crash of an aeroplane, ***a bursting of a dike****, as well as a coincidentally fairly severe contamination or defilement, which affects a significant area, and in general all accidents which cause or can cause the loss of many lives or significant material damage;*
c) damages: amongst others a fire, an explosion, a collapse, a subsidence or landslide, ***a break in a pipe or in a reservoir****, as well as a traffic accident that requires the use of special means.*" (own marking)

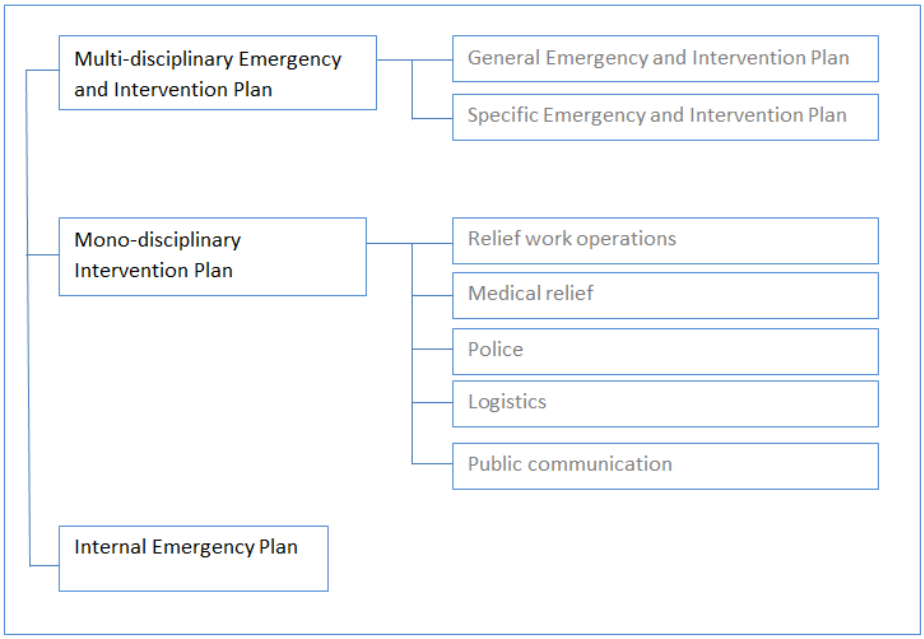

Figure 14: Overview of emergency and intervention plans

The most relevant plans to flood preparation are the EIP's, which are drawn up at the federal, provincial and municipal levels. They consist of a General Emergency and Intervention Plan (GEIP) and a Specific Emergency and Intervention Plan (SEIP). The GEIP contains the necessary information and general guidelines to ensure the management of an emergency situation: different alarm phases, procedures concerning alarming the population, accommodation of the victims in case of an evacuation, *etc.*[64] The SEIP supplements the GEIP with additional specific guidelines for particular risks, *e.g.* a SEIP on floods can contain geographical information.[65] There exists a federal SEIP 'Natural disaster – High water and floods', but this was never officially approved.[66] Some municipalities also have an SEIP on floods.

The mono-disciplinary intervention plan regulates the intervention options of one discipline (*e.g.* start up, division of tasks, commands, *etc.*). The internal emergency plan draws up adapted material and organisational emergency measures at the level of a company and/or institution.

- ***National Emergency Plan***

A national emergency plan was approved in 2003.[67] It follows the emergency planning structure of the Ministerial Circular of 11 July 1990[68] and is only put in practice[69] in very specific crisis situations: for instance when there is treat or presence of numerous casualties or when two or more provinces

[64] Article 26 of the Royal Decree of 16 February 2006.; Ministerial Circular of 26 October 2006 concerning the emergency and intervention plans.
[65] Article 3 of the Royal Decree of 16 February 2006.
[66] Coördinatiecommissie Integraal Waterbeleid, *Rapport Globale evaluatie overstromingen 2010 – bijlage 5*.
[67] Royal Decree of 31 January 2003 establishing the emergency plan for crisis events and –situations that require a coordination or management at national level, *BS* 21 February 2003.
[68] Circular of 11 July concerning the emergency plans – Implementation of the law of 21 January 1987 on the major-accident hazards of certain industrial activities. This Ministerial Circular has been replaced by the Ministerial Circular of 26 October 2006 concerning the emergency and intervention plans. The plan however is still applicable.
[69] Point 4.1 of the Annex of the Royal Decree of 31 January 2003.

or the entire national territory is involved or the means to be deployed exceed the means of a provincial governor.[70] In the period investigated, it has never been activated in case of flooding.

- **Flood risk maps**

The Floods Directive requires that every member state develops flood risk maps, which show the number of potentially affected inhabitants, types of economic activity, installations which might cause pollution in case of flooding, *etc.* (see Figure 15). These maps can be used as a tool for fast and accurate crisis response.

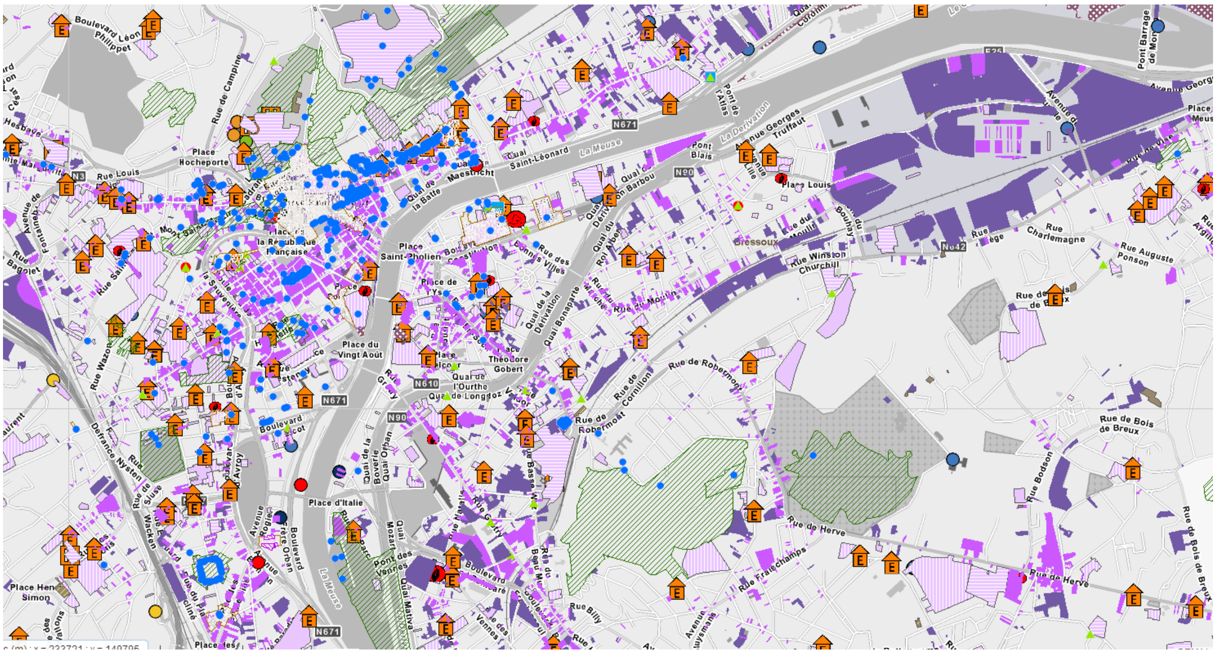

Figure 15: Flood risk map of Liège. This map gives an overview of flood vulnerabilities in the city of Liège, e.g. schools, hospitals, classified monuments, SEVESO-companies, housing, etc. *(Source: http://geoapps.wallonie.be/inondations)*

C. Resources

Financial, material and human resources

As long as the crisis remains in the municipal phase, the municipality pays the response costs. In the provincial and federal phase, the federal government finances the means. The regional governments, in turn, fund the flood-forecasting systems.

Municipalities are legally obliged to provide the infrastructure, equipment and staff required for their fire brigade service.[71] This places a serious burden on the municipal budget. The federal government can grant complementary subsidies for the purchasing of equipment and the provision of training. However, this financial support is not prescribed by law and varies from year to year. Under the

[70] Point 4.1 of the Annex of the Royal Decree of 31 January 2003.

[71] Royal Decree of 8 November 1967 concerning the organisation of municipal and regional fire brigade services.

currently implemented fire brigade reform, costs are divided 50-50 between the federal state and the municipalities.[72]

The Flood Preparation Arrangement suffers from a lack of resources, in particular in terms of personnel, more than other arrangements do. For many small municipalities with limited financial resources, appointing an emergency planning official is not evident. Therefore, these officials are sometimes hired on a part-time basis or shared among several smaller municipalities. At other governmental levels too, emergency planning units face a decline in personnel since the start of the economic crisis in 2008. The funding of daily operations has also been cut back and the funds for new projects have been reduced drastically.

Expertise

The expertise of crisis managers varies greatly. While crisis managers in provinces and big cities are trained intensively and are regularly confronted with crisis events, their colleagues in smaller municipalities and more rural provinces experience crisis situations at a less regular basis and do not have a similar capacity to build up a professional crisis response structure. However, in general, an evolution can be observed towards greater professionalisation. The federal government is, for example, currently assembling a mobile expert pool of communication officials that can assist local governments during emergencies.

The Higher Institute of Emergency Planning is assigned to spread new insights and best practices to a wider public and to follow-up research projects on crisis management.[73]

D. Discourses

Discourses on the crisis management structure

At present, the main debate in the Flood Preparation Arrangement concerns the level at which emergency planning officials should operate. It is widely acknowledged that officials in smaller municipalities lack the experience and time necessary to satisfactory fulfil the position. However, every actor has different ideas about how to solve this problem. Within the province of Antwerp, for example, crisis managers are in favour of upscaling the position to a supra-local level, *e.g.* the fire brigade zones. In East-Flanders and Hainaut, the position of the municipal emergency planning official is considered indispensable, given his local expertise. Crisis managers there prefer to stimulate inter-municipal cooperation between emergency planning officials instead.

Frustration exists among crisis managers about the fragmented structure of the regional governments. During crises, it is often unclear for them who is to be contacted within these organisations. They are, therefore, very positive towards the development of the Walloon Crisis Centre and, more recently, to its Flemish counterpart, the CCVO.

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[72] Civiele Veiligheid, http://www.civieleveiligheid.be/CivieleVeiligheid/HervormingvandeCivieleVeiligheid/, (accessed at 13/03/2014).
[73] Article 1 of the Royal Decree of 29 July 1991.

Rather than coordinating during floods, the provinces expect the federal level to play a supportive role in crisis management: it should facilitate the knowledge exchange between them. Moreover, local actors would like the federal government to be more supportive in terms of finances. Legislation, such as the Royal Decree of 2006 and the fire brigade reform, has forced local actors to professionalise. However, it has not provided the means required to do so.

Large amounts of support exists for the 'pragmatic approach' within crisis management. Several respondents stress the importance of training and evaluation over formal emergency planning. The official emergency plans are considered necessary but only as a starting point for the disciplines to meet and to develop an effective and flexible emergency planning structure.

Discourses on citizen involvement

The large majority of crisis managers interviewed in our analysis believe flood preparation should be a shared responsibility between the government and its citizens. However at the same time, crisis managers assume that the Belgian population lacks the culture to do so. Floods do not occur frequently enough and citizens are used to falling back on the well-functioning crisis management structure. Consequently, little effort has been made to enhance self-reliance.

Accordingly, crisis managers rarely make use of spontaneous volunteering. Opinions on the desirability of volunteers vary largely among actors. While most actors are in principle in favour, concerns are raised on how to coordinate and insure them. Most actors claim that citizen volunteers are appealing in theory but are too complicated an idea to bring into practice.

2.3.4 The Flood Recovery Arrangement

A. Actors

Governmental actors

As will be further explained below, the disaster fund was, prior to the sixth state reform, a responsibility shared between the federal ministry of interior affairs and the ministry of finances (i.c. disaster fund). In July 2014, the expertise concerning the disaster fund was transferred to the regions.

The Recovery Arrangement thus no longer belongs to the competence of the federal government and private companies entirely.

- ***Actors in the context of insurance***

The Federal Ministry of Economy is the governmental actor who regulates the Belgian insurance system. In addition, the Office of Tariffication is an important actor (seeTable 18).

Table 18: Composition and function of the Office of Tariffication

Office of Tariffication	
Composition	- Representatives of the minister - Representatives of the insurance sector - Representatives of consumer organisations
Assignments	- Determining the tariff conditions and the contractual conditions for the risks of natural disasters that the insurers do not want to cover in accordance with their proper conditions - Drafting a yearly report on the functioning of the Office, and drafting an analysis on the tariff conditions for natural disasters as applied by the insurers.

- ***Actors in the context of acknowledging the event as a natural disaster***

In the aftermath a flood, a procedure is set in motion to acknowledge the event as a natural disaster. Prior to the sixth state reform, the acknowledgment occurred through a royal decree, i.e. at the federal level. However, the sixth state reform has transferred the competences for the disaster fund to the regions. This regionalisation applies to all disasters that have occurred since 1 July 2014. The role of the regional governments in flood recovery is thus increasing.

For disasters that occurred prior to 1 July 2014, the acknowledgment procedure is presented in Table 19.

Table 19: Acknowledgment procedure for disasters prior to 1 July 2014

Actor	Task
Mayor(s) of the municipalities involved	- Submits the request for acknowledgement of the event as a natural disaster to the provincial governor
Provincial governor	- Composes a file for his province (on the basis of the data handed in by the mayor(s))
Federal ministry of interior affairs	- Submits the provincial request to the ministerial council in order to acknowledge the event as a natural disaster (or to refuse to do so)

The procedure is very similar for floods after the date of 1 July 2014. The municipality should provide the regional disaster fund, i.e. in the Flemish, Walloon and Brussels-Capital Region respectively, with all the information. *E.g.* in case a flood occurred on Flemish territory, the Flemish disaster fund will then ask for the acknowledgment of the floods as natural disasters from the Flemish minister-president. The floods are considered to be natural disasters following publication of the relevant Order of the Flemish Government in the Belgian Official Journal.

- ***Actors in the context of compensation following floods***

Once an event has been recognised as a natural disaster, the compensation procedure is set in motion.[74] In the pre-sixth-state-reform-era, the procedure is presented in Table 20.

Table 20: Compensation procedure for disasters

Actor	Task
Provincial governor	- Receives the file for compensation and appoints an expert to investigate the further procedure for compensation
Disaster fund	- Grants the compensatory fee

For floods that have occurred after the date of 1 July 2014, victims in the Flemish Region have three months' time to submit a file claim with the Flemish disaster fund. Just like before, it is the provincial governor who plays a central role. The Flemish disaster fund looks into the application for compensation in assignment of the province where the damage has occurred, and the governor decides the compensation. In case the victim does not agree with the compensation decision, he/she can file a motivated application for revision with the disaster fund, or can appeal to the Court of Appeals within the timespan of one month following the decision.[75] The procedure in the Walloon Region is similar, as it is also based on the pre-existing federal procedure.

[74] When the floods have affected goods of the public domain, such as roads and bridges, then the administrations must submit the application for compensation directly to the Ministry of Interior Affairs, and not to the provincial governor. This should be done within six months following the date of publication in the Belgian Official Journal of the Royal Decree acknowledging the event as a natural disaster.

[75] See application guidelines for the Walloon Region, available on the internet at: http://pouvoirslocaux.wallonie.be/jahia/webdav/site/dgpl/shared/calamites/guide_calm_09-2014_Fr.pdf.

- ***Regional governmental actors***

As is the case in the Flood Preparation Arrangement as well, the role of the regional governments in flood recovery is increasing. With the inclusion of the flood risks in the fire insurance in 2005, Regional governments became responsible for providing flood maps. The sixth state reform of 2014 transfers also the formal competences for the disaster fund to the regions. In Wallonia, the responsibility for the recognition of natural disasters will be laid by the Walloon crisis centre (CRC-W).

- **Private actors & civil society**

Private parties play a major role in flood recovery. Since the Act of 17 September 2005, private insurance companies have replaced the principal role of the government as compensator.

During the decision-making process of the adoption of floods into the fire insurance, consumer organisations were in contact with Assuralia, a representative organisation for insurance companies, to watch over the protection of consumers' rights.

B. Rules

Two main legal instruments form the basis of the Recovery Arrangement, namely the Act of 25 June 1992 on the Land Insurance Contracts and the Act of 12 July 1976 on the repair of certain damage caused to private goods by natural disasters.

Legal steps towards compensation damages

- ***The Act related to natural disasters***

Initially, the Recovery Arrangement was dominated by a 100% public compensation mechanism on the basis of the Act of 19 July 1976 related to natural disasters. On the basis of this act, once an event, such as a flood, had been classified as a natural disaster (through a royal decree) victims of floods could be compensated by the National Fund for General Disasters ('disaster fund'). The disaster fund will be discussed in more detail below.

However, the procedure was often lengthy and bureaucratic. This led to the introduction of an insurance model for co-compensation.

- ***The Land Insurance Contract Act***

The Land Insurance Contract Act of 25 June 1992 is the basic piece of legislation regarding insurance agreements in general.[76] The act sets out requirements and safeguards that must be respected when drawing up insurance contracts. The Royal decree of 24 December 1992 on the insurance against fire and other dangers as concerns the simple risks aims to execute this Land Insurance Contract Act. It applies to insurance agreements mainly insuring simple risks against damage caused by, *inter alia*, fire, electricity, storm, natural disasters, water and broken windows (Bruggeman, 2010).

Towards a comprehensive obligatory insurance policy against floods

[76] It has been modified by the Act of 4 April 2014, which consolidates several insurance related rules into one single legal framework.

As of 2 March 2006, the insurance policy against damage caused by floods has been made obligatory and is automatically included in the simple risk fire insurance policy. So from the moment a person signs a fire policy, the insurance for floods is included therein. Although not obligatory, 95 % of owners and 89 % of renters in Belgium have subscribed to fire insurance.[77] The inclusion of floods into this insurance regime was done through a modification of the Land Insurance Contracts Act and the Act related to natural disasters, initially by means of the Act of 21 May 2003, and finally through the Act of 17 September 2005.

- ***The Act of 21 May 2003***

The Act of 21 May 2003 introduced mandatory insurance coverage against floods through an extension of the fire insurance policy for simple risks (Bruggeman, 2010). The insurance coverage for floods was limited to those buildings located in risk zones, which were described as those areas that have been subject to or may be subject to recurrent and important floods.

However, the Act of 21 May 2003 never entered into effect. The fact that only the buildings in high-risk zones were covered, would lead to an uninsurable concentration of risks. The legislator reasoned that this situation would be contrary to the essence of an insurance system.[78]

- ***The Act of 17 September 2005***

Through the Act of 17 September 2005 modifying the Land Insurance Contract Act, the obligatory insurance policy for floods, regardless of the location of relevant buildings in risk zones, was instituted.[79] Moreover, this obligation has been generalised to all natural disasters, i.e. earthquakes, landslides, dike breakings, *etc.* The reasoning behind this generalisation is that no Belgian citizen can be certain of never being confronted with these types of natural catastrophes. And, with respect to floods, the legislator states that these do not only affect those living by a river, canal or waterway, but on the contrary, they are also caused by *e.g.* overflowing sewerages. Thus, a person living on the tenth floor of an apartment building in Brussels can be as affected by natural phenomena as people living in rural areas.

The Land Insurance Contract Act determines the scope of what should be covered by insurance. The phenomenon "floods" is classified in the category of "natural disasters", and is described as "the overflow of banks of rivers, canals, lakes, ponds or oceans as a result of atmospheric precipitation, the melting of snow and ice, a dike-break or tidal wave".[80] Floods are also considered as including the flow of water due to insufficient absorption by the soil as a result of atmospheric precipitation.[81] The act also determines which damages should be compensated for, namely:

- The damage to the insured goods directly resulting from the floods or a covered danger directly resulting from the floods, in particular fire, explosion, including the explosion of dynamite.

[77] It is often a mandatory condition to obtain loans from banks, often included as a requirement in rental contracts, …
[78] The execution was furthermore hindered by the fact that it could only enter into force on the day that the risk zones in the Flemish Region, the Walloon Region and the Brussels Capital Region would be delineated. The regions are namely responsible for proposing the criteria for the delineation of the risks zones.
[79] Namely through the new articles 68-1 – 68-8 of the Act.
[80] Art. 68-2 of the Act of 25 June 1992 on the Land Insurance Contract.
[81] This description was added to the Land Insurance Act by the Act of 1 March 2007 related to diverse provisions.

- The damage to insured goods that would follow from measures that have, in such case, been taken by a competent authority for the security and protection of the goods and the persons, including the floods resulting from the opening or demolition of locks, dams or dikes, with the goal of preventing a potential flood.
- The cleaning and demolition costs necessary for the reconstruction and reinstatement of the insured goods.
- For houses, the housing costs made in the period of three months following the claim, in case the residential premises have become unfit for habitation.[82]

The determination of the risk zones, namely the zones that are subject to recurrent[83] and grave floods, was carried out by the Royal Decree of 28 February 2007.[84]

The insurers have the freedom to determine themselves the premium rate they wish to apply. However, the maximum tariff is determined by the Office of Tariffication. When this maximum tariff is applied, the insurer can decide to enter the risk in a compensation mechanism "CANARA" which spreads the premiums and the losses of these risks between all of the fire insurers active in Belgium.

For those buildings that are built in such high-risk areas after the date of 23 September 2008,[85] insurers are not obliged to cover the building and its contents for water damages. If the insurer does decide to insure it, the maximum tariffs of the "Office of Tariffication" are no longer applicable. Consequently, the height of the premium is at the discretion of the insurer. A further discouragement aimed at preventing people from building there in the future relates to the fact that if a person cannot find insurance coverage in such flood prone area, the disaster fund will not intervene in cases where floods do occur and result in damages.

The Disaster Fund

Since the entry into force of the Act of 17 September 2005, insurers compensate for the majority of the damage to goods following a flood, whereas previously these damages were compensated through the intervention of the disaster fund. The disaster fund now only intervenes in the following instances:

- Goods that are not categorised as "simple risks";
- Agriculture goods that are principally excluded from coverage, *e.g.* the living stock outside the building;

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[82] Art. 68-4 of the Act of 25 June 1992.

[83] The recurrence period is defined as the inverse of the annual probability of occurrence or exceeding of a particular event. For example, for an event with a recurrence period of 25 years, there would be a chance of 1 out of 25 that an event of the same intensity would occur the following year. The importance of a flood is determined by the amount of water that overflows and thus mainly by how the level of deepness of the water on the field.

[84] The regions are also responsible for this delineating. The criteria on the basis of which the Regions delineate the risk zones are set out by the Royal Decree of 12 October 2005. The Royal Decree of 28 February 2007 has been modified by the Royal Decree of 6 March 2008, to take into account the cartography of risk zones by the Walloon Region.
For the Flemish Region, the maps are included on the following website: http://geovlaanderen.agiv.be/geovlaanderen/watertoets2012/
For the Walloon Region, see: http://geoportail.wallonie.be/cms/home/geocatalogue.html?search-text=a3fa00be-393c-4442-9a7f-9ef5bedc5e39&activeMDTypeTab=mdType_plainData&mdUUID=a3fa00be-393c-4442-9a7f-9ef5bedc5e39; And: http://cartopro3.wallonie.be/CIGALE/viewer.htm?APPNAME=ALEA_INOND
For the Brussels Capital Region, risk zones in this regard have not been officially determined for these purposes.

[85] 18 months upon publication of the Royal Decree determining the high-risk zones.

- Vehicles that were not placed in a protective area (*e.g.* a garage) at the time of the floods;
- Goods that are not insured due to the financial situation of the victim, i.e. when victims are the beneficiaries of alimony at the time of the disaster;
- Goods that belong to the public domain of the entities with legal personality listed in article 42 of the Act of 12 July 1976.

Compensation from the disaster fund is excluded for those goods covered by the fire insurance.

C. Resources

Financial resources

With the transition from the disaster fund to an insurance-based system, competences and finances have been shifted from the government towards the private sector.

According to Flemish Parliamentarians,[86] the disaster fund has been empty since April 2012. It has been stated that 2.120 files for compensation have been submitted for damages caused by the floods in 2010, of which 1.717 have been approved. However, in the spring of 2012, only 920 were actually compensated, and 800 victims were still waiting for their compensation.[87]

In the context of the regionalisation of the National Disaster Relief Fund, the "butterfly agreement" sets forth the amount of 11,8 million EUR for the transfer of this fund.[88]

Expertise

Both the governmental actors as the private insurers possess specific expertise and information concerning flood recovery. Insurance companies make use of flood risk maps to calculate the correct policy for a certain location. Over the years, these maps were updated with additional information, collected from damage claims. Regional and local governments, relief workers, *etc.* possess useful experiences in relation to flood recovery as well. Information between all of these actors is only shared very infrequently though.

D. Discourses

Government interference versus market mechanisms

The Belgian insurance system for flood events is a mixed system of free market mechanisms and governmental interference. A balance was found by way of a system that leaves insurers the freedom to determine themselves the premium rate they wish to apply, up to the maximum tariff determined by the Office of Tariffication. For buildings built in flood-prone areas after 23 September 2008, they

[86] MP Nathalie Muyle of CD&V. See Written Question in the Senate, 5 March 2012, nr. 5-5792, Available on the Internet at: http://www.senate.be/www/?MIval=/Vragen/SchriftelijkeVraag&LEG=5&NR=5792&LANG=nl, last accessed on 12 March 2014.
[87] Newsarticle 17 July 2012, http://www.knack.be/nieuws/belgie/geen-geld-meer-in-de-kas-van-het-rampenfonds/article-normal-61365.html.
[88] X., Governmental Agreement of 1, December 2011, Available on the Internet at: www.premier.be/nl/regeerakkoord, last accessed on 12 March 2014.

do not even have to take this maximum tariff into account. Finally the insurers are backed up with an intervention threshold per disaster. When this threshold is crossed, the excess will be reimbursed by the disaster fund.

According to a respondent from an insurance company, big insurers would still favour this damage threshold to be increased, to make an intervention of the disaster fund less likely, since they fear this will complicate the compensation procedure to a great extent. However, for smaller insurance companies, this threshold is an important guarantee for their solvability.

Solidarity versus awareness-raising

The discourses of the policy makers have been pending between flood risk prevention (risk awareness-raising) and affordable flood insurance for everyone (solidarity). The final Act of 17 September 2005 balances between these two discourses: flood risks were integrated into the widely applied fire insurance but its maximum tariffs are not applicable to buildings in flood-prone areas built after 23 September 2008.

2.4 Explanations for stability and change at national level

2.4.1 Characterising flood risk governance in Belgium

The Belgian FRGA is primarily characterised by its non-existence. This does not imply that flood risks in Belgium are not governed, but that there is no overruling arrangement coordinating and steering all of these efforts. Instead, flood risks are managed by a wide range of different actors.
In so doing, an important role is played by water managers at regional and provincial level. Flood risk management is carried out by governmental bodies with considerable independence from the political level, particularly at regional level. As a result, FRG is characterised by technocratic decision-making.

A determining physical feature in Belgium is its spatial planning. Little control has been exerted on spatial development in the past, with a high degree of urban sprawl being the result (Poelmans & Van Rompaey, 2009). This forms a constraining factor to FRG today.

For Belgium specifically, in comparison to other STAR-FLOOD countries, are its efforts to integrate water quality and quantity policy. In Flanders this manifests itself legally with the DIWP, in Wallonia with the Water Code. The Flemish Region also decided to integrate the FRMPs into the river basin management plans.

2.4.2 The extent of governance dynamics in Belgium

A general shift can be observed within Belgian flood risk governance towards an integrated flood management between 1995 and 2015, which is the time frame chosen for our investigation. This shift implies the integration of different water objectives, of different flood strategies and an enhanced coordination between governmental actors.

In Flanders, incremental changes are witnessed since the 1998 floods. They are incremental since they have resulted from an extensive decision-making and implementation process (Crabbé, 2008). Despite their slow progress, the modifications have had a considerable impact on the current FRGA.

With the introduction of the DIWP and CIW, deep changes have taken place within all the dimensions of the arrangement.

In Wallonia, change occurred rapidly after the 2002/03 floods. The Plan PLUIES (2003) is by stakeholders referred to as a radical change in terms of rules and discourse. The implementation of this plan followed however incrementally. Within the actor dimension, important change took place with the instalment of the GTI.

- ***Towards creating space for water***

In both the Flemish and the Walloon Water System Arrangement, a shift is visible from a flood policy based on rapid water drainage towards creating space for water. Since the beginning of the century, the Flemish and Walloon governments have rolled out a programme of flood control areas and river restoration, in addition to the existing flood defence infrastructure. The restoration of rivers and flood plains does not only aim to enhance flood safety, but in many cases, also the dual-function of ensuring water quality and meeting biodiversity objectives.

The integration of water quality and quantity management can be observed in the legislation as well, *e.g.* the DIWP/Water Code as well as the integration of FRMPs and RBMPs in the Flemish Region. The shift towards creating space for water has in both regions been accompanied with the introduction of new spatial planning instruments. In Wallonia, however, the integration of spatial planning into water policy appears to be less prominent than it is in Flanders.

Recently, the making space for water discourse has been challenged by Flemish actors through the employment of an emergent discourse concerning cost-efficiency. According to the discourse of multi-layer water safety, FRM has to include an optimal mix of prevention, protection and preparation measures. This mix is obtained through cost-benefit analyses, which, in some cases, appear to give preference to local defence measures over mitigation.

- **Towards enhanced coordination between governmental actors**

During the period investigated, initiatives have been launched in both regions to improve coordination between the widespread number of governmental actors involved. Formal coordination has been introduced with the CIW, GTI, the river contracts, the sub-basin boards and the regional crisis centres.

Alongside the improvement of coordination, important steps were also taken in the Flemish Water System Arrangement to reduce the amount of water managers, i.e. by diminishing the number of polders and wateringues and with the transfer of most 3rd category watercourses from the municipalities to the provinces.

- **Towards regionalisation of flood risk governance**

Although the regional governments have the intention to include all FRMSs in their management, they are limited in doing so since the last two strategies traditionally remain within the competence of the federal government. Recently, however, several initiatives have been taken, which reveal an increased interest of the regional governments in the Flood Preparation and the Flood Recovery

Arrangement. Examples include the Walloon and Flemish Crisis Centre, the regionalisation of the disaster fund, *etc.* These developments can, potentially, lead to a further convergence of strategies.

During the period investigated, the regional level has gained most competences. There have been attempts by the regional governments themselves to reinforce their position within the regional water system arrangements, alongside the transfers from the federal level. Clear examples of this include the on-going debate concerning the province's competences and the installation of the local sub-basin boards by the Flemish government. This evolution can be framed in terms of a broader shift in power constellations within the Belgian government structure.

- **Towards shared responsibilities with non-governmental actors?**

Traditionally, flood risk governance in Belgium is a highly technocratic issue, carried out by governmental actors almost exclusively. However, over the last decade, a number of initiatives have emerged that indicate a trend towards a new distribution of responsibilities between governmental and non-governmental actors. The most significant examples of which include the introduction of flood risks in the fire insurance, the duty to inform and the multi-layer water safety discourse.

2.4.3 Explaining change

Particularly in the actor and rules dimension, changes have been initiated by the DIWP in Flanders and the Plan PLUIES in Wallonia. Taken separately, these policy and legislation documents are the result of a mixture of endogenous and exogenous factors (see Table 21).

Table 21: Factors of change at national level

	Exogenous factor	**Endogenous factor**
Towards making space for water	• Water Framework Directive • Flood Directive	• Floods 1998 and 2002/03 • General awareness-raising
Decrease of fragmentation & increase of coordination between actors		• Political windows of opportunity • Discourse of integrated water policy
Regionalisation of competences	• State reform	

- ***The winter floods in 1998 and 2002/03***

The floods in 1998 formed a trigger event in Flanders. They confirmed the already emerging view within the Water System Arrangement that classical flood defence measures were insufficient and that it would be necessary to provide further space for water. A number of initiatives which were already pending at that time, such as the development of the DIWP, were reinitiated as a result of this increased awareness.

In Wallonia, a similar trigger event was formed by the floods in 2002/03. In the following year, the Walloon government presented its Plan PLUIES, which aimed at the integration of flood protection, prevention and preparation.

- ***European legislation and international knowledge exchange***

European regulation, such as the Water Framework Directive and the Floods Directive, exerted external pressure on the regional water system arrangements to improve their functioning. In Flanders, attempts for a holistic legislative framework on water policy had been made for years. In combination with the recent flood experiences, proponents used the awaited WFD to reach agreement on the DIWP (Crabbé, 2008).

Walloon actors also refer to the Directive as the main driving-force behind the shift towards natural flood management. In both regions, the WFD meant a step forward in the integration of water quality and quantity management.

The FD, in turn, gave another boost to the FRM of the regions. In Flanders, it caused in the first place a discourse shift, with the introduction of the multi-layer water safety (see Discourses under 2.3.1). In addition, the implementation of the procedural requirements of the FD, such as the issuance of the flood risk and flood hazard maps, has strengthened existing and developing instruments. The implementation of the FD in the Walloon Water Code (2010) resulted in a clearer and more comprehensive legal basis for FRM. Moreover, Walloon water managers specifically refer to the participation in European Interreg- and LIFE-projects as driving forces behind innovative water management.

Both regions are in the final stages of drafting the flood risk management plans. Some respondents expect that these will further integrate the actions taken by different stakeholders, but since the plans are drafted without additional funding, it is also feared that they might not lead to new investments in the field.

Apart from legislation, the EU and other international fora facilitate the spread of new ideas in flood risk governance, such as the concept of integrated water policy in the 1990s and the 3P-approach more recently.

- **Political windows of opportunity and state reform**

As well as events, other windows of opportunities facilitated change in the investigated period, particularly in the actor dimension. Abolishing or merging organisations, or improving coordination, often coincides with the replacement of specific, highly ranked officials. In cases of the largely applied possibility to transfer the 3rd category watercourses to the provinces, the change has been partly induced by the economic crisis, which increased the financial pressure placed on municipalities to reduce competences.

Another exogenous factor in our explanation of change is the regionalisation process, which has generally enhanced the regional government's competences in comparison to other levels.

2.4.4 Explaining stability

Table 22: Factors of stability at national level

	Exogenous factors	Endogenous factors
Existing regulation and practice of spatial planning	Maladjusted organization of the public space, caused by past spatial planning choices	
Actor fragmentation and lack of (interregional) coordination		Path dependency of organisational structure

Although the Belgian FRGA can be described as being very dynamic, a number of inert factors appeared resistant to change (see Table 22).

The primary bottleneck felt in both regional water system arrangements is Belgium's historical backlog of spatial planning. Prior to the DIWP, spatial plans were drawn up and building permits granted without adequate consideration being paid to the impact upon the water system. As a result, the amount of built-up area has tripled between 1976 and 2000 in some regions and more than 20% of built-up land in Flanders is situated in flood-prone zones (Poelmans and Van Rompaey, 2009; Poelmans et al., 2011). A similar situation can be found in the more densely populated areas of Wallonia. Innovative flood risk prevention instruments, such as the water assessment and flood cartography, comprise an important step to limiting further development in flood prone areas but the damage caused by older developments is difficult to overturn.

A second persistent bottleneck is the fragmentation of competences. Significant efforts have recently been made to reduce the number of actors or to increase the coordination between them. Yet, it remains a fact that competences are spread over a wide range of different governmental bodies. This causes inefficiency and, in some cases, ineffectiveness. The reason for this fragmentation lies in path dependency: the existing actors have gained their competences through separate historical developments and they appear to be very resistant to reform.

A bottleneck related to this fragmentation is the non-structural coordination and communication between the three regions. Following the 2010 floods, there has been contact between the Flemish and Walloon Parliament, but deliberation on a systemic and structural basis is still missing.

2.5 Evaluating flood risk governance at national scale

This section will illustrate the extent to which the Belgian flood risk governance can be considered resilient, efficient and legitimate. A more in-depth evaluation will be made in chapter 6 of this report.

Table 23 Table 23 below, provides a concise overview of the findings in terms of the evaluation of flood risk governance at the national scale, as explained in the following sections.

Table 23: Overview of evaluation of flood risk governance at national scale

Evaluation criteria	+ or -	Feature of governance
Resilience	+	▪ Increased focus for water concerns in spatial planning ▪ Innovative spatial planning instruments ▪ Broadening of FRM strategies ▪ Bridging mechanisms ▪ Considerable expertise on water management ▪ Evaluations of legal and policy frameworks
	-	▪ Historical backlog of spatial planning ▪ Enforcement and follow-up of FRM instruments ▪ Fragmentation of expertise
Efficiency	+	▪ Use of CBA in Flemish Region ▪ Transfer of ex-post compensation from public to private funding ▪ Walloon and Flemish Crisis Centre
	-	▪ Fragmentation
Legitimacy	+	▪ Public participation in line with EU legislation ▪ Acceptability generally high ▪ Access to justice and information
	-	▪ Low awareness on flood risks ▪ Judicial backlog

2.5.1 Societal resilience

Capacity to resist

In general, the capacity to resist has increased in the timespan investigated. Both regions have taken measures, such as dike elevations and flood control areas, to reduce the likelihood and magnitude of flood hazards. Furthermore, the attention for water concerns in spatial planning has increased significantly. In Flanders, this manifests itself in a wide range of available instruments, *e.g.* the water assessment, re-parcelling with land swap, *etc.* For Wallonia, one can point out article 136 CWATUP. This instrument is, however, less legally embedded than its Flemish counterpart.

Several bottlenecks hamper the resilience of FRG. The most important one is the spatial planning policy in the past, which did not sufficiently take flood risk into account. However, the need to pursue an ambitious spatial planning policy today opened a window of opportunities, *e.g.* the recognition of the problem of construction in flood prone areas has led to the introduction of a new, innovative instrument: the signal areas. Important steps were also made in the context of other bottlenecks, *e.g.* the decree on complex projects and the procedural decree on the integrated permit were recently adopted in the Flemish Region in order to improve the formal procedures of (building) permits and (spatial) plans, which are now characterised by their complexity and long lead-time.

A barrier to the effectiveness of FRM instruments lies with their enforcement and follow-up in the field. Building infractions can be found by the building inspections. However, there is no clear link between the enforcement mechanism of spatial planning and the legal frameworks applicable for FRM instruments. Furthermore, nor the DIWP nor the Water Code contain a specific control

mechanism for compliance with the conditions imposed by the water assessment and article 136 CWATUP.

Capacity to absorb and recover

An integrated flood management, which takes into account all FRMS in a coordinated manner, is currently being pursued in both regions (see Figure 16, 17 and 18). On this point, flood managers mainly stress the integration of spatial planning regulation into FRM. Linked to this, many flood managers apply a discourse of shared responsibility. This idea stems from the discourse of the 3P's, translated in Flanders as multi-layer water safety, according to which also citizens should share responsibility in FRM.

Figure 16: Flood risk strategies in the Flemish Region

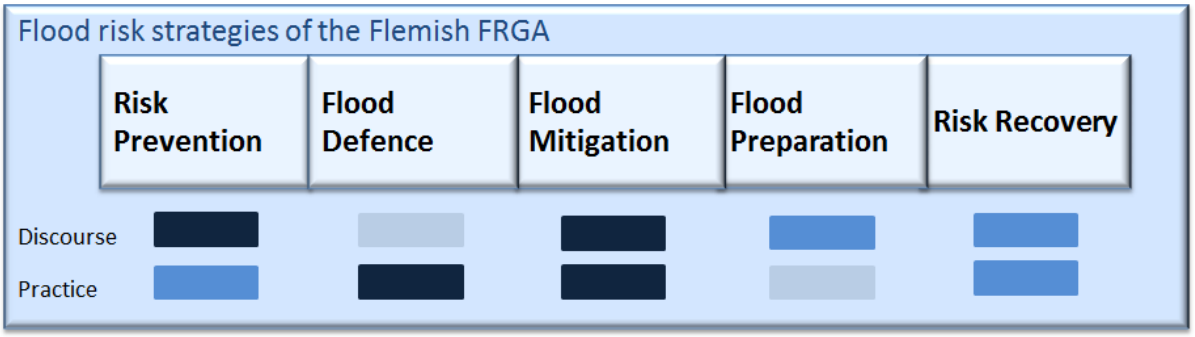
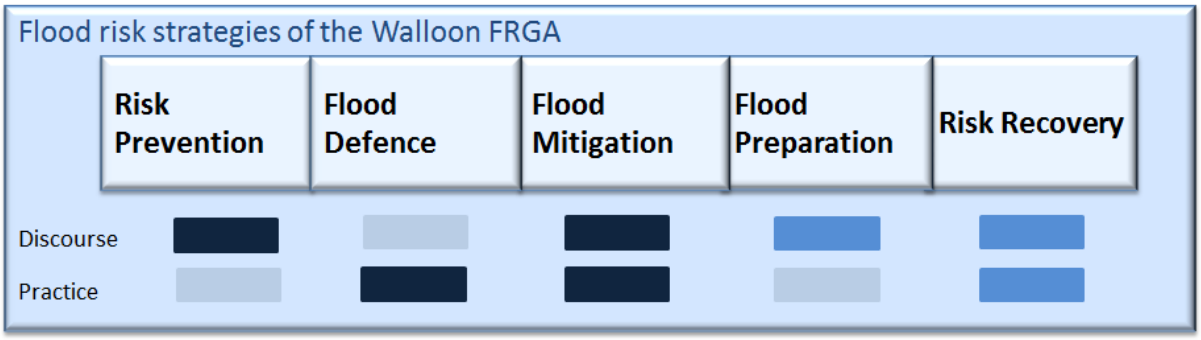


Figure 17: Flood risk strategies in the Walloon Region



Coordination between the actors has also intensified, due to the use of bridging mechanisms, such as the CIW and GTI. Further alignment of the different strategies can be expected, *e.g.* the CIW has currently updated the insurance-related flood risk maps.

Capacity to adapt

There is a considerable expertise on water management. Both regions have well-developed knowledge institutes on the topic, *e.g.* Flanders Hydraulics Research. In the Walloon Region, there is also a tendency to cooperate intensely with universities. Unfortunately, the different actors work independently from each other, which leads to a fragmentation of expertise. The CIW and GTI aim to act as platforms for knowledge exchange, but this exchange remains suboptimal. In practice, each water manager still develops his own expertise.

A big step forward to overcome the barrier of fragmentation has been the integration of the data from navigable and non-navigable watercourses. The information can now be found at one single website, respectively www.waterinfo.be for the Flemish Region and infocrue.wallonie.be for the Walloon Region.

Several aspect of the legal and policy frameworks for FRM have been subject to evaluations. Following these evaluations, new instruments were introduced or existing instruments and policies were adapted to improve their efficiency and effectiveness. For example, the evaluation of the water assessment by the CIW in the aftermath of the 2010 floods indicated that it did not always function in a coherent and consistent way due to the complexity of its procedure. Consequently, the water assessment was simplified, both content-wise as in terms of formal aspects.

2.5.2 Efficiency

Economic efficiency

Economic efficiency is an important driver for policy makers in the Flemish Region, as they often make use of cost-benefit analyses. However, some actors criticise the technocratic methodology behind the CBA's. In the Walloon Region, less attention is paid to CBA.

The transition from the disaster fund to an insurance-based system led to a shift in financial and other resources from the government towards the private sector. In general, this change from ex-post compensation by the government from being a governmental mechanism exclusively to a private insurance system increased the economic and resource efficiency of the federal Recovery Arrangement. In the future, efficiency gains can be achieved by sharing information more frequently between the governmental actors and the private insurers.

Resource efficiency

In the Flemish FRGA, the 2013 reform of the DIWP led to an increased efficiency, *e.g.* planning and coordination burdens were significantly reduced. In addition to the establishment of a Walloon and Flemish Crisis Centre, the currently implemented fire brigade reform should lead to a more efficient use of staff and equipment in the Preparation Arrangement.

In both regions, attempts are made to improve efficiency. In the Walloon Region, focus is put on an increased coordination between the various actors, while in the Flemish Region measures are taken to reduce the number of actors involved, *e.g.* the largely applied transfer of competences to provinces for 3rd category watercourses. However, despite these efforts, actor fragmentation still remains an important bottleneck, for instance systemic coordination between the different regions, which in some basins could significantly improve the efficiency of the water management, is still lacking.

2.5.1 Legitimacy

Participation and acceptability

The provision of public participation is in Belgium in line with EU legislation, *e.g.* six-month public consultation for the FRMP's. For individual citizens, participation is mostly limited to these formal procedures and to the dissemination of information. However, in the decision-making process for water-related decrees or regulations, the regional governments must consult advisory boards and councils that formally represent civil society groups, *e.g.* the Flemish Council for the Environment and Nature. Within these councils, umbrella organisations represent the stakeholders.

Since floods do not occur very frequently, the general awareness on flood risks in Belgium is low. Certain recent instruments, such as the duty to inform, may enhance citizens' awareness of flood risks and thus increase legitimacy.

Despite the low interest among citizens in the decision-making process of flood-related regulations, the FRM approach is, in general, widely accepted. However, since the end of 2013, there has been a discursive shift in the discourse of the Flemish government towards FRM as a shared responsibility between governmental actors and citizens. This newly applied discourse might form a threat to the arrangement's legitimacy, as among the population, the belief that FRM is a government responsibility currently remains dominant.

Procedural justice, accountability, transparency, access to information

Courts and Tribunals exercise the judiciary power in Belgium. In addition, citizens can file an appeal against decisions of administrative governments with the Council of State or with specialised administrative courts. For the annulment of laws and decrees, citizens can go to the Constitutional Court.

All citizens have equal access to justice. However, due to judicial backlog, judicial proceedings may take a long time and can consequently be expensive.
Furthermore, the Constitution guarantees the right of access to administrative documents.

Social equity

The Belgian FRM is based on solidarity: public funds, *e.g.* tax income, fund flood risk measures. The inclusion of flood damage in the fire-insurance is an exception to this principle. On the one hand, all citizens, regardless of the location of their buildings, fall under the coverage of the widely applied fire insurance. Yet, on the other hand, the maximum tariffs are not applicable to buildings in flood prone areas, built after 23 September 2008. In these cases, the height of the premium is at the discretion of the insurer. Furthermore, if a person cannot find insurance coverage in such flood prone areas, the disaster fund will not intervene when a flood occurs and results in damages.

2.6 Conclusion

FRM in Belgium is highly influenced by the complexity of the country's administrative structure: the competences for the various FRMSs are spread over the federal and regional level. Flood risk prevention, defence and mitigation are located at regional level and are embedded in the regional Water System Arrangements. The competences in the other two arrangements, which concern flood preparation and recovery, lie mainly in the hands of the federal government. Yet, in line with their ambition to include all FRMS in their management, the role of the regions in these arrangements is growing, *e.g.* the transfer of the responsibilities over the disaster fund to the regions in the middle of 2014.

The role of insurance companies in the flood recovery arrangement has increased significantly with the inclusion of floods into the fire insurance. In general, however, the role of private actors in FRG is limited. FRM is considered to be an exclusive government responsibility. However, in the period investigated, a shift can be noticed in the flood risk policy from a government-led approach towards an increasing focus on individual responsibility. An important step towards this has been the duty to inform, which aims to raise citizens' awareness on flood risks. This shift in responsibility is particularly present in the Flemish discourse on multi-layer water safety, which pleads for equal attention for flood prevention, protection and preparedness and for sharing responsibilities between divergent governmental actors and citizens. Walloon governmental actors are less outspoken on this subject.

With regard to the strategies prevention, mitigation and defence, which are encapsulated in the Water System Arrangements of the Walloon Region, the Flemish Region and the Brussels Capital Region, it can be said that the European legislation has constituted an important driver toward more comprehensive flood management. For example, prior to the entry into force of the Floods Directive, no comprehensive legal framework existed in the Walloon and Flemish Regions to manage flood risks, although measures were already included into the legal framework.

Between 1995 and 2105, important steps have been made in all arrangements of the Belgian flood risk governance, *e.g.* DIWP, Plan PLUIES, Royal Decree of 2006 on Emergency Planning, inclusion of flood damage in the fire insurance, *etc.* All these efforts indicate a growing attention for FRM in Belgium. At present, an ambitious flood risk policy is being pursued, *e.g.* the regulation concerning signal areas attempts to prevent additional flood damage in flood prone areas. It remains yet to be seen whether the ambitions of the government can overcome the bottlenecks persistent in the field.

Since FRM does not only depend on initiatives at the federal and regional level, but also on their implementation by local actors, the next 2 chapters will give a look on how flood issues are tackled in the cities of Antwerp, Geraardsbergen and Lessines. Among others, it will be shown to what extent the 5 FRGA at the national scale are reflected in the case studies and to what extent policies and legal initiatives at the national scale enable or constrain a resilient FRM at case study level.

3. Flood Risk Governance in Antwerp

3.1 Introduction and scope of the analysis

With 512,000 inhabitants, Antwerp is the Scheldt basin's largest city (see **Figure 18**). The city is located on a vulnerable spot along the river; while the river downstream from Antwerp forms a funnel, it narrows up significantly near the city. Although the river presents a large potential threat, Antwerp has not been affected by river flooding in recent years.

This case study investigates how flood risk governance has been developed in a big city with a high potential threat but limited flood experience. In this sense, the Antwerp case stands in contrast to Geraardsbergen and Lessines, which are small cities with a lower potential threat but larger flood experience. Moreover, Antwerp is an interesting case for analysing flood risk management since it belongs to the cities to be protected by the Flemish Sigma Plan (see Chapter 2).[89] In this chapter, attention is paid to the impact of this plan on the local Flood Risk Governance Arrangement (FRGA).

The case study concentrates on flood management at city level but keeps an open view to events taking place in the wider Antwerp region. Antwerp City is composed out of 9 districts, which have their own district governments but do not exercise authority on flooding issues.[90] Consequently, the lowest level of government involved in the study is the city government.

[89] The Sigma Plan of 2005 is an integrated management plan for the tidal Scheldt river, which aims to improve its flood safety, accessibility and natural value. It forms the successor of the Sigma Plan of 1977, which focus was limited to flood protection.
[90] The districts include Antwerp, Berendrecht/Zandvliet/Lillo, Berchem, Borgerhout, Deurne, Ekeren, Hoboken, Merksem and Wilrijk.

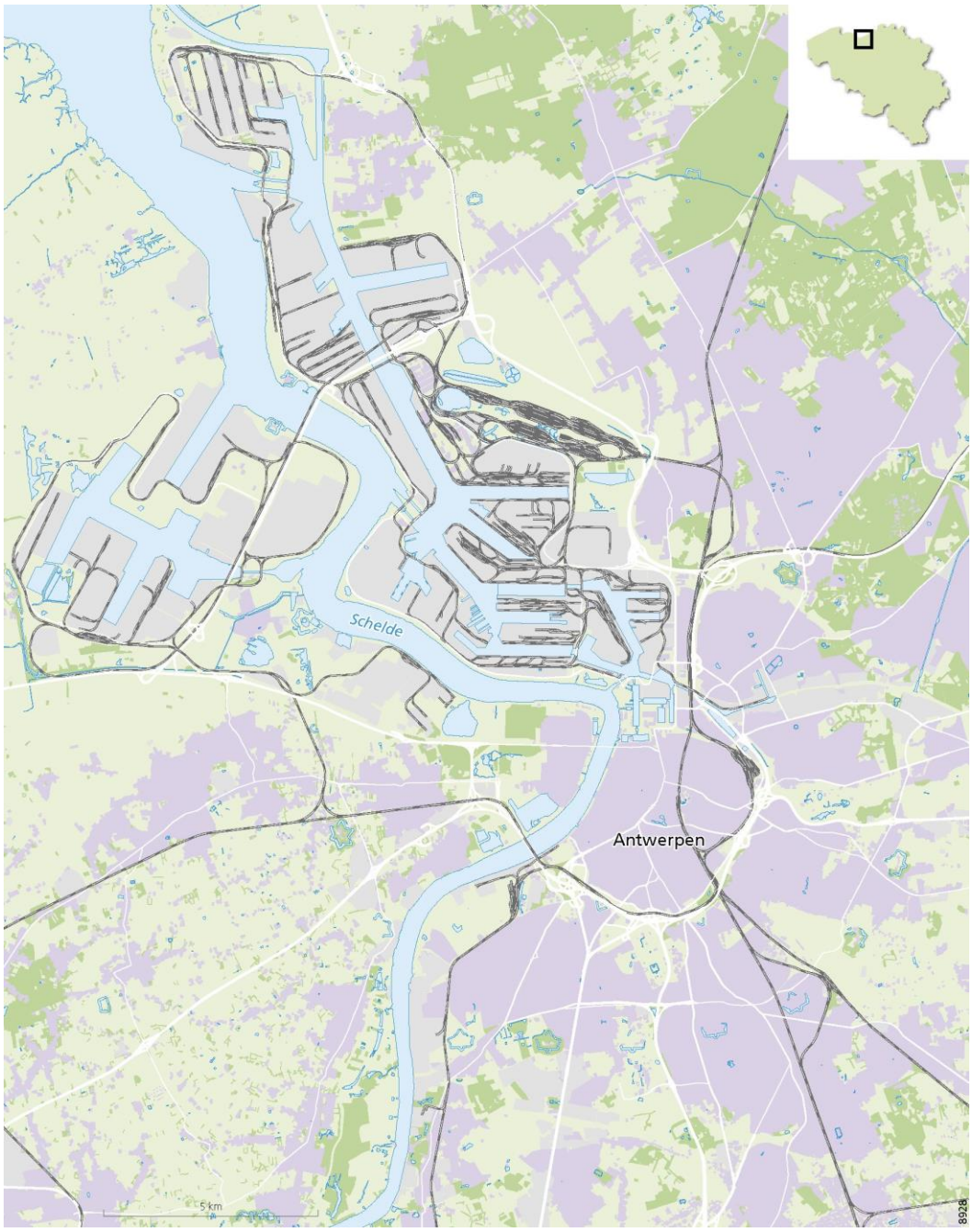


Figure 18: Map of the Antwerp case study.
Source: Carto – Faculty of Geoscience – Utrecht University

3.2 Contextual background of the case study

Flood vulnerability

With its location along the Scheldt, Antwerp is vulnerable to tidal storms. Devastating storms took place in 1953 and 1976. After the latter, a 'temporary' water barrier was built along the Scheldt quays, which has protected the city against flooding up until today. But the current protection level of the Scheldt basin is estimated only to withstand a storm with a return period of 1/75 years.

Therefore the original flood protection plan (Sigma Plan) has been adapted in 2005, which should lead to a protection level of T1000-T4000.[91]

Although Antwerp has not suffered from tidal flooding since 1976, it has been confronted with flood problems of pluvial cause in 1998 and 2003. These floods took place in the low-lying but densely populated districts of Ekeren and Merksem (0,90 m NAP at its lowest point), north of the city centre (see Figure 19). The 1998 flood was caused by a mixture of exceptional precipitation and inadequate drainage infrastructure. In the past, the area formed the delta of the Schijn river but over time the watercourse had been piped up. Because its surrounding area had been developed and the piped river was not well-maintained, the zone had become very vulnerable to flooding.

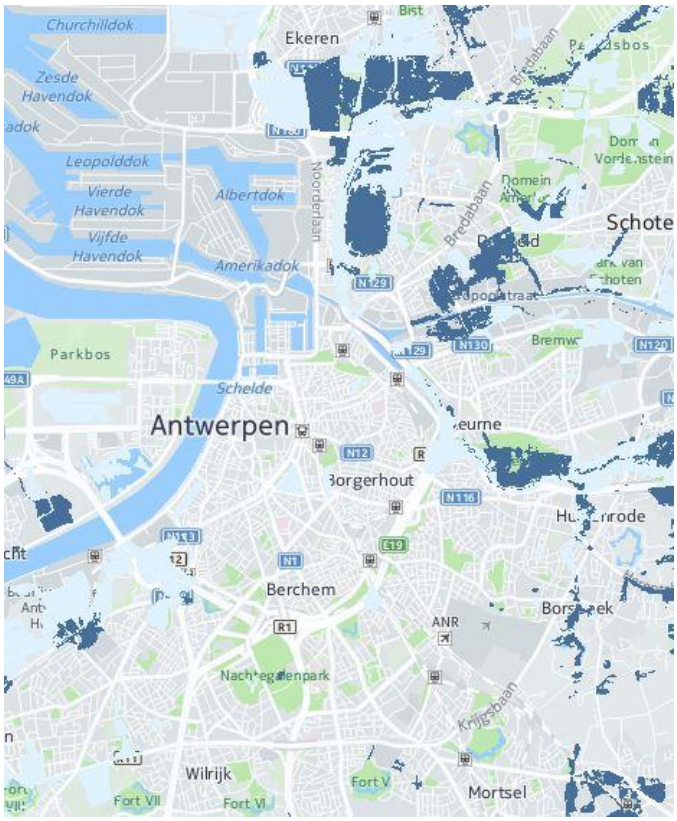


Figure 19: Flood-prone areas in Antwerp.
The dark blue zones signify effectively flood-prone areas, the light blue potential flood-prone areas. Most susceptible for flooding are the districts of Ekeren and Merksem, north of the city centre (Source: AGIV 2014).

Physical and social infrastructure

The Antwerp region forms the centre of Belgium's logistical network. It is circumvented by several national and international highways and is on one side demarcated by the Scheldt and on the other by the Albert Canal (which links the Scheldt to the Meuse river). Antwerp also houses Europe's second largest port (Eurostat, 2015).

[91] In contrast to the Dutch Delta Plan, the Sigma Plan has not started from a prescribed safety standard but based its policy on cost-benefit analysis. This analysis determined T1000 as the most optimal protection level for rural areas and T4000 for cities.

Thanks to its economic position and size, Antwerp possesses financial and human resources which most municipalities do not. This despite the fact that the average income level of its citizens lies 10% below the Belgian average. Citizens living in the low-lying parts of Ekeren and Merksem receive a middle-high to high median income level (Antwerp City, 2014).

3.3 Analysis of flood risk governance in Antwerp

The Antwerp FRGA can be unravelled into 3 different sub-arrangements: Urban Water Management, Flood Defence and Flood Preparation. These sub-arrangements differ from the national FRGA because the link between flood risk prevention and protection is less strong at the local level.

The Urban Water Management Arrangement deals with pluvially-caused flooding, while the Flood Defence Arrangement focuses on the prevention of tidal and fluvial floods. The Flood Preparation Arrangement aims at the prevention of flood damage through crisis management.

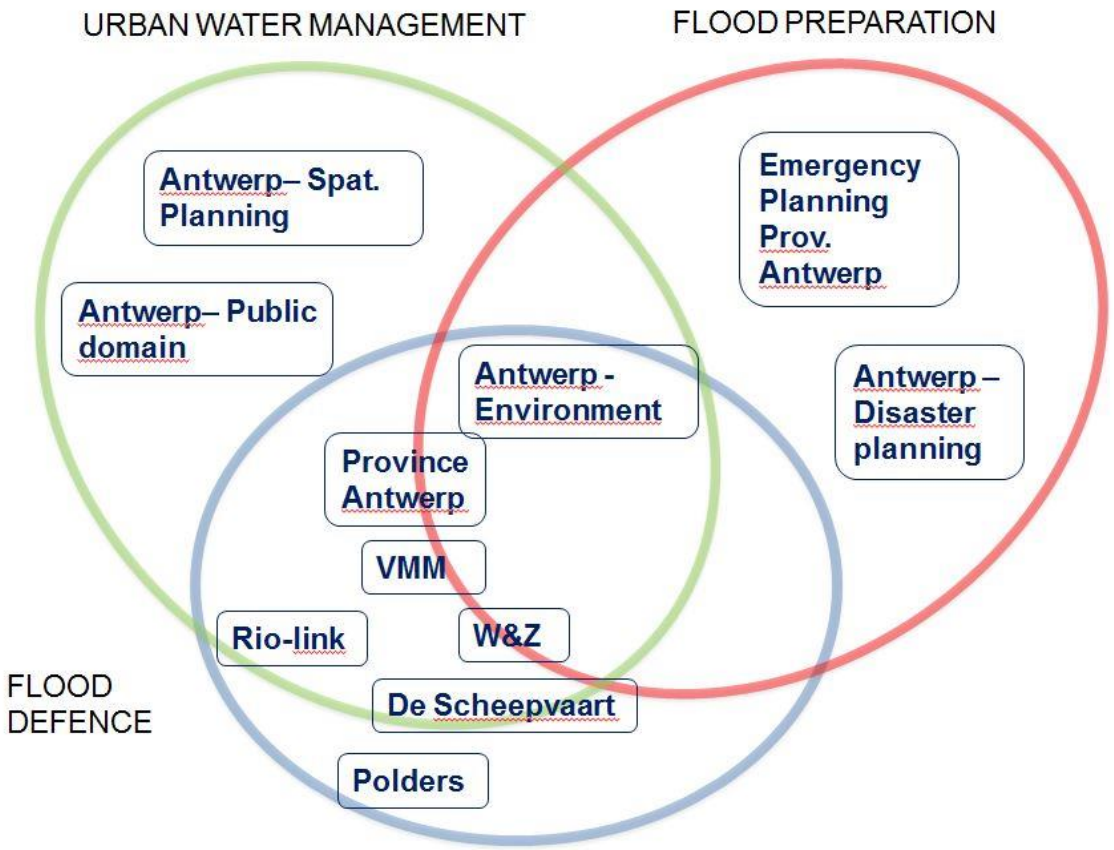


Figure 20: Governmental actors within the Antwerp FRGA

3.3.1 Actors

Actors within the Antwerp FRGA are situated at 4 governmental levels, namely municipal, provincial, regional and federal (see Figure 21). The municipal level dominates the Urban Water Management and Flood Preparation Arrangement, while the Flood Defence Arrangement is mainly comprised of supra-local actors. Within the Antwerp city administration, the Departments of Public Domain and Spatial Planning are responsible for the development and implementation of regulation on water infiltration, deliverance of building permits and the design of public space. The Environment

Department is in charge of the development of a climate adaptation strategy. The management of the sewage system has been outsourced to a public company named rio-link.
Flood Preparation is in hands of the Disaster Planning Department, which drafts emergency plans and coordinates the 5 disciplines involved in crisis response.[92] The municipal actors are supported by the federal governor's emergency planning Department for the province of Antwerp.

There is no active civil society group, which we could find within Antwerp, involved in issues related to flooding

3.3.2 Rules

An overview of the main regulation per sub-arrangement is provided below.

- *The Urban Water Management Arrangement:*
  - In accordance with the DIWP, advice is requested from the water managers concerning the impact of a permit, plan or programmes (*e.g.* building permit, spatial implementation plan) on the water system. The advice forms the basis of the water paragraph in the permit, plan or programme.
  - The Flemish government selected a number of signal areas, i.e. zones in flood-prone areas with a hard, yet undeveloped destination in the territory of Antwerp (*e.g.* building or industry zones with are not yet built on). For each of them a decision needs to be taken as to whether their destination needs to be changed or whether they can be further developed under strict conditions.
  - The city has developed a Green Plan with attention for the nexus between water and green provision in public spaces.[93] A Rainwater Plan, which should enhance the attention for water retention in the public domain, is currently under development.
  - On 4 April 2011 Antwerp revised its building code.[94] The new code includes the obligation for new roofs with an inclination of less than 15° to install a green roof.

- *The Flood Defence Arrangement:*

Flood defence in Antwerp is mainly determined by the Sigma Plan of the Flemish government, which aims to protect the city against a 1/4000 storm (W&Z, 2013b). In order to do so, the existing water barrier needs to be raised by 90 cm.[95]

- *The Flood Preparation Arrangement:*

As is obliged by law, Antwerp has a General Emergency And Intervention Plan (GEIP).[96] In practice, crisis response in case of flooding is based on informal 'action plans' and experience.

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[92] These disciplines are relief work, medical relief, police, logistic support and information.
[93] Green Plan Antwerp, Part III: Environment, April 2013, Available on the Internet at: http://www.antwerpen.be/docs/Stad/Bedrijven/Stadsontwikkeling/SW_Beleid/201304_03_BG_Milieu_DEF_kl.pdf, last accessed 2 May 2014.
[94] The new Building Code is available on the Internet at: http://www.antwerpen.be/docs/Stad/Bedrijven/Stadsontwikkeling/SW_Burgers/Bouwvergunning/bouwcode_definitievevaststelling.pdf, last accessed 17 June 2014.
[95] Principal Agreement Master Plan Scheldt Quays, approved by the Aldermen Board at 03/09/2010.
[96] General Emergency and Intervention Plan Antwerp, approved by the Aldermen Board of Antwerp at 22/11/2013.

3.3.3 Resources

A lack of financial resources is palpable in the Flood Defence Arrangement, particularly concerning the implementation of the Sigma Plan. The Flood Preparation Arrangement on the other hand is said to be well-equipped in terms of financial, material and human resources. Actors from the Urban Water Management Arrangement are in need of additional staff. Compared to other municipalities, Antwerp has relatively extensive expertise at its disposal, including an hydrologist, professional fire brigade, *etc.*

3.3.4 Discourses

In relation to fluvial and tidal flooding, the actors of the Antwerp FRGA employ a discourse of flood protection. Floods are to be prevented and in the densely populated territory of Antwerp this implies that the actors need to rely on flood defence infrastructure. In more rural areas, the water managers say to prefer mitigation techniques but in the city this is deemed impossible. For the prevention of pluvial floods, the actors make use of a discourse of water storage and infiltration: building expansion to flood-prone areas is to be restricted, water should be infiltrated and stored in the public domain, *etc.* The VMM and Antwerp Environment Department frame this in the wider discourse of multi-layer water safety (see p.43).

Water management is regarded as being a highly technocratic subject, which is not well-suited to public participation. Particularly within the Flood Defence Arrangement, floods are framed as a government responsibility. This discourse is also widely adopted by the population. In other arrangements, there is a tendency to share responsibilities with citizens. For example, local crisis managers tend to expect that citizens will provide their own sand bags and in the Urban Water Management Arrangement building requirements are to be applied and financed by the population.

3.4 Explaining change and stability in Antwerp flood risk governance

3.4.1 Trends of change

The main shift within the Antwerp FRGA, although one which is mainly observed in discourse, is the replacement of an exclusive focus on flood defence towards a discourse of 'making space for water'. Flood defence remains a dominant strategy within the Antwerp arrangement but is complemented with flood risk prevention and mitigation measures.

Next to that, also the flood preparation strategy has become more prevalent. Compared to the floods in 1998, the city nowadays has a well-developed disaster planning department. According to the emergency planning official, the attention given by other departments for emergency planning has risen. Contacts between emergency planning and others remain ad hoc but with the development of the climate adaptation strategy they could become more institutionalised in the future.

Although the number of actors involved remains high, recently efforts have been made to reduce the degree of fragmentation, *e.g.* the transfer of competences of 3rd category watercourses to the province and the abolition of the Polder of Stabroek. Promising as well is that the new Flemish Governmental Agreement 2014-2019 prescribes the merger of the departments W&Z and De Scheepvaart. Moreover, actors indicate that formal and informal coordination between them has increased.

3.4.2 Explaining change

An overview of the main endogenous and exogenous factors causing changes in the FRGA between 1995 and 2015 is given in Table 24, below.

Table 24: Overview of factors causing change in Antwerp

	Exogenous factor	Endogenous factor
Growing attention for water storage and infiltration	• Influence from Flemish governmental level	• 1998 Flood • Discourse of climate change adaptation
Increase investments in water policy and crisis management	• General professionalization crisis management	• 1998 Flood
Reduction of degree of fragmentation	• Influence from Flemish governmental level	

- ***The 1998 flood***

The 1998 flood served as an eye-opener for many actors involved in the Antwerp FRGA. After the flood, awareness rose that flooding could no longer be countered by the traditional defence methods alone, but that water needs space. This paved the way for a new discourse.

The flood event also had very direct consequences. Important investments were made both within the Antwerp Province and the Disaster Planning Department, such as the introduction of mobile phones, company cars, additional staff, sand bag storage, *etc.*

Of course, it is questionable whether the flood was the cause of change or merely the trigger. According to several water managers ideas for innovation were already circulating among them but the flood event opened a window of opportunity to provide the political support necessary for putting them into practice.

- ***Influence from the Flemish governmental level***

The Flemish regulation on the water assessment has served as an important driver of change within the Antwerp FRGA, although certain actors stress that the discursive shift towards space for water was not imposed by the Flemish government but developed within the city itself. Others do however explicitly refer to the water assessment as cause of change:

"*Today, the lowest-lying areas could not be allotted anymore since we have the water assessment*."
(Translated excerpt from interview with an official from the city administration)

Since Antwerp already had a Safety Cell and full-time emergency planning official, the Royal Decree of 16 February 2006 did not have big implications. On the contrary, the Royal Decree was, among others, drafted by the previous emergency planning official of the city and thus Antwerp served as a model for it. Innovation within the Flood Preparation Arrangement has mainly been influenced by the fact that Antwerp contains a high concentration of risks (transport, chemical industry, *etc.*) and because of their experience with pluvial flooding between 1998 and 2003.

- **Horizontal communication**

Within the Urban Water Management and the Flood Defence Arrangement best practices from other cities, within or beyond the confines of the country, are considered to be an important source of inspiration. Often, these examples are imported from the Netherlands, *e.g.* multi-layer water safety. Also participation in European projects is regarded as an important inspiration source for innovation.

- **Climate change**

Climate change is often mentioned as a reason for change. The Sigma Plan, for example, is based on an expected sea-level rise of 0,60 m by the year 2100. And with the prescription of green roofs in the revised building code the city wants to improve water infiltration but also to mitigate urban heat island effects. Respondents from the Spatial Planning Department also refer to climate change as being an important driver for the growing attention to give space to water.

- **Agents for change**

Change agents can be found in each of the 3 sub-arrangements.

A discourse-coalition is active, with a focus on water infiltration, within the Urban Water Management Arrangement. This coalition includes departments from the city administration who are supported by supralocal actors. Each member has its own competences to foster attention for water infiltration:

- Department Environment:
  - impose conditions on water infiltration and storage for the sale of public property;
  - conduct research on pluvial flood modelling in cooperation with rio-link;
- Department Spatial Planning:
  - revision of the Building Code;
  - nexus water and green development in spatial plans;
- Department Public Domain:
  - development of a Rainwater Plan;
  - water assessment advice;
- rio-link:
  - use of ditches and porous sewage pipes;
- VMM:
  - water assessment advice;
  - feasibility study on the reconstruction of the Schijn river.

A policy entrepreneur at political level has been former alderman Guy Lauwers, who initiated the idea of the Rainwater Plan.

Within the Flood Defence Arrangement another discourse-coalition is formed by W&Z and the Department of City Development. A joint project came to existence when W&Z and the city found each other in their interests to provide the Scheldt Quays with new flood protection infrastructure and a renovated public domain. The Scheldt Quay project was at political level supported by former mayor Patrick Janssens.

Also the Flood Preparation Arrangement contains a number of officials who are very proactive to improve the city's crisis management. As a result, the City and Province of Antwerp often play a role as forerunner in this domain.

3.4.3 Explaining stability

Apart from occasional shifts, the Antwerp FRGA possesses a number of stabilising factors, endogenous to the arrangement (see Table 25).

Table 25: Overview of factors causing stability in Antwerp

	Exogenous factor	Endogenous factor
• Actor fragmentation		• Organisational path dependency
• Low citizen involvement in crisis management • Insufficient provision water storage in public and private space		• Lack of flood awareness among population & spatial designers • Lack of enforcement

First, competences within water management remain fragmented. Attempts to reduce this fragmentation level are hampered by the interest officials from these organisations have in their existence. Sometimes, however, changes in personnel offer windows of opportunity either to abolish or merge actors.

The involvement of citizens in crisis management and the provision of water storage in public spaces requires a culture change which is still under development. Flood awareness among the population is very low and governmental actors are sceptical as to whether this could be raised through awareness campaigns. Some expect the use of financial instruments to be more helpful in fostering behavioural change.

The development of a Rainwater Plan is expected to raise the awareness of spatial designers to provide more space for water in the public domain. But apart from the prevailing culture, change is hampered by physical and structural factors. Large-scale flood mitigation measures have become unfeasible due to the building infrastructure in the city and its port, and also small-scale measures have to compete with many other spatial claims on the public domain.

Finally, promising legislative developments such as the provision of green roofs might be hampered in their implementation due to a lack of enforcement. Because of a human resource deficit, no control exists of the follow-up of building requirements.

3.5 Evaluating flood risk governance at the case study scale

In the following section an evaluation is made of the resilience, efficiency and legitimacy of the Antwerp FRGA. An overview of this evaluation is provided in the table below.

Table 26: Overview of the evaluation of the Antwerp FRGA

	Evaluation of the Antwerp flood risk governance arrangement	
Resilience	+	▪ increased capacity to resist
	+	▪ variety of strategies
	-	▪ lack of alignment between strategies
	+/-	▪ learning capacity but lack of implementation
	-	▪ lack of enforcement of regulation
	-	▪ lack of flood awareness among population
Efficiency	+	▪ attention for cost-efficiency in Sigma Plan
	-	▪ highly fragmented actor structure
Legitimacy	+	▪ high level of output legitimacy
	-	▪ low input legitimacy: little involvement of citizens in decision-making and implementation

3.5.1 Evaluation of resilience

Capacity to resist

Although the increase in flood safety from the Scheldt river through the Sigma Plan forms the corner stone of the Antwerp FRGA, its capacity to resist has only improved in terms of pluvial flooding in the investigated period. By dredging the piped Schijn river and installing additional pumping facility, a technical solution has been found for the flooding problem in the north of Antwerp. Since 2003 the city has faced only minor flood problems.

When it comes to tidal flooding, the Scheldt basin is currently only protected against a 1/75 year storm but once the Sigma Plan is implemented, the city's protection level should rise to 1/4000 (Broeckx et.al., 2010).[97] The problem-solving effectiveness of the Sigma Plan, i.e. preventing harmful floods, is widely recognised by experts and stakeholders. Its goal-attaining effectiveness, on the other hand, is threatened by budgetary constraints. Both W&Z and the city administration experience a deficit in budget to implement the plan as scheduled.

Capacity to absorb and recover

- ***Variety of strategies.***

Figure 22 gives an overview of the strategies used in discourse and practice in the Antwerp FRGA. Fluvial flood management relies on flood defence and, to a lesser extent, flood preparation. Pluvial flooding is addressed by flood mitigation, risk prevention and preparation strategies. Flood recovery includes the application of the federal insurance system.

[97] This figure is not a norm but merely the result of a cost-benefit analysis. Consequently, there are no legal consequences to the non-attainment of this safety level for the Flemish government.

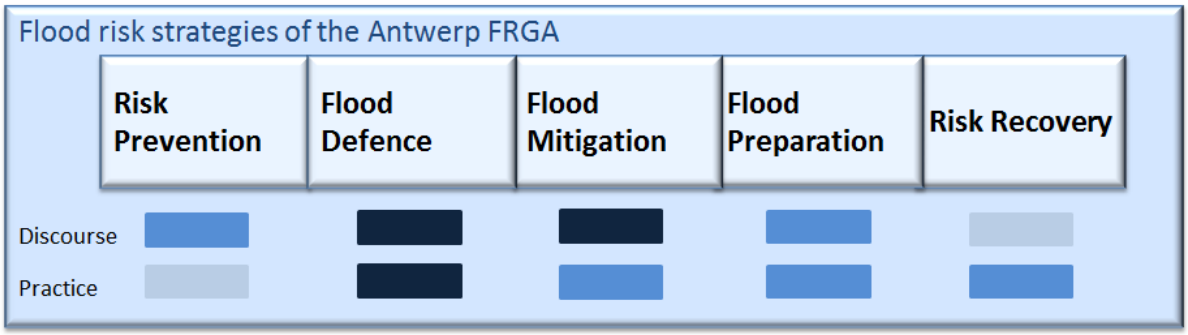

Figure 21: Flood risk strategies of the Antwerp FRGA

Flood risk governance in Antwerp is an almost exclusive governmental issue. No initiatives are present among the population of Antwerp by which to build up community resilience towards flooding. There is no active public debate on the issue, no examples were found of citizens protecting their own property and there is no tradition of citizen volunteering during emergencies. Neither does the city take initiative to foster self-reliance.

- ***Alignment between strategies.***

The sub-arrangements of the Antwerp FRGA work rather independently of each other. The intention of the Environment Department, however, to draft a climate adaptation strategy offers opportunities for a more holistic approach to be taken in the future.

- ***Coordination between actors****.*

All actors of the arrangement consider the high degree of actor fragmentation a suboptimal situation. The fragmentation level complicates the decision-making process and demands a high input of resources. However, a positive trend can still be observed (see 3.4).

Capacity to adapt

- ***Within the Urban Water Management Arrangement.***

The Antwerp city administration shows itself as being open to learning and innovation. It looks to other cities in and outside Belgium for inspiration and participates in European projects.
In recent years, legislative steps have been taken to improve rainwater infiltration and water storage, both in the public and private domain. But while ambitions are high at policy-making level, they wane throughout the implementation process. Spatial plans do pay attention to water provision, but this aim has to compete with other spatial claims once translated to a specific design. The Rainwater Plan, which is currently under development, should stimulate spatial designers to pay more attention to space for water.
In the private domain, requirements on water infiltration and storage are imposed but not enforced. Due to the lack of follow-up, concerning compliance, it is often difficult to evaluate the effectiveness of the regulation.

- ***Within the Flood Defence Arrangement****.*

Although fluvial flooding is mainly addressed through flood defence infrastructure, explicit attention is paid to adaptive capacity. The Sigma Plan will be evaluated and if necessary adapted in 2050.

- ***Within the Flood Preparation Arrangement.***

The floods in 1998 led to a widespread criticism on the city's relief work operations, particularly in relation to the lack of communication. In the meantime, the Antwerp crisis management has gone through significant changes. It became more professionalised and possesses additional resources. The greatest leap forward has been made in the domain of communications. The department of Disaster Planning uses a variety of communication channels which include social media, websites, automatic telephone calls, *etc.*

3.5.2 Evaluation of efficiency

Cost-efficiency has been a principal driver in the development of the Sigma Plan. For Antwerp, the cost-benefit analysis concluded that T4000 would be the most optimal protection level (Broeckx et.al., 2010).

The FRGA's efficiency as well as its effectiveness, is hampered by the Flood Defence Arrangement's level of actor fragmentation. Today, no fewer than seven water managers are active in the Antwerp territory. It regularly occurs that watercourses are neglected because it is unclear who is responsible or that the impact of projects on other watercourses has not been taken sufficiently into account. In order to be effective, a high amount of coordination is required within the FRGA, which makes the decision-making time-consuming.

> *"The different governmental layers work independently from each other. At the territory of Antwerp I often deal with De Scheepvaart, W&Z, VMM, the Port, with the Province and with our own maintenance services. Those actors actually are not actively involved in each other's management areas and do not always know from each other what or how they are managing. As a result, it happens that the city maintains watercourses for which they are actually not responsible."*
> (Translated excerpt from interview with an official from the city administration)

3.5.3 Evaluation of legitimacy

Procedural justice, participation and acceptability

The engagement of citizens in flood risk governance in Antwerp is low. Official plans, such as spatial plans and the river basin management plan, have been subject to a public inquiry but the response was limited. Also the participation session organised in preparation of the Sigma Plan was not well attended. Later sessions focussing more specifically on the implementation of the Scheldt Quay project were called a success but they did not address the water barrier itself.
The only sub-arrangement in which citizens are assigned an active role is the Urban Water Management Arrangement, for which they are responsible for the implementation of the requirements imposed by the water assessment and building code.

Although public participation is low, the current legitimacy of the FRGA does not seem to be threatened by it. Flood risk governance is considered to be a government responsibility by the population at large.

"I also realised through the participation process that there is a large support base [for the Scheldt Quays Master Plan]. At the participation meetings it was always remarkable that everyone agreed that something needed to happen. The precondition that the height of the flood protection needed to be raised has rarely been questioned."[98]
(Translated excerpt from an interview with an actor from the city administration)

In the long run, the lack of citizen participation and interest in floods might comprise a threat to the arrangement's legitimacy and resilience. Actors from different governmental levels point out that in the future it will not be possible to protect certain low-lying neighbourhoods from flooding. Hence, the government sees its own responsibility as being limited only to a certain point. However, this message has not been widely communicated to the population of these areas and from the interviews was clear that the average Antwerp citizen still expects the government to prevent floods or at least mitigate the damage caused by them. When a future flood event would emerge, this discursive discrepancy could severely challenge the arrangement's legitimacy.

"Interviewer: Would the neighbourhood be prepared in case of a new flood event?
Respondent: Many houses have been sold in the meantime so the people that live there now had nothing to do with it. Therefore I don't think so. A good action plan of the government is needed in that case."
(Translated excerpt from interview with a flood victim of 1998)

Social equity

According to the CBA, the societal benefits of flood safety are largest when Antwerp is protected against a tidal storm of T4000 through collective defence infrastructure. Collective protection, paid by the Flemish or Antwerp taxpayer, is generally preferred by water and sewage managers. A prudent discourse is applied only in the Flood Preparation Arrangement towards sharing flood response responsibilities with local inhabitants.

3.6 Conclusions

With its location next to the Scheldt, Antwerp faces a potential threat of severe flood damage. In order to protect the city against a tidal storm, the Sigma Plan wants to improve its flood defence infrastructure significantly. Between 1995 and 2015, however, changes in the Antwerp FRGA were mainly influenced by another flood problem, namely pluvial flooding. The 1998 floods have led to a strengthening of the flood preparation and flood defence strategy. Apart from that, also the flood risk prevention and mitigation strategy underwent important changes, mainly influenced by Flemish regulation and awareness raising.

Does the Antwerp case form a typical example of local flood risk governance or an atypical one? It is typical in the sense that just like the majority of the Belgian municipalities, it is rarely confronted with flood problems. Therefore, it serves as an interesting example of how FRG is dealt with in cities, which have a potential threat but limited recent experience.

[98] An elaborated participation process took place in the development of the Master plan (i.e. the implementation plan for the Sigma plan and renovation of the quays in Antwerp). The debate on the required flood safety levels itself was however excluded from this process.

The Antwerp FRGA distinguishes itself from most other municipalities, however, through its capacity to invest. When it comes to its budget, but even more so in terms of expertise, Antwerp City has resources that most municipalities cannot afford. The professionalization of the arrangement correlates to a low flood awareness among the population and consequently a low engagement. Even more than citizens of rural areas, the Antwerp population considers FRM to be a government responsibility.

The sub-arrangements defined in this case differ from those at national level. Also in the next two cases, the strategies on flood risk prevention and protection are not so tightly intertwined as is the case nationally. Within the regional Water System Arrangements, the two strategies are addressed by departments from the same government and coordinated through an official coordinating body. At municipal level, the local level dominates the first strategy and the supra-local governments the second. Furthermore, coordination between the strategies depends on voluntary initiatives from specific departments. One exception to this rule is evident in Geraardsbergen, in which a separate coordinator for integrated water policy has been assigned (see following chapter). We consider more formal coordination mechanisms between the different sub-arrangements to be beneficial for the resilience and efficiency of local FRGAs. In Antwerp, this kind of coordination could be established in the framework of the climate adaptation strategy.

4 Flood Risk Governance in Geraardsbergen and Lessines

4.1 Introduction and scope of the analysis

With 32,950 and 18,448 inhabitants respectively, Geraardsbergen and Lessines are two small cities along the Dender River (see Figure 22). By offering a rural scenery relatively close to Brussels, Ghent and Mons, the region has become attractive to inhabitants searching for affordable building plots in the countryside. But when in 2010 the Dender valley was hit by an extreme precipitation event, several districts of both communes became victim of severe flooding. In the wake of the event, both Geraardsbergen and Lessines took steps to improve their flood risk management. Since the former is situated in the Flemish Region and the latter in the Walloon Region, they offer interesting cases for cross-regional comparison. The analysis of Geraardsbergen and Lessines was conducted as two separate case studies, but we have decided to present them in one integrated chapter to benefit fully from the possibilities these cases offer for comparison.

The case studies investigate changes in flood risk governance between 1995 and 2015, but with a special focus on the situation prior to and following the flood event of 2010.

Figure 22: Map of the case studies of Geraardsbergen and Lessines
Source: Carto – Faculty of Geoscience – Utrecht University

4.2 Contextual background of the case study

- **Flood vulnerability**

As a tributary of the Scheldt, the Dender belongs to the international Scheldt basin. The river runs for a total of 69 km, 18 km of which is situated in Walloon territory and the remaining 51 km of which lies in Flanders (see Figure 23) (CIW, 2014).

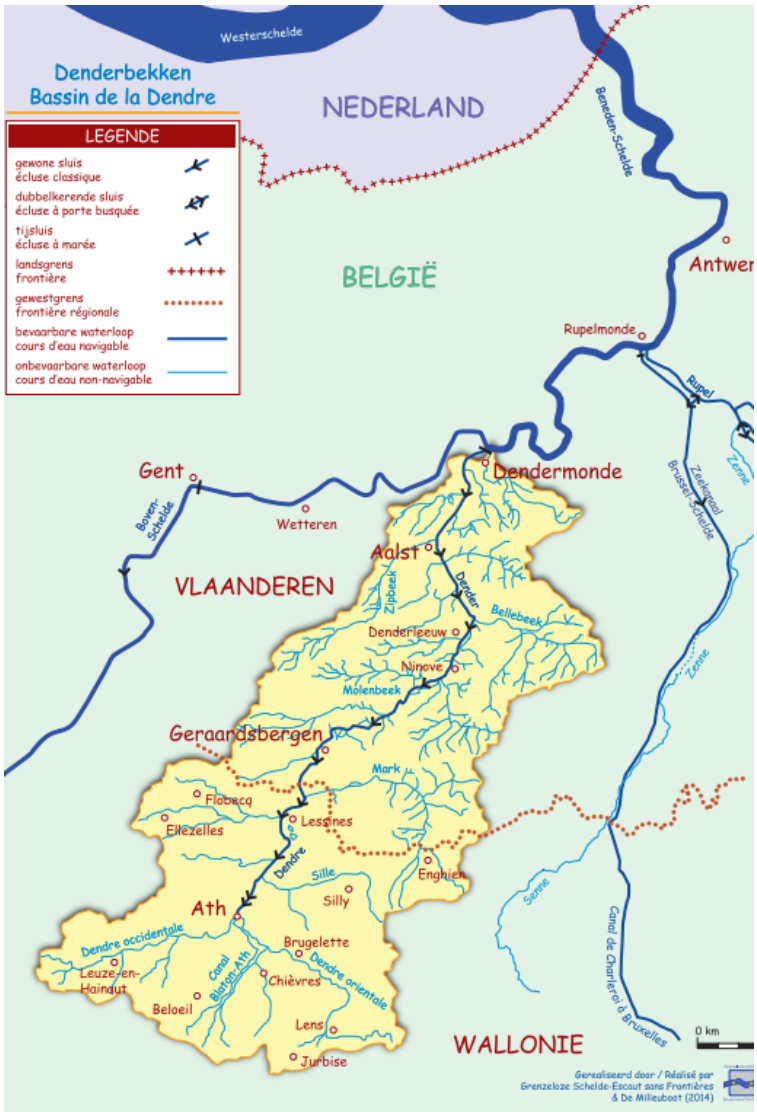

Figure 23: Dender basin with indication of Geraardsbergen and Lessines.
(source: Grenzeloze Schelde, 2014)

The main part of the Dender basin is accessible to smaller, recreational vessels exclusively (max. 300 ton), but between Aalst and Dendermonde the river can be used for freight transport. As a consequence, the river is categorised as being navigable and managed by navigable watercourse managers W&Z (Flanders) and DGO2 (Wallonia). Its tributary rivers, on the other hand, lie in the hands of several non-navigable water managers.

The Dender is known as a typical spate river (Giron et al., 2010). Rainfall strongly influences the rivers' discharge; as a result, a sudden rise in its water level is a common phenomenon in periods of

precipitation. To facilitate navigation, the Dender was canalised and 13 sluices were built in 1865. Today, the worn-out sluices form a barrier to effective drainage of the rivers' discharge to the Scheldt and are, thus, in need for renovation.

The spatial development(s), as well as geographical conditions, also increase the vulnerability of the river basin. Since the 1970s, significant parts of the natural flood zone of the river have been filled in by housing and economic activities. Over the last 20 years, the river has caused flood damage at least 4 times: in the winter of 1995, 1999/2000, 2002/03 and 2010 (CIW, 2009). The most severe flood event during the period researched took place in November 2010. It led to the flooding of 398 and 239 houses in Geraardsbergen and Lessines respectively, and to one casualty (Assuralia, 2011).

- **Physical and social infrastructure**

Both the Flemish and Walloon Dender basin are dominated by arable land and meadows (70%) (CIW, 2014; CR Dendre, 2014). Compared to other Flemish basins, the Dender has a relatively low degree of urbanisation (18%). In Wallonia, housing and industry is even limited to 8%. The basin has a number of small and medium industry zones. Heavy industrial activities are hardly present.

According to the welfare index, both Geraardsbergen and Lessines belong to the middle-range group of municipalities (Belfius, 2014).[99] Research of Coninx and Bachus (2008) shows that certain neighbourhoods of Geraardsbergen are socially to extremely socially susceptible to flooding (see Figure 24). Their analysis is based on parameters of age, health status, income, family composition, nationality and property type. The districts most impacted in 2010 belong in part to the zones indicated as socially susceptible.

[99] This index compares the average income within the municipality with the average income within Belgium.

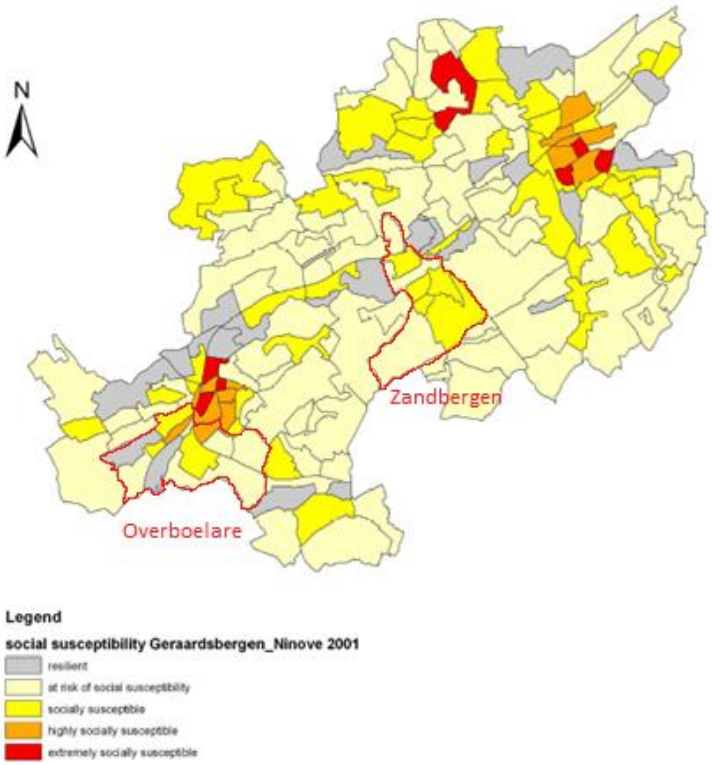

Figure 24: Social susceptibility in Geraardsbergen (left of the figure) and Ninove (right). *(Source: Coninx & Bachus 2008.)*

4.3 Analysis of flood risk governance in Geraardsbergen

The following sections will provide an overview of the flood risk governance arrangements (FRGAs) of the two cases. First, the arrangement of Geraardsbergen is analysed, the section which follows will go into the Lessines arrangement.

The Geraardsbergen FRGA can be divided into 3 different sub-arrangements: Urban Water Management, River Management and Flood Preparation. The Urban Water Management Arrangement regulates its impact through spatial planning, whereas the River Management Arrangement focuses on the prevention of fluvial floods. The Flood Preparation Arrangement aims at the prevention of flood damage through crisis management.

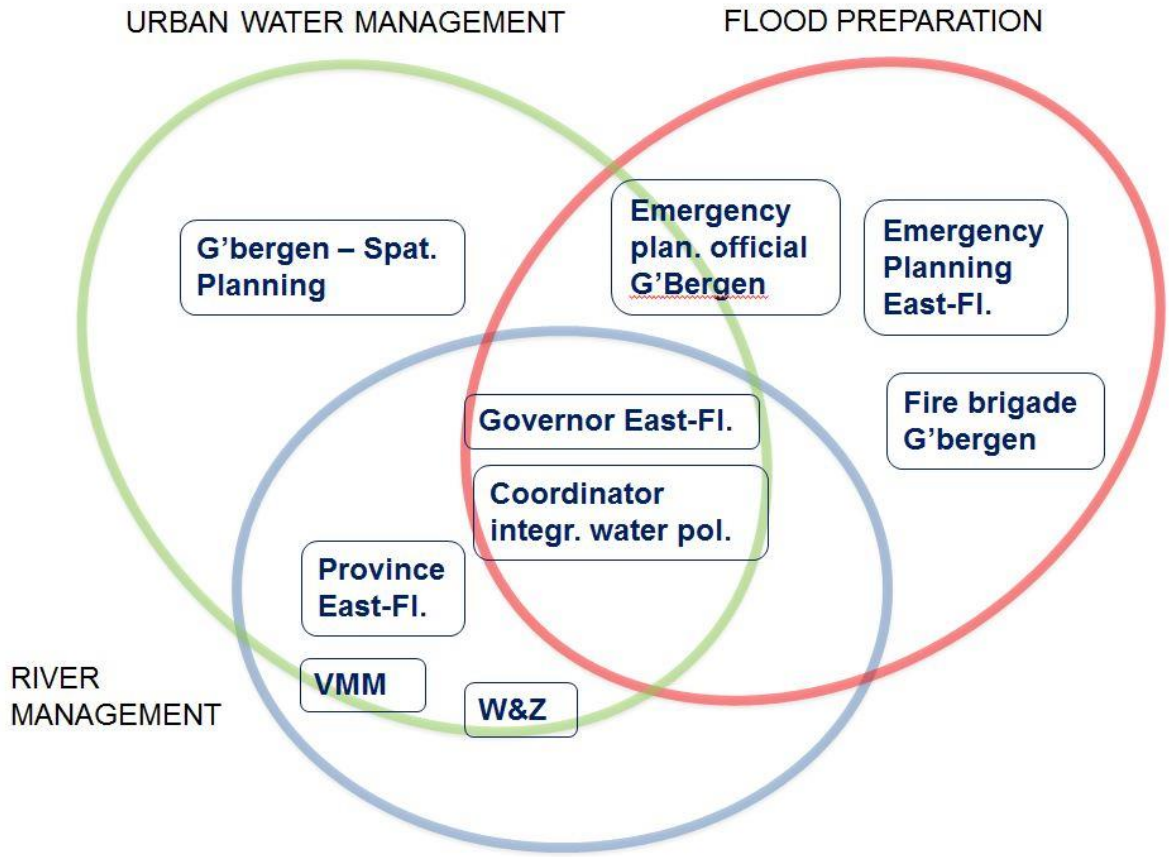

Figure 25: Overview of governmental actors in the Geraardsbergen FRGA

4.3.1 Actors

The principal governmental actor of the Urban Water Management Arrangement is the City of Geraardsbergen (see Figure 25). Its spatial planning department has responsibilities in granting building permits, drafting spatial plans, building code, *etc.* The city administration is supported by water managers at the provincial and Flemish levels in its decision-making, who give formal advice in the framework of the water assessment. Moreover, the city is the owner of the sewage system within the municipality, but it has outsourced its management to the public company De Watergroep.

Unlike Urban Water Management, the actors of the River Management Arrangement are located at the supra-local level. The Dender is managed by W&Z, the non-navigable watercourses of 1st category (*e.g.* the Marke) by VMM and the non-navigable watercourses of 2nd and 3rd category by the Province of East-Flanders.[100]

Flood Preparation is a municipal competence principally. The main actors here are the mayor, who presides over the safety cell, the city's emergency planning official, who prepares the activities of the

[100] In 2014 the municipality of Geraardsbergen transferred its watercourses of 3rd category to the Province of East-Flanders. Consequently, they have been reclassified as 2nd category. For the sake of readability, however, we have decided to continue to describe them as 3rd category in this report.

safety cell, and the fire brigade. Geraardsbergen is supported in its crisis management by the emergency planning unit of the provincial governor of East-Flanders.

Following the 2010 flood, Geraardsbergen appointed a coordinator for integrated water policy within its administration, alongside an alderman who has the same title. They have the task to coordinate all the initiatives taken in the different domains surrounding flood risk management.

Two civil society actors are of particular importance within the FRGA; namely, the Committee of Overboelare and Omer Wattez. The first unites inhabitants of the Overboelare submunicipality, which was gravely affected by the flood in 2010. The citizens originally established the committee to assist one another with their insurance claims, but they became a pressure group to urge governmental actors to find solutions for the flood problem soon after. Omer Wattez, on the other hand, is an environmental group which advocates the restoration of the natural flood plain. The organisation does this by lodging appeals against every building permit issued in flood prone areas.

4.3.2 Rules

An overview of the main regulation per sub-arrangement is given below.

- **The Urban Water Management Arrangement**

The main regulation in the Urban Water Management Arrangement includes:

- The water assessment: in accordance with the Flemish DIWP, advice is requested from the water managers on the impact of the permit, plan or programme (*e.g.* building permit, spatial implementation plan) on the water system.
- The city's spatial structure plan mentions flood risk policy in its guiding part, these provisions are, however, not legally binding.[101]
- The Flemish government selected seven signal areas in the territory of Geraardsbergen, i.e. zones in flood-prone areas with a hard (*e.g.* building or industry), yet undeveloped, spatial destination.[102] For 3 of them, a first screening pointed out no further actions were needed. For 'Moerbeke' was stated that construction should be avoided or, when inevitable, should find place according to guidelines drafted by the province. Also for 'the Gavers' a plan will be drafted to allow for further development without impeding the current water storage capacity. For the areas of 'Roodkruisstraat' and 'Sint-Jozefsinstituut' a governmental decision is expected by the end of 2015.
- Geraardsbergen adopted a municipal spatial regulation on rainwater in 2009.[103] However, this has not yet been adapted to the new Flemish spatial regulation on the same topic. Moreover, the city grants a subsidy of max. €625 for the construction of infiltration facilities or a rainwater tank.

[101] Spatial structure plan City of Geraardsbergen, guiding part, p. 3.
[102] Signal areas are zones susceptible to flooding which have been assigned as building or industrial areas but which have not been developed yet. The signal areas have been listed in the River Basin Management Plans of 2008-2013. Thereafter, for each area an evaluation by the Flemish government has been made to determine which type of actions were necessary to protect these zones.
[103] Decision of City Council of Geraardsbergen on 15 December 2009

- **The River Management Arrangement**

On 25 May 2012, the Flemish Government announced a Concept Note for the Dender basin, on request of the City of Geraardsbergen for regional action. This document lists up actions to be taken in order to avoid new flood events. Central in the Flemish policy for the Dender stands the renovation of the sluice complex on the Dender river.

In the drafting up of the Flood Risk Management Plan, the Flemish government conducted a study to determine an optimal mix of prevention, protection and preparation measures for each watercourse in the Dender basin. The study concludes that, alongside protection measures[104], the Dender basin would profit from actions in the spatial planning domain, *e.g.* a building cessation and flood resilient building. This does however require action from actors outside the River Management Arrangement.

- **The Flood Preparation Arrangement**

Geraardsbergen possesses a General Emergency and Intervention Plan (GEIP), an operational safety cell and an emergency planning official. Considering the fact that the city has a lot of experience with flooding, the GEIP was considered sufficient to handle this type of risk. Therefore a specific plan on floods was not drafted.

In the wake of the 2010 flood, the City of Geraardsbergen has taken a number of innovative initiatives to improve its flood response. For example, an SMS warning service for citizens was developed and a subsidy of max. 250 euro has been introduced for citizens to install individual flood protection measures.

4.3.3 Resources

It is often stated in the forum of the public opinion that the Dender receives too little funding compared to other waterways, due to its low economic importance. However, W&Z denies that a lack of budget is the cause of the lack of progress in the implementation of protective infrastructure. Like the other water managers in the basin, the organisation says to be well-funded by the government. Following the flood in 2010, several water managers received additional budget for flood protection.

Complaints about budget are on the contrary regularly heard within the Flood Preparation Arrangement. Actors saw their budgets decrease during the period investigated (1995 – 2015). The fire brigade also mentions a shortage of volunteers.

Citizens affected by the 2010 flood have been compensated through the fire insurance. Next to that, the city investigated what would be the benefit of diminishing these properties' rateable value. This benefit appeared however to be limited to a saving of 50 euro per household. Instead, the city decided to spend the amount saved on the municipal budget by not reducing the rateable value on flood protection measures.[105] At annual level, this means an increase of the flood risk management budget of €36.000.

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[104] In terms of protection measures the study advises to widen the Dender, implement local dikes and to renovate the sluices. On its tributaries safety can be increased through the instalment of flood control areas and local dikes.

[105] Report of meeting Board of Mayor and Aldermen Geraardsbergen of 24 February 2014 (personal communication)

4.3.4 Discourses

The competent water manager, W&Z, declares that they, generally, follow the 3-step approach of capture-storage-drainage. However, at the Dender River itself they consider water buffering to be unfeasible because of geographical and hydrological conditions.
The Flemish water managers make use of the multi-layer water safety discourse. Based on the results of the FRMP-study (see supra), the actors claim more focus should be placed on flood risk prevention measures in order to decrease future flood risks.

All the actors from the arrangement agree that the flood problem in the Dender valley is mainly caused by the development of its flood plains. However, this situation is the result of political choices made in the past, which designated these areas as building zones. As a result, property owners assume they have a legal right to build there and the City of Geraardsbergen considers it not correct to refuse their permits. Instead, they chose to impose adaptive measures. But whereas the city wants to stimulate citizens to take individual protection measures, the population of flood prone zones considers flood protection as a government responsibility. If the government allows them to build, they should protect them.

4.4 Analysis of flood risk governance in Lessines

The FRGA of Lessines can be split into three sub-arrangements, which is analogous to the Geraardsbergen and Antwerp cases.

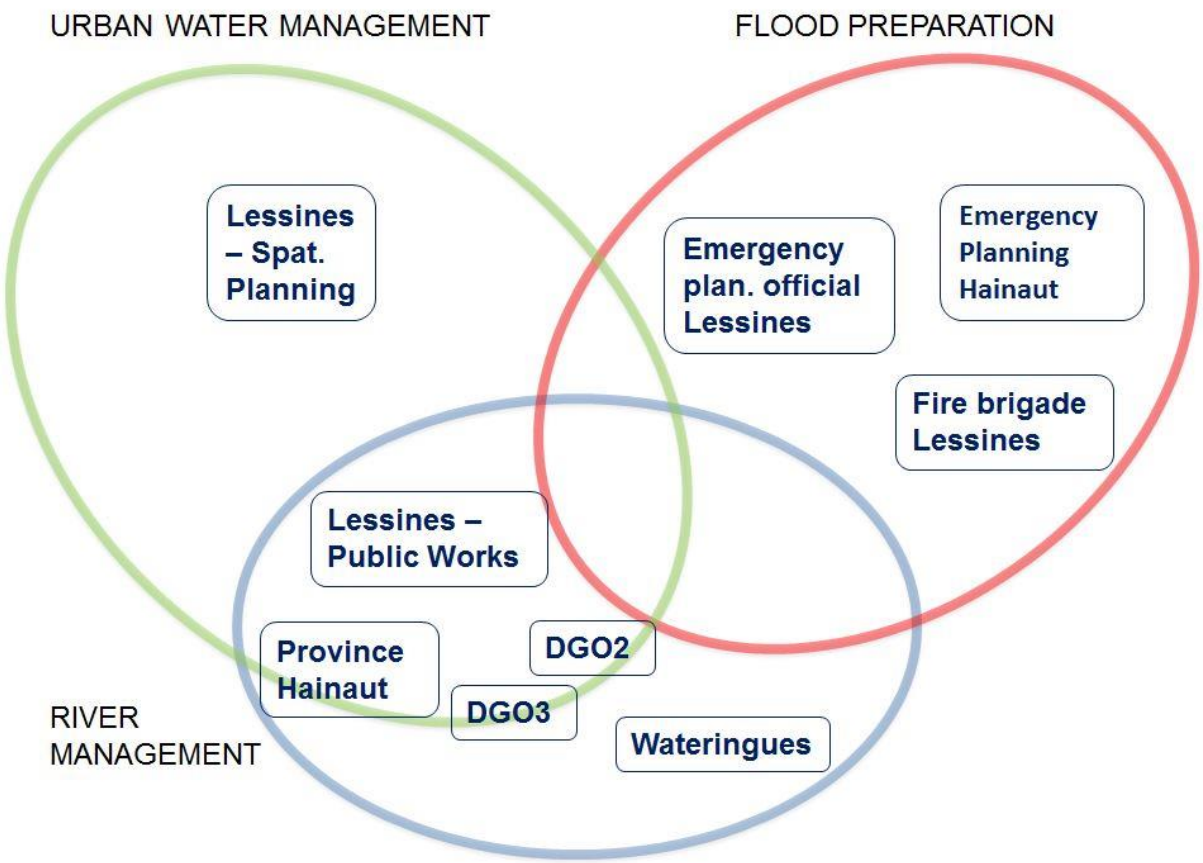

Figure 26: Overview of the governmental actors of the Lessines FRGA.

4.4.1 Actors

Six different watercourse managers are active within the River Management Arrangement in the territory of Lessines (see Figure 26). Within the Walloon government administration, DGO2 is responsible for the Dender river and DGO3 for 1st category non-navigable watercourses. The Province of Hainaut manages 2nd category watercourses and the City of Lessines manages those of the 3rd category. Moreover, the Wateringues of Tordois and of Trimpont are responsible for non-navigable watercourses in their territory.

The competences for Urban Water Management lie principally in the hands of the City of Lessines, since it is responsible for granting most building permits and can draft spatial plans and rules. The municipal level also serves as the main actor in the Flood Preparation Arrangement. Crisis response is the mayor's responsibility as he presides over the safety cell. He is supported in this task by the municipal emergency planning official and relief services and by the emergency planning unit of the governor of Hainaut.

Within the FRGA, a significant role is played by the *Committee of Flooded*, which is comprised of flooded inhabitants of Deux-Acren. With their organisation, the citizens of this sub-municipality want to exert pressure on the government to increase their flood safety. The committee meets with representatives from the city council and administration in the Flood Cell every 3 months. This initiative was taken by the mayor of Lessines in 2013 to include the citizens in the decision-making on flood management. Another coordination platform is the river contract Dender, which was launched in 2010. However, until now, the river contract has mainly focused on other water problems, which do not include flooding, such as invasive plants, biodiversity, *etc.*

4.4.2 Rules

Below follows an overview of the main regulation per sub-arrangement.

- **The Urban Water Management Arrangement:**

The City of Lessines has neither a municipal spatial plan nor a building code, but applies the region's plans and codes. It is subject to the sectoral plan of "Ath-Lessines-Enghien" of 1986.[106] In 2010, the plan was revised with respect to the territory of Lessines. The Walloon environmental council had urged the Walloon Region to investigate the potential for rainwater infiltration and retention in the development of an additional industrial zone. In the end, however, the revised plan did not contain any specific measures to reduce flood risks.

In the wake of the floods in 2010 and 2011, the municipal council had decided not to allow any further construction in flood prone areas.[107] On 25 April 2013, they limited the provision to high-risk zones only. In medium and low risk zones, building is permitted again under the condition that there is no elevation of the domain. The applicant has to state which measures are taken concerning flood vulnerability and additional measures can be imposed. For every building permit in these areas, advice has to be sought from the water manager involved, according to art. 136 CWATUP.

[106] *Belgian Official Journal* of 11 September 1987.
[107] See extract of municipal council of 26 April 2012, nr. 2012/036.

- **The River Management Arrangement:**

Following the 2010 floods, several policy initiatives were taken to enhance the protection level of the basin. After a study was conducted by Liege University (ULg, 2011), it was decided to construct a dike at Deux-Acren and a flood control area (FCA) at a tributary of the Dender. Their implementation is planned for 2016.
In their water management, the Walloon government regularly makes use of the instrument of expropriation. In order to facilitate this process, DGO3 has developed an alternative procedure in which the farmers involved can maintain their business after being expropriated.

- **The Flood Preparation Arrangement:**

In fulfilment of the Royal Decree of 2006, the City of Lessines appointed an emergency planning official in 2012, established a safety cell and approved its GEIP in 2013. Currently, it is developing a specific emergency plan (SEIP) on flooding.

4.4.3 Resources

With exception of the City of Lessines, all water managers received a budget increase after the floods in 2010. The Hainaut Province particularly managed to grow rapidly in recent years, both in terms of financial and human resources. As a result of this increase, the province was able to strengthen its expertise significantly.

In the Urban Water Management Arrangement, great progress has been made by the Walloon Government in terms of expertise with the development of the flood cartography. Interestingly, the arrangement tends to shift responsibilities concerning expertise to private actors; it is the private owner who needs to determine the compensation volumes necessary for water storage.

The Flood Preparation Arrangement's resource deficit is very similar to Geraardsbergen; finances, equipment and staff resources are felt to be lacking. Moreover, it appears to be difficult for an emergency planning official in a city the size of Lessines to acquire the hands-on experience and expertise necessary, since emergency situations are not very common and training opportunities are rare.

4.4.4 Discourses

Throughout the period investigated, a 'room for the river' discourse has slowly emerged among the non-navigable water managers operative in Lessines. This has resulted in a series of flood control areas, which have been implemented in the Walloon part of the Dender basin. At the Dender river itself, flood protection through water retention is deemed impossible. Instead, its water management relies heavily on flood defence infrastructure. The water managers, however, are well-aware that flood defence measures alone will not suffice to solve the flood problem in the basin. Instead, they state that additional actions, particularly in terms of spatial planning and crisis management, are required.

Within the Urban Water Management Arrangement, a mentality shift took place at local political level following the floods in 2010. In contrast to the past, significantly more attention is being paid to potential flooding problems when granting building permits.

Compared to Geraardsbergen, the City of Lessines places more responsibility on property owners' shoulders. In the wake of the 2010 flood, the Aldermen Board promptly decided to prohibit any further construction in flood-prone areas, regardless of the fact that these had been delineated as building zones. Thereafter though, a new allotment was permitted after all on the condition that '*the owners would not claim compensation from the state in case of flood damage*'.[108]

In general, the actors of the Lessines FRGA strongly hold to a discourse of powerlessness. A representative from the local spatial planning departments declared that *"we would like to be more ambitious but we don't have the power and resources for it*". The same fatalism can be found in the Flood Preparation Arrangement. Both governmental as well as non-governmental actors remark that once a flood occurs, there is not much they can do: '*water cannot be stopped*'. Consequently, the population of Deux-Acren does not believe in the effectiveness of individual protection measures. This stands in contrast to several governmental actors who state that flood management should be a shared responsibility. In contrast to Geraardsbergen, however, no policy initiatives have been taken to enhance the citizens' self-reliance to date.

4.5 Explaining change and stability in flood risk governance at the case study scale

The following chapter aims to explain the presence and absence of change in the FRGAs of Geraardsbergen and Lessines. In order to facilitate the comparison, both cases are addressed simultaneously.

4.5.1 Explaining change

Between 1995 and 2015, awareness rose among local politicians and citizens that more attention should be paid to flood vulnerability in spatial developments. Several investments were also made in the Dender basin to provide storage for water and the protection level was raised through local dikes and mobile dams. The cooperation between the actors within each FRGA has improved. While shifts at higher governmental levels occurred incrementally, change in Geraardsbergen and Lessines took place more radically and were induced by the 2010 flood.

As is clear from Table 27, the factors that explain these changes are to be searched both inside and outside of the local FRGAs.

[108] See extract of municipal council of 26 April 2012, nr. 2012/036.

Table 27: Overview of factors of change in Geraardsbergen and Lessines

Changes within Geraardsbergen FRGA		
	Exogenous factor	**Endogenous factor**
Growing attention for water in spatial planning	• Water assessment: objective basis for local authorities	• 2010 flood
Investments in flood defence & preparation		• 2010 flood
Increase of coordination		• Organisational reform after 2010 flood 2010
Changes within Lessines FRGA		
	Exogenous factor	**Exogenous factor**
Growing attention for water in spatial planning	• Flood cartography of the Walloon region: objective basis for decisions of local authorities	• 2010 flood
Development crisis management structure	• Legislation & pressure from supra-local governmental level	
Increase of flood mitigation & ecological water management	• Water Framework Directive	• General awareness-raising

- **The 2010 flood and the influence exerted at the supralocal governmental levels**

Geraardsbergen, and Lessines to a lesser extent, had already been confronted by a flood in 2003 but this had been framed as an 'exceptional event'. The fact that only 7 years later an even more severe flood hit the region came as a shock. In both cities, it led to changes in all 3 sub-arrangements but the most dominant shifts can be found in the Urban Water Management and Flood Preparation Arrangements.

In Geraardsbergen, the flood led to political acknowledgement that mistakes in spatial planning were made in the past and that greater attention to water in spatial development was required. Whereas floods, in most cases, offer opportunities for already existing discourses to become institutionalised by rules, the opposite occurred in the case of Geraardsbergen. Instruments for flood management through spatial planning, *e.g.* the water assessment, already existed but it was only with the 2010 flood that a discourse emerged which sought to implement the existing legislation, as it was meant by its developers. The new flood awareness was further institutionalised with the appointment of a coordinator for integrated water management within the city administration.

In Lessines as well, the flood event led to an increased awareness within the city government. More attention to flood vulnerability was given to the issuing of building permits. This evolution cannot be entirely ascribed to the flood event, but is also influenced by the development of flood cartography by the Walloon government. In the past, policy-makers in Lessines were well aware of their territory's flood susceptibility but it was not considered to be politically feasible to prohibit building on this basis alone. With the flood maps, local authorities have an objective basis on which to refuse permits or impose conditions.

At the time of the 2010 flood, Flood Preparation was the least developed sub-arrangement in Lessines. The event led to the recruitment of an emergency planning official and to the development of a GEIP, although indirectly; it was the provincial emergency planning department who urged the city to fulfil the requirements of the Royal Decree of 2006 concerning emergency planning.
In Flanders, the flood revealed missing links between water and crisis management. Under the stewardship of the late Governor of East-Flanders, André Denys, coordination between the two domains has improved.

In the River Management Arrangements, changes occurred in the resource dimension mainly. Several water managers, in Flanders and Wallonia, are reported to have received additional funding after the 2010 flood. Especially at provincial level, water departments grew in terms of financial and human resources. This development, however, was already underway prior to the 2010 flood and was brought about by internal re-organisation.

- **Discourse on ecological water management**

A shift that is not linked to the 2010 flood is the increased awareness among water managers in the two cases of ecological water management and flood mitigation measures. This development originates from the beginning of the century and is framed in a broader discursive shift (see infra).

- **Agents for change**

One policy entrepreneur at the local level is the mayor of Geraardsbergen, Guido De Padt. He has been the driving force behind a letter written by several mayors from the Dender region to urge the Flemish government to take necessary protection measures at the river. As well as the mayor, the coordinator for integrated water policy within the Geraardsbergen city administration serves as an important driving force in keeping the flood problem on the agenda and in the development of new initiatives.
The current mayor of Lessines, Patrick De Handschutter, is also attentive to the flood problem. For example, he has taken the initiative to install a Flood Cell and during his presidency the city council decided to prohibit building in high risk zones.

4.5.2 Explaining stability

Despite the fact that flood awareness among the government and the population is high in Geraardsbergen and Lessines, real changes in the field remain insufficient. This is caused by a number of inertia within the system (see Table 28).

Table 28: Overview of factors of stability in Geraardsbergen and Lessines

Stability within Geraardsbergen FRGA		
	Exogenous factor	**Endogenous factor**
• Insufficient flood protection • Urbanisation floodplain	• Complex decision-making procedures of the Flemish Region; • Lack of resources for crisis management at local and federal level.	• Chaotic organization of the public space, caused by spatial planning choices in the past; • Limited range of flood protection possibilities due to physical path dependency; • Lack of attention for water issues when enforcing spatial planning legislation.
Stability within Lessines FRGA		
	Exogenous factor	**Endogenous factor**
• Inadequate crisis management • Urbanisation floodplain • Insufficient flood protection	• Lack of resources for crisis management at local and federal level.	• Chaotic organization of the public space, caused by spatial planning choices in the past; • Limited range of flood protection possibilities due to physical path dependency; • Lack of attention for water issues when enforcing spatial planning legislation; • Path dependency of organisational structure.

A first bottleneck is the complex decision-making procedures for large projects, which aim to integrate divergent interests. Plans for the renovation of the sluices along the Flemish Dender, for example, were already drawn up in 2003 but their implementation has consistently been delayed. The delay is attributed to the fact that policymakers have to negotiate with a wide range of actors to come to a project with broad public support. In addition, it is said that prior to the flood in 2010, little priority was given by the Flemish government to the Dender basin. In contrast, DGO2 renovated 2 of its sluices in 1982 and 2000, a third one is currently under construction.

Secondly, inertia is caused by the spatial planning policy's traditions. Within the Dender valley, significant parts of the floodplain have been assigned as building zones, with the first spatial regional plans being drawn up in 1978 and 1986[109]. Consequently, these plans led to wide-scale legalised building in flood-prone areas. In principle, it would be possible to rezone them to a softer land use but this would require compensation for the value loss of the current land owners. In Flanders, new legislative tools have been recently developed which should increase the financial feasibility of rezoning. In Wallonia, a similar trend is not present. Instead, the City of Lessines decided to prohibit all new constructions in flood prone zones at first, but since these make up 60% of the available

[109] Spatial regional plan for Aalst-Ninove-Geraardsbergen-Zottegem (Royal Decree of 30 May 1978) and for Ath-Lessines-Enghien (Decision of Walloon Government of 17 July 1986).

building land the measures formed a barrier to the further development of the city. Therefore, conditional building is now, once again, allowed in low and medium risk zones.

A bottleneck linked to the spatial path dependency is the lack of enforcement of legislation, and more specifically of the conditions imposed by the water assessment/article 136 CWATUP in the building permit. We assume, especially in Lessines, that deviations from the permit might occur, since the responsibility to determine the compensation level is made by the property owner (see 0).

Current spatial planning also restricts the variety of possible flood protection measures. The water manager says that they are in favour of flood mitigation but because the Dender's natural flood plains have been built-up it needs to fall back on classical defence infrastructure.

Fifthly, resource deficits form a barrier for the Flood Preparation Arrangements; relief services largely depend on the municipality for their budget. In the aftermath of the economic crisis of 2008, however, many of them have encountered financial difficulties. Furthermore, Geraardsbergen and Lessines are not confronted with a high number of risks on their territory (*e.g.* Seveso-firms), which limits the support and expertise which would be required to maintain an extensive crisis management structure.

In contrast to Geraardsbergen, the trend to decrease the number of water managers involved is absent in Lessines. At present, the city is responsible for 3nd category watercourses, except on the territory of the two remaining wateringues. According to some actors, this comprises a barrier to efficient and ecological water management.

> *"We are used to it but we have to check ourselves every time what the exact boundaries of the territory we are competent for are. We know who to contact for it, but it is not clear at all for the inhabitants. If there would be one navigable and one non-navigable water manager, it would be more coherent."*
> (Translated excerpt from an interview with a watercourse manager)

4.6 Evaluating flood risk governance at the case study scale

In this section the FRGAs of Geraardsbergen and Lessines are evaluated on their resilience, efficiency and legitimacy (see Table 16 for overview). Like in the previous section, the evaluation compares the two cases simultaneously.

Table 29: Overview of the evaluation of FRGA in Geraardsbergen and Lessines

	Geraardsbergen	Lessines
Resilience	(-) Low capacity to resist due to the development of flood plains and insufficient flood protection (-) Capacity to adapt hampered by heritage of spatial planning (-) Lack of enforcement of flood risk prevention instruments	

	(+/-) Variety of strategies adopted but delay of implementation of flood defence measures (+) Improved coordination between strategies since 2010 (-) Capacity to adapt hampered by complexity of decision-making process	(+/-) Variety of strategies adopted but flood preparation still in infancy (-) Strategies operate independently from each other (-) Flood risk prevention instruments less institutionalised → forms potential barrier for effectiveness
Efficiency	(-) Resource-efficiency threatened by long lead-time decision-making (+) Cost-efficiency forms important criterion for Flemish government	Scepticism towards cost-benefit analysis
Legitimacy	(-) Acceptability low due to delay implementation of flood defence infrastructure (-) Participation focuses primarily on governmental organisations FRG based on solidarity but tendency towards sharing responsibility (*e.g.* FRMP-study)	(+) Good contacts between Committee of Flooded and water managers (-) Public participation generally limited to information dissemination Discourse on shared responsibility → prohibition to build in high risk zones regardless spatial destination

4.6.1 Evaluation of resilience

Capacity to resist

As demonstrated by the floods in 2010, Geraardsbergen and Lessines' capacity for resistance is low. In the wake of the 2003 flood, a dike was built at Overboelare, but its height was calculated on the maximum water level at that time. As a result, it appeared not appropriate to withstand a more severe flood. Also in Lessines the existing infrastructure proved insufficient. The 2010 flood led to the instalment of smaller (temporary) protection measures but stakeholders generally recognise that larger investments are required to prevent future flooding.

The two cities are highly dependent on one another where their capacity to resist flooding is concerned. As a respondent from DGO2 pointed out, it is not possible to sufficiently protect Deux-Acren as long as the sluices at the Flemish part of the river are not renovated. Geraardsbergen, in its turn, depends for its protection on the Walloon management's flood response. If DGO2 opens its sluices too promptly, this can create a sudden uplift in the water discharge. Thus, communication between the different water managers is of vital importance to the resistance of the FRGA. This information exchange is said to have improved significantly in the aftermath of the last flood event.

Capacity to absorb and recover

- **Variety of strategie**s.

It is generally recognised that full resistance is not feasible. Flood risks will remain even after protection measures have been put in place due to the river's characteristics and the developments in its flood plain. Consequently, other FRMSs have been implemented in the two cities (see Table 30). Figures 28 and 29 provide an overview of the strategies used in discourse and practice in both FRGAs.

Table 30: Overview of applied FRMSs in Geraardsbergen and Lessines

	Flood Risk Prevention	Flood Defence	Flood Mitigation	Flood Preparation	Flood Recovery
Geraardsbergen	Consistent application of water assessment	Dike infrastructure, sluice complex	FCAs on tributary rivers	Crisis response structure, SMS warnings	Private insurance system + disaster fund
Lessines	Prohibition of building in high risk zones, application of art. 136 CWATUP	Dike infrastructure, sluice complex	FCAs on tributary rivers	Crisis response structure	Private insurance system + disaster fund

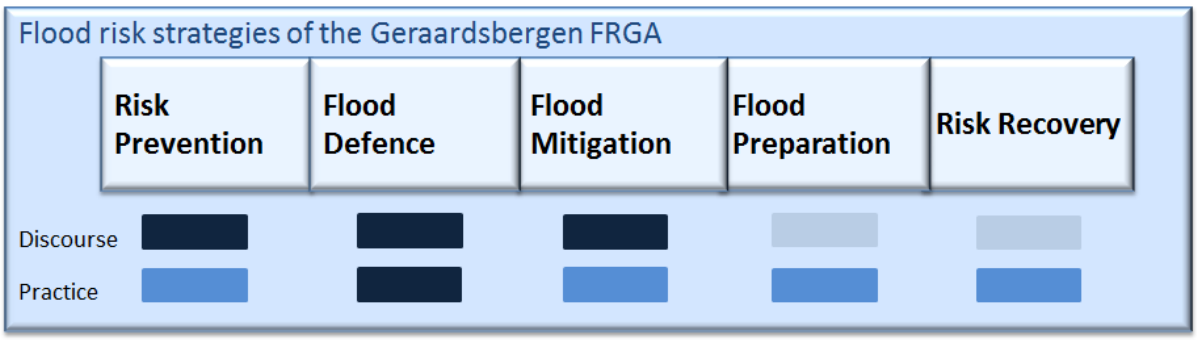

Figure 27: Flood risk strategies of the Geraardsbergen FRGA

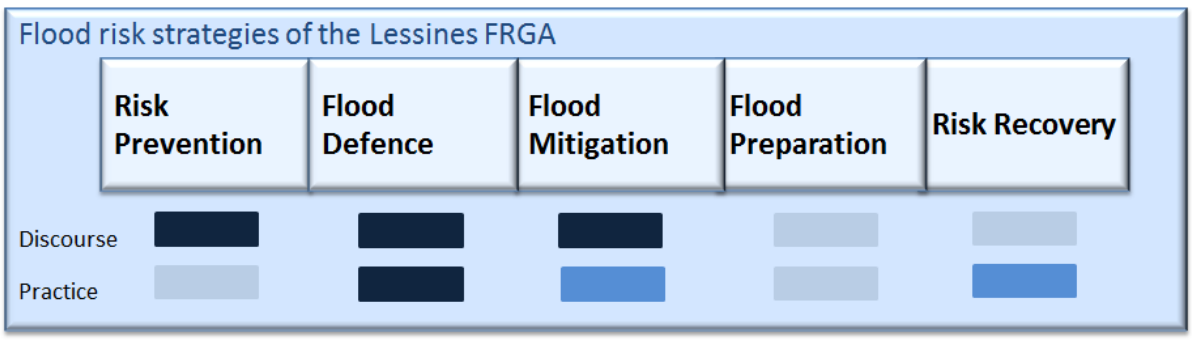

Figure 28: Flood risk strategies of the Lessines FRGA

According to actors of the Geraardsbergen arrangement, the effectiveness of crisis response and thus the absorption capacity has improved between 2003 and 2010 due to a more efficient organisation. The city nowadays disposes of a well-developed crisis response structure. In Lessines, which was not impacted to the same extent in 2003, the Flood Preparation Arrangement failed to deliver an effective crisis response in 2010. At the time, the city had neither an active emergency planning official nor a GEIP. As a result, no emergency phase was installed by the mayor, which implies that no support from the provincial/federal level could be offered and multidisciplinary coordination was absent. In the meantime, a multidisciplinary crisis management structure has been developed. However, it has not yet been tested in practice, neither in the context of an exercise nor in a real event. Hence, its effectiveness remains to be demonstrated.

In both Geraardsbergen as well as in Lessines, the effectiveness of flood preparation is threatened by a lack of financial and human resources. Possibly, the reform of the fire brigade in 2015 will increase the efficiency and effectiveness of the crisis response. Some respondents remain, however, sceptical; they question whether the effect will be (all that) significant in practice, since the fire corps already assist one another at present.

No flood recovery sub-arrangement exists at the local scale, but citizens can recover flood damage through their private fire insurance. In both cities, inhabitants of impacted areas declare that they are satisfied with the compensation they received from their fire insurance in the wake of the 2010 flood. Several respondents state that up to 100% of their damage costs were reimbursed. Of course, compensation is only possible for citizens who have insurance but its uptake is very high (over 90% of the population) (Assuralia, personal communication).

The capacity to absorb and to recover depends not only on the actions taken by water and crisis managers, but also on the actions taken by individual inhabitants. In the wake of the 2010 floods, action committees were formed in the neighbourhoods most affected. The committees have a positive influence on resilience, since they guarantee constant flood awareness among the population and offer a structure by which they can respond and recover promptly in the event of disaster. However, establishing self-reliance is not these committees' main aim. Instead, they consider flood protection an exclusive government responsibility and consequently, urge authorities to take action. This stands in contrast to the discourse of several governmental actors, who put forward that citizens should share responsibility in FRM. In Geraardsbergen, a number of policy initiatives were taken to encourage individual protection but, according to local inhabitants, only a handful of citizens adapted their houses in the aftermath of the 2010 floods. There is little trust in the effectiveness of individual flood protection among the population of both cities.

Alignment between strategies. There appears to be a stronger alignment between the different strategies within the Geraardsbergen FRGA than is the case either for Antwerp or Lessines. The city has appointed a coordinator for integrated water policy and until recently, its emergency planning official drafted the water assessment advice for municipal watercourses. At the provincial level, coordination is offered by the governor, who is responsible for crisis management and in addition chairs the Dender sub-basin board. The Flemish water managers also make a conscious effort to try to align strategies in their FRMP-study.

In Lessines, the linkage between strategies seems less intense, despite the existence of two coordination platforms; namely the Flood Cell and the river contract. Discussions within the Flood Cell have, until recently, concentrated exclusively on flood protection and the Dender River Contract focused on water problems other than flooding. As a result, the different strategies in the case of Lessines operate rather independently from one another. A exception is formed by the application of art. 136 CWATUP, which links flood protection and flood risk prevention.

Coordination between actors. Coordination in the Dender basin is principally based upon individual contact. Formal coordination between the two regions is limited to an annual meeting between DGO2 and W&Z. Within the Flemish arrangement, meetings are held within the sub-basin board but until now these had a merely procedural character. Recently however, it is said the sub-basin board meetings have become more substantive thanks to the newly introduced 'area-specific and thematic deliberation'. In Wallonia, the Dender river contract plays only a minor role in FRG. Despite the low amount of information exchange, most of the FRGA's actors do not feel the need for greater coordination since there are sufficient contacts which are established on an interpersonal basis.
Yet, coordination was an issue during the 2010 flood. Local actors in Flanders say they were not aware that the sluice in Lessines would be opened and consequently they could not anticipate on the sudden water discharge. However, according to both DGO2 and W&Z, an exchange of information did in fact take place. Hence, the problem of coordination was possibly located within the Flemish Region itself.
Crisis managers indicate that more pre-event coordination between coordination committees would be useful, *e.g.* in periods during which there is a high risk of flooding.

- **Capacity to adapt**

Water managers of the Geraardsbergen FRGA are aware that flood risks will increase in the future and take this into account in their policy development (*e.g.* FRMP-study of Flemish government). The adaptive capacity of the arrangement is, however, seriously hampered by two factors: spatial planning's path dependency and the complexity of decision-making processes.

Within the Urban Water Management Arrangement.
The 2010 flood once again demonstrated the severity of the problem with spatial planning in the Dender region. Developments in the natural flood plain of the river led to severe damage during the most recent flood event. Since that time, Geraardsbergen and Lessines have tried to put a hold on further construction in vulnerable zones. Both cities say to consistently follow the water advices given by the water managers when granting building permits. It has been claimed that the water assessment advices in Geraardsbergen have also improved with the transfer of 3rd category watercourses to the province. In contrast to the city, the province is better capable to determine the precise water volumes that ought to be stored. Yet, it is only in rare cases that building permits are refused because of flood vulnerability. Usually, building conditions are imposed for flood-proofing and to maintain the water storage capacity of the parcel.

An important difference between Geraardsbergen and Lessines lies in the fact that in Geraardsbergen property owners can choose how they compensate for the loss of water storage but the volumes (that need to be compensated) are determined by the water manager. This way, the

Flemish authorities try to foster a correct implementation. . In Lessines, on the other hand, the calculation of the required compensation volumes is regarded as being the responsibility of the private owner. Yet the implementation and compliance with the conditions imposed has not been systematically controlled in both cities due to a lack of personnel. Some respondents believe the implementation rate to be high anyway since it is in the owner's own benefit to do so. This statement is, however, questioned by others who remark that "individual house owners are insufficiently aware of their impact on the water system" (personal communication).

Actors from both FRGAs admit that, even with adaptive building, the allowance for further development of the flood plains remains a suboptimal solution. Lessines, therefore, initially prohibited all new constructions in flood risk zones. However, it was realised soon after that this action was not economically or judicially feasible given the fact that 60 to 70 % of available buildable area was located in these zones and property owners threatened to initiate judicial proceedings. As a result, the prohibition was restricted to high risk zones only. From a water system angle, it would be best to expropriate the most vulnerable building spots or to change their destination but, except in a few cases, no government is willing or able to finance this.

> *"In principal you are right that it would be better not to let people build in these areas. But imagine you own a building plot over there and I would say 'I'm sorry but you cannot build there'. What would you say? 'Who will reimburse me?' Well, not us… So therefore we say 'you can build, but just not anything you want'."*
> (Translated excerpt from interview with an official of the Geraardsbergen City Administration)

Recently however, the Flemish Government has taken initiatives to provide authorities with instruments that make it easier to strive for an optimal organisation and management of the land, *e.g.* reparcelling with planning swap. Geraardsbergen is investigating the possibilities of this latter instrument on its territory.

In order to arrive at a more adapted spatial planning, it is also important to improve the population's understanding of the risk of building in flood-prone zones. An important step in this direction is the obligation in Flanders for real estate advertisements to mention the flood vulnerability of a parcel. In Wallonia, the obligation is limited to notary deeds pursuant to the CWATUP.

Within the River Management Arrangement

The adaptive capacity of the Geraardsbergen FRGA is estimated as low. After every flood, ambitious plans are developed but real changes in the field are not witnessed. Exemplary in this regard is the renovation of the sluice complex at the Dender, which was planned in 2003 already but has not yet reached its implementation. According to some, the Flemish government gave little priority to invest in the Dender. Since these floods, attention has increased significantly but complex decision-making procedures hamper rapid improvement. In its most recent progress report, the Dender sub-basin board remarks that with the current available means and procedures flood risks will not diminish before the year 2020 (Sub-Basin Board Dender, 2014). In Wallonia, on the other hand, already 2 sluices have been renovated and a third is currently under construction. Next to that, small dikes have been installed after the flood. This leads some Flemish actors to the conclusion that "*Walloon*

water managers first build something and afterwards deal with the procedural requirements" (personal communication). Some respondents wonder, however, whether this example is enough to make general statements about the adaptive capacity of the Walloon water management. They point out that, in Flanders, important steps have also been taken, *e.g.* retention basins at non-navigable watercourses.

4.6.2 Evaluation of efficiency

One ought to remain sceptical of the Geraardsbergen arrangement's resource-efficiency, considering the long lead-time of the decision-making. Cost-efficiency is, however, deemed to be highly important by the Flemish government. With its FRMP-study, it aims to find an optimal mix of protection, risk prevention and preparation. Provincial and municipal actors are more critical towards the intense focus on efficiency. According to them, the CBA should remain a supportive tool instead of a decisive one.

Cost-efficiency is also met with scepticism in the Walloon Region. According to a respondent, the cost of protecting people's lives can never be too high. Consequently, efficiency is not considered to be an important criterion in the decision-making process. An example is the flood control area at a tributary of the Dender. A study from Liege University (ULg, 2011) investigated the effectiveness of a dike at Deux-Acren and a FCA at Ghoy. It was concluded that the dike would secure 20 to 40 ha extra from flooding but that the impact of the FCA on flood safety was low. Still, the implementation of this FCA is planned by DGO3. According to them, the flow rates used by the university were too high. The size of the basin has also been adapted but the extent to which this has raised its effectiveness is unclear.

4.6.3 Evaluation of legitimacy

Procedural justice

Questions can be raised about the transparency of the decision made by Lessines' city council to ban construction in high risk zones. This decision has not been widely communicated to the population at large, which makes that many property owners become aware of the prohibition only when they apply for a building permit.

Participation and acceptability

The Geraardsbergen case shows a trade-off between input and output legitimacy, which is exemplary for other basins in Flanders. The amount of actors who need to be consulted throughout the decision-making processes for big infrastructure projects is sizeable. As a result, their lead-time is long and effectiveness is lacking in the field. This threatens the output legitimacy of the arrangement, since citizens believe that their protection is not a priority for the government.

The public is only consulted in the final phase of the decision-making process. In earlier phases, citizens are represented by municipalities and stakeholders by their governmental departments, *e.g.* nature or agriculture departments. In contrast to this though, direct participation has been organised by the City of Geraardsbergen in the wake of the 2010 flood in all districts in order to hear citizens' concerns and suggestions. Inhabitants from the affected neighbourhoods declare that the majority of

their proposals were included in the plan of action which was drafted afterwards. However, representatives from citizen committees regret that they were not involved in the further decision-making by the water managers.

The Committee of Flooded in Deux-Acren, in contrast, considers itself well-informed by the water managers. Meetings take place on a regular basis between the committee and the Walloon and provincial water managers. Conversely, dissatisfaction exists among its members concerning the city's flood policy. The Flood Cell, installed by the mayor of Lessines, does not seem to enhance legitimacy. The citizens do not consider these meetings to be fruitful, due to a lack of interest from certain political actors.

In general, public participation in water management projects is restricted to the dissemination of information. Only DGO3 claims to make use of a more elaborate public participation procedure. Despite the fact that the river contract assembles all the stakeholders involved in water management in the basin, the water managers rarely use it as a tool for public consultation.

Social equity

The cases of flood risk policy in the Dender raise the question of the distribution of responsibility. Based on the interviews, it is estimated that the population of the neighbourhoods affected in Geraardsbergen and Lessines exists, on the one hand, of lower middle class, who were the original inhabitants, and immigrants from other regions looking for affordable and beautifully located building ground. Some of the respondents consider these inhabitants to be self-responsible, since they chose to build on that location in the first place.

In the Geraardsbergen FRGA, there is general agreement that when a land is designated by the government as a residential zone, then the owners should be allowed to build there. In Lessines, this discourse is less prevalent. The decision to prohibit building in flood prone areas, regardless of their spatial planning destination and without compensation, raises the question of fairness vis-à-vis the property owners.

An interesting development, concerning social equity, is the FRMP-study. On the one hand, one could say that the elaborate amount of attention paid to societal costs and benefits enlarges the legitimacy of the arrangement. On the other hand, it raises the debate of who needs to bear the costs of flood management. The study concludes that in some cases it is more efficient to provide protection at property-level but it leaves aside the question of who should finance this individual protection: the property owners or the government? The discourse of multi-layer water safety states that FRM is a shared responsibility between different governmental and non-governmental actors and, thus, seems to imply that citizens also bear a financial responsibility. In its first pilot projects, *e.g.* Maarkebeek, the VMM decided to bear the cost for individual protection by itself.

4.7 Conclusions

The floods in 2010 opened windows of opportunity both in Geraardsbergen as Lessines which allowed them to improve their flood risk governance. The cities have begun to pay more attention to flood vulnerability in their spatial planning, improved their crisis response structure and implemented some small protection measures. The impact of the flood was not limited to these two

municipalities alone. In general, it is noticed that Belgian municipalities have started to assess water problems in their spatial planning policy more seriously. In this sense, the two cases examined in this chapter are indicative of a wider trend at local level. In the Geraardsbergen case, the city has even functioned as a deterrent to other Flemish municipalities, after having appeared negatively in the news.

At the same time, Geraardsbergen and Lessines act as rather atypical examples of local flood risk governance, due to their above-average experience with flooding. Not many other Belgian municipalities have a coordinator for integrated water policy or a flood cell installed by the city government.

One could assume that bottlenecks, prevalent in Geraardsbergen and Lessines, are even more present in those municipalities less affected by flooding. The lack of resources for flood preparation is a problem that appears to be common to all smaller cities and municipalities. It would be desirable for local crisis managers to receive more support from the provincial and federal level, but budgets at these echelons are tight as well.

Flood awareness is high among the population of Geraardsbergen and Lessines compared to Antwerp. This does, however, hardly result in an increased self-reliance. A lot of scepticism exists as to the effectiveness of individual protection measures. Nevertheless, many governmental actors expect citizens to share responsibility in FRM. In order to stimulate self-reliance, actors indicate that it would be useful to have an international knowledge exchange concerning the potential of individual protection.

Inadequate spatial planning, caused by political choices in the past, remains the main bottleneck. The current spatial planning situation makes it unfeasible for local authorities to prevent further development in flood-prone areas, let alone to find a solution for already existing constructions. Both cities are in search of new spatial planning instruments and could thereby learn from one another. From our point of view, this offers interesting chances for interregional exchange of best practices.

5. Explanations for stability and change in flood risk governance

5.1 Introduction

Between 1995 and 2015, the Belgian FRGAs have been very dynamic. Significant changes have taken place both in terms of actors, rules, discourses and, to a lesser extent, resources.

Changes mostly followed specific flood events, which opened windows through which to address longer-standing concerns. In the Water System and Recovery Arrangements, these changes were at first developed at the national level. Only in the last 5 years, after the occurrence of recent flood events, innovations have been witnessed at case study level as well. In the Preparation Arrangement, change occurs more bottom-up. An example is the innovation in Antwerp crisis management taken in the aftermath of the 1998 floods, which later inspired the development of the Royal Decree of 2006.

While change is characterised as incremental at the national level, more radical changes can be found at case study level. Examples are the significant resource increase after the 1998 flood in Antwerp and changes in all dimensions following the 2010 flood in Geraardsbergen and Lessines.

5.2 Explanations for change in flood risk governance

5.2.1 Trends of change

In the analysis of Flanders and Wallonia, and of the three case studies, a number of trends can be observed.

The first trend is the increasing amount of attention paid to making space for water. In a densely populated city such as Antwerp, this discourse concentrates on water infiltration and small-scale retention measures primarily, *e.g.* green roofs and water receptors (see 3.3). In more rural areas, focus is put on retaining the water storage capacity of flood-prone zones (see 4.3 and 4.4). Making space for water is framed in a broader discourse about integrated water management, which aims to incorporate both water quantity, quality and ecological objectives. In both regions, water managers indicate that they attempt to combine safety and navigation objectives with improving biodiversity and water quality, *e.g.* through ecological banks, re-meandering, *etc.*

The second dominant trend is the improved coordination between actors. Whereas water managers state that they had very little knowledge of each other's activities in the past, they now communicate on a structural basis thanks to platforms such as the CIW and GTI and increased personal contacts. Coordination has also improved between water managers and spatial planners.

The third trend concerns the pursuit of integrated water management which comes with a shift of responsibilities. This shift occurred in the first place between governmental actors. Flood management was regarded as being water managers' exclusive competence until the end of the 1990s. With the rise of the making space for water discourse, spatial planners became key actors in flood risk management. More recently, the FRGA has started to transfer flood risk responsibility to non-governmental actors, *e.g.* inclusion of flood risks in the fire insurance (2005).

One last main trend in Belgian FRG concerns the tendency towards regionalisation. While in several STAR-FLOOD countries a process of decentralisation can be observed, the regionalisation process in

Belgium has rather led to a re-centralisation of competences at the regional level. With the transfer of most Flemish 3rd category watercourses to the provinces and supervision through the water assessment/art.136 CWATUP, the involvement of higher government authorities in local flood risk governance has increased.

5.2.2 Factors of change

Changes have been introduced through a mixture of endogenous and exogenous factors (see Table 31). At the national level, the presence or absence of change is a result of the interaction between developments within the policy domain itself, domestic trends outside the FRGA and international influences. At the municipal level, a similar interplay takes place between factors internal to the local FRGA, pressure from the national FRGA and flood events.

Table 31: Factors explaining change in Belgian FRG

	Exogenous factor	**Endogenous factor**
Growing attention for space for water	• EU policy: WFD, FD • Local projects funded by EU • International discourse of integrated water management	• Floods as trigger • Multi-level governance
Improved coordination between actors involved	• EU policy: WFD, FD	• Floods as trigger • Policy entrepreneurs
Shift of responsibilities to different governmental and non-governmental actors	• EU policy: FD	• Floods as trigger
Regionalisation	• State reform	

- **Floods as trigger events**

Specific flood events have played a determining role in the development of the FRGA, both on the national level as well as in the case studies. The most important floods in the investigated period took place in 1998, 2002/03 and 2010. Interestingly, the impact these events had differs. The 1998 floods were a confirmation for policy-makers in Flanders of an emerging awareness that the classical water management approach was no longer sufficient (see 2.3.1 D). Consequently, it led to the development of new legislation and to an organisational reform. In Wallonia, the floods in 2002/03 had a similar effect (see 2.3.2 D). The impact of the 2010 floods, on the other hand, can be primarily observed at the local scale (see chapter 4). While the previous floods led to legislative initiatives, the 2010 event triggered a more stringent application of this legislation by local authorities in the cases investigated.

- **EU policy**

As explained in section 2.4, Belgian FRG has been significantly influenced by the Floods Directive and, even more importantly, by the Water Framework Directive. At the local level, their impact is felt only indirectly through the national implementation of these Directives. Larger cities, *e.g.* Antwerp, are influenced through participation in European city exchange projects. Smaller municipalities, however, often lack the resources to take part in these types of initiatives.

- **Multi-level governance**

Changes occur through an interplay of influences from the local and supralocal levels. Regional and federal legislation puts pressure on local authorities to pay attention to flood risk issues. Instruments as the water assessment and flood cartography provide local governments with objective arguments to stand against other local concerns (see 4.5). Moreover, the Royal Decree of 2006 on emergency planning pushed municipalities to develop a structured crisis management (see 4.5).
However, in order to induce change, policy initiatives at a higher governmental level must be met by pressures at a local level. These can be flood events, inter-municipal knowledge exchange or local policy entrepreneurs (see 3.4.2 and 4.5.1).

- **Change agents**

Innovations at national level are mainly induced by administrative bodies rather than politicians. In Flanders, the VMM can be considered to be the main driving-force behind the CIW in the integration of water management and spatial planning. In addition, also the navigable water managers have taken a number of innovative initiatives, *e.g.* the Sigma Plan, river widening of the Meuse, *etc.* In Wallonia, DGO3 is very active in the development of flood cartography, PARISs, river contracts, *etc.* The central figure of Walloon flood risk policy, however, is Paul Dewil, an official originating from DGO2. Paul Dewil chairs the GTI and is the head of the Walloon crisis centre. He has acted as the driving force behind the integration of water management with spatial planning and particularly with crisis management in the Walloon Region.

While change agents at national level exist of government administrations or public officials, policy entrepreneurs at political level can be found at lower echelons. An example is the current mayor of Geraardsbergen, Guido De Padt, who has actively lobbied for the Flemish government to take additional protection measures. In the province of East-Flanders, the late Governor André Denys is regularly mentioned as a driving force behind the improved coordination of water managers and crisis managers in the Dender basin. Within their administrations, these policymakers are supported by less visible entrepreneurship from active officials and departments, *e.g.* the environment department in Antwerp, the coordinator for integrated water policy in Geraardsbergen, *etc.*

Unlike policy entrepreneurs, so-called maintenance workers stabilise existing institutional arrangements. This is the case in the pursuit of reducing actor fragmentation. These attempts are often blocked by leading public servants within these organisations. Therefore, the retirement of specific officials can offer a window of opportunity by which to abolish or merge organisations (see 2.4.2).

5.3 Explanations for stability in flood risk governance

Although important steps have been taken in terms of integrated water and flood management, their impact remains partly restricted to the policymaking level. Despite good intentions, flood managers in the field still hold, to a large extent, to classical approaches. This is due to factors of path dependency (see Table 32).

Table 32: Factors causing stability in Belgian FRG.

	Exogenous factor	Endogenous factor
Flood defence in practice still dominant		• Physical infrastructure • Spatial planning (regulation and practice) • Lack of flood awareness
Actor fragmentation		• Organisational path dependency
Integration of preparation and recovery in its infancy	• Competence distribution of emergency planning and insurance policy	• Floods as trigger

Path dependency is primarily caused by physical conditions. In response to the flood defence policy from the past, human developments have structured themselves around the infrastructure in place, making it difficult to make a clear shift from flood defence to mitigation. Examples include developments in flood susceptible areas that limit the possibilities for water retention or the sluices at the Dender, which have the dual-function of both safety and navigation (see chapter 4). However, water managers have in a number of pilot projects actively chosen to encroach onto the existing spatial situation to make room for water, *e.g.* Sigma Plan.

Legislative path dependency is caused by spatial planning regulation and its implementation in practice, which limits the possibilities for flood risk prevention. By paying insufficient attention to flood vulnerability in the draft of spatial plans, policymakers in the past have limited the current options to retain flood prone areas from further development.

Next to physical and legal constraints, FRG is impacted by organisational path dependency. In the past years attempts have been made (mainly in the Flemish Region) to reduce the number of water managers and to restructure towards a basin-based approach but according to many respondents the fragmentation level remains too high. The current organisational structure is the outcome of an historical distribution of competences, which might have had its merits at one time, but which forms a barrier to integrated management today. Attempts made to reorganise this structure are deadlocked by the individual interests of these organisations. Though, as explained above, windows of opportunity sometimes appear at times of resources deficits (*e.g.* transfer of the 3rd category watercourses to provinces) or staff turnover.
In some cases, the organisational path dependency impacts the physical structure. The Dender for example, is categorised as a navigable watercourse and therefore managed by W&Z, despite the fact that most of the river is merely suited for small recreational shipping. However, as a result, the flood management of the river is tuned to navigation purposes and, consequently, to flood defence measures.

Another implication of the current organisational structure is the fact that the flood preparation and the flood recovery strategies are less integrated in the FRGA than the flood risk prevention strategy (see 2.3.3 and 2.3.4). These strategies belong to a different governmental level which makes their integration less evident. However, as explained above, recent organisational changes open opportunities for further strategy convergence.

An additional persisting factor hampering change is the lack of flood awareness among local authorities and the population. Since 2003, local governments in Flanders and Wallonia have instruments at their disposal which allow them to actively pay attention to water interests when delivering building permits (i.e. water assessment and art. 136 CWATUP). It has only been in recent years, however, that most municipalities have actually started to apply them consistently. This is due to an increased awareness, triggered by flood events, and to a reform of the tool in 2012, which simplified its application. Although regional and local policymakers have good intentions for an ambitious flood policy, these ambitions are often put aside once they have to compete with other local needs during the course of the implementation process.

In general, flood awareness among the population remains low. This acts as a barrier for implementing flood risk measures such as resilient building, individual water storage, *etc.* The enforcement of these measures is poorly developed due to a lack of resources and expertise at municipal level.

5.4 Conclusion

Multi-level governance plays an important role in explaining change and stability in Belgian FRG. In some cases, one governmental echelon plays an obstructive role to another, *e.g.* municipalities who ignored or overlooked the advice given by water managers in the past, or the need felt by local governments for a Walloon planning regulation on risk areas. At other times, governmental levels can have a stimulating impact upon one another, *e.g.* Walloon flood cartography, Flemish signal areas, European WFD, *etc.*
In the Water System and Recovery Arrangements, innovations are mostly introduced at higher governmental levels and are imposed in a top-down manner. In the Preparation Arrangement, however, a mutual interplay exists between the different governmental levels involved.

Although some examples of radical change were found in the cases studies, most shifts in the investigated period have been incremental. More radical innovation is obstructed by the following inertia; the limiting physical conditions, legislative barriers in spatial planning and organisational path dependency.

6 Evaluation of flood risk governance

6.1 Introduction

This chapter assesses to what extent flood risk governance in Belgium can be considered resilient, legitimate and efficient. The FRGAs at national and case study levels have already been evaluated in chapters 2, 3 and 4. This chapter aims to bring together the findings in terms of evaluation of flood risk governance at both levels. Moreover, this chapter provides a bird's eye perspective that enables the identification of similarities and differences between the national and case study levels in terms of how these respective levels are evaluated.

As mentioned above, in the STAR-FLOOD project, three desired outcomes of flood risk governance have been identified: the governance should promote societal resilience to flooding, this should be done in an efficient way, and it should be considered legitimate (Larrue et al, 2013). Resilience is a central criterion and conceptualised in terms of the capacity to resist, respond and recover from a flood event ("buffer capacity"), and the capacity to learn, innovate and improve responses to flood risk ("adaptive capacity"). This cannot be assessed in isolation and considerations legitimacy and efficiency are also required. In turn, each criterion must satisfy the condition of appropriateness and be assessed within the normative, cultural and socio-political context of a place at a given point in time.[110] The sections below, 6.2. societal resilience, 6.3. efficiency and 6.4. legitimacy, analyse the extent to which flood risk governance in Belgium does indeed reach these outcomes.

The table below, provides a concise overview of the findings in terms of the evaluation of flood risk governance in Belgium, as will be explained in the following sections.

[110] Further information on the evaluation framework can be found in Deliverable 2.2.1 and 2.2.2.

Table 33: Overview of evaluation of Belgian flood risk governance

Evaluation criteria	Feature of governance	
Societal Resilience	+	▪ Broadening of FRM strategies at all levels + rise of bridging mechanisms (CIW, GTI, PARISs); ▪ Increased focus on nexus spatial planning-water management; ▪ Innovative spatial planning instruments (land swap, …) in Flemish Region.
	-	▪ Lack of community resilience; ▪ Lacking enforcement of FRM instruments at all levels; ▪ Historical backlog spatial planning framework (especially in the Flemish Region); ▪ Implementation gap.
Efficiency	+	▪ Transfer of ex-post compensation from public to private funding; ▪ Use of CBA in Flanders.
	-	▪ Fragmentation (but improvements in investigated timespan).
Legitimacy	+	▪ Acceptability generally high; ▪ Information requirements in real estate increase awareness (in Flemish Region); ▪ Increasing involvement stakeholders through river contracts (in Walloon Region); ▪ Solidarity in insurance system for floods.
	-	▪ Focus on output legitimacy, lack of input legitimacy.

6.2 Societal Resilience

6.2.1 Capacity to resist

The capacity to resist implies that the FRGA demonstrates the ability to reduce the likelihood or magnitude of flood hazards.

A number of wide-scale floods took place in Belgium, between 1995 and 2015; namely, in 1995, 1998, 2002, 2003, 2010 and 2011. The floods led to serious material damage but in most cases there were no casualties, which in itself indicates a capacity to resist. Each of these floods led to the implementation of new protection infrastructure, which locally enhanced resistance. In some cases however, *e.g.* the Flemish part of the Dender, adequate measures to prevent future flood damages are yet to be implemented. The implementation of measures has been delayed due to the long lead-time in the decision-making process and a lack of investment in the past.

In general, the capacity to resist has increased through the installation of local dikes and flood control areas. Moreover, the Flemish and Walloon governments attempt to prevent additional flood damage through spatial planning regulations. In already developed areas, further sealing of the area is conditioned upon building flood-proof, through the instruments of the water assessment/art. 136 CWATUP, and to compensate for the loss of water storage, through rainwater regulations for example. In not yet developed flood plains, measures such as signal areas are oriented towards

preventing construction altogether. Whether these suffice to resist flood damage in the future still remains to be seen.

A possible barrier to the effectiveness of these instruments is the difficult enforcement in the field. Our case studies have shown that municipalities do not have the personnel required to control whether the permit conditions, imposed by the water assessment/ article 136 CWATUP, green roof requirements, *etc.* have been implemented. This is consistent with the findings at the national level; namely that the legal frameworks applicable for floods (DIWP/Water Code) do not contain these kinds of specific control mechanisms. After the permit has been delivered neither the DIWP and the Order of 2006 on the water assessment nor the CWATUP in the context of article 136 provide for a systemic follow-up and enforcement mechanisms to safeguard actual compliance with these conditions. Enforcement provisions are included in the general framework for the determination of building infractions pursuant to spatial planning regulations. Infractions regarding the conditions of the water assessment can be determined through building inspections; however, there is no clear link between these authorities and the water managers. In the Flemish Region, enforcement in the context of integrated water policy has been put on the agenda following an evaluation, conducted by CIW in the wake of the 2010 floods, and is part of the CIW's multiple year planning for the period 2016-2019 (CIW, 2014). The as yet-to-enter-into-force Flemish Decree, which relates to the "all-in-one permit for physical aspects", brings with it a renewed focus on enforcement.[111] To date, these initiatives have not yet been put into practice. Finally, the case study research has shown that, the enforcement bottleneck also exists for FRM instruments that have been initiated at case study level itself. For example, the requirements with regard to green roofs, included in the Antwerp building code, do not provide for a compliance control mechanism and the authorities, therefore, do not have a clear understanding of the compliance rate.

In the timespan investigated, the effectiveness of FRM instruments in the Flemish and Walloon Regions has been hampered both by complexity and a lack of clarity. Following the 2010 floods, an evaluation was carried out of the applicable FRM instruments by the CIW and several advisory bodies (CIW, 2011b). It concluded that the water assessment in Flanders did not always function in a coherent and consistent way, *i.e.* there was a lack of information to predict the outcome of the water assessment, advice was sought inconsistently and that the quality of the advices was questionable (SERV, 2011). The main bottleneck in this regard was the complexity of the procedure, *e.g.* with regard to the lack of clarity relating to both the thresholds and the scope of advice sought. The 2012 reform of the water assessment significantly improved the efficiency and effectiveness of the instrument.[112] The Walloon counterpart of the water assessment, art. 136 CWATUP, has not yet been the subject of an evaluation or of a reform. The instrument leaves a great deal of discretion for permit issuers and water managers and the point at which advice needs to be sought, and what this advice should contain, has not yet clearly been set out.[113] Another barrier, with respect to art. 136

[111] Draft Decree of 31 January 2014 related to the enforcement of the all-in-one permit for physical aspects, Parl. 2013-2014, Piece 2419, Nr. 1.
[112] Through the Order of the Flemish Government modifying the Order of 20 July 2006 on the Water Test, Belgian Official Journal of 14 November 2011.
[113] In the Walloon Governmental Declaration for the period 2014-2019, the intention is stated to take measures to further analyse the impact of construction of the water system, and thus the instrument will likely be further developed. See Walloon Governmental Declaration 2014-2019.

CWATUP, concerns the issue that appeals launched against permit refusals, which are based on considerations of the water system, have placed the validity of delineated flood prone areas into question.[114]

Another example of the legal framework hampering the effectiveness of FRG in Belgium is that provinces in the Walloon Region, at the time of writing, do not possess an explicit legal basis upon which to expropriate in the context of their FRM measures.[115] The future new version of the Walloon Water Code will provide this legal basis for all water managers, including the provinces. In general, lengthy expropriation procedure both in the Flemish and the Walloon Region can be considered to be a barrier to effectiveness in the Belgian FRGA. Water managers in the Walloon Region, however, have developed a mechanism to circumvent the cumbersome procedure by concluding exploitation agreements with the owners. The owners are indeed expropriated, but may continue to exploit the land without having to pay a fee. This approach has not been consolidated in the legal frameworks.

6.2.2 Capacity to absorb and recover

The ability to absorb and recover relates to the capacity of the FRGA to reduce the consequences of floods, whereby the social-environmental system is better able to absorb and/or quickly recover from the flood events.

A possible indicator in this regard is the degree of diversification of strategies. One of the important questions to answer in the context of the STAR-FLOOD project is indeed the extent to which there is a diversification of FRM strategies. All FRM strategies are present in the Belgian FRGA. In the period investigated (1995-2015), a clear broadening of strategies can also be observed, both at the level of the Flemish and Walloon Regions and at the level of the case studies. Figure 2930 and 31 provide an overview of the strategies used in discourse and practice in Flanders and Wallonia.

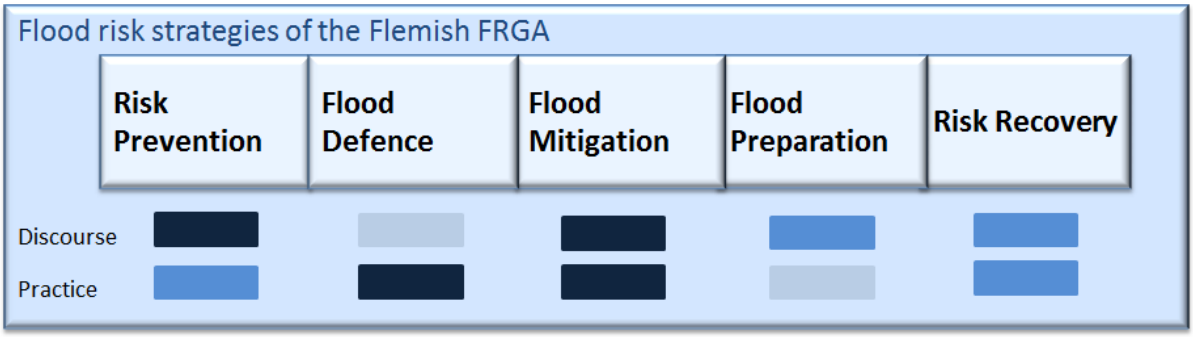

Figure 29: Flood risk strategies of the Flemish FRGA.

[114] Council of State nr. 187,450 of 29 October 2008, RW 2007-2008. See also La Commune d'Aywaille v la Région wallonne, Council of State nr. 222.716, 4 March 2013.
[115] Art. D.53-11 Water Code *juncto* the Expropriation Act of 26 July 1962. Thus they have less power to negotiate a reasonable price, conduct feasibility studies, *etc.* See *I.a.* Interview with actors of the Province Brabant Wallon, 3 September 2014.

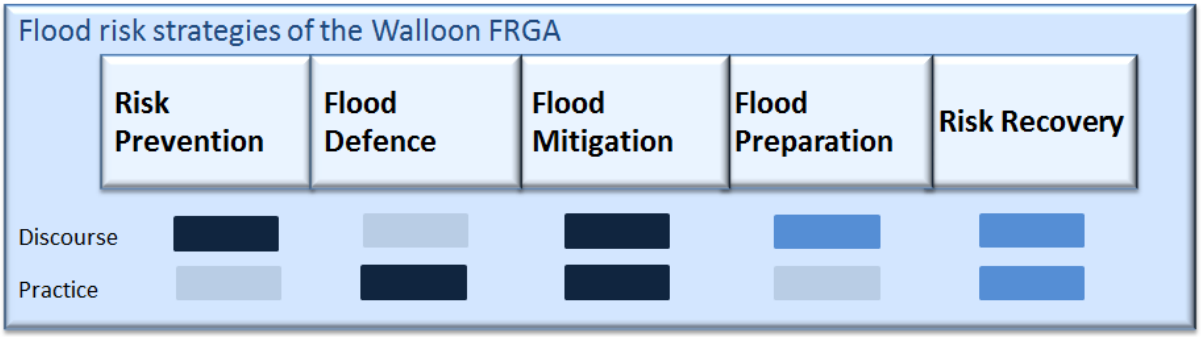

Figure 30: Flood risk strategies of the Walloon FRGA.

The mere fact that different FRMSs are present is not a sufficient way through which to achieve resilience. There also needs to be coordination and alignment between them. Bridging mechanisms, by which to improve inter-strategy coordination are currently present in both regions, *e.g.* the CIW and ORBPs in Flanders and GTI and PARISs in Wallonia.[116] Recent events have also induced further alignment of the different strategies. For example, whereas prior to the sixth state reform, the disaster fund relayed to the federal level of competence, it is now a competence of the regions. Since the prevention strategy belongs to the competence of the regions as well, it can be expected that the prevention and recovery strategy further align. A first indication towards this is the current update of the insurance-related flood risk maps by the CIW.

One of the follow up points identified in the evaluation of the 2010 floods was that water managers and major actors in the insurance market should cooperate more firmly. More specifically, the action point stated that an agreement should be arrived at between the water managers and Assuralia, the Belgian professional association of insurance companies, with the goal of mutually sharing existing data on natural disasters. This agreement has not yet been concluded hitherto. Civil servants from the VMM (Flemish Environment Agency) working on the instrument of water assessments and on adaptive building have stated in this context that they still do not have a clear view on how the insurance sector calculates the relevant fees applicable in risk prone areas.
A diversified set of strategies, induced by the viewpoint that floods cannot be stopped, is also present at the case study level. In all case studies, the legal framework provides for:

- Prevention measures: rainwater regulations in building code and water assessment in Antwerp and Geraardsbergen, prohibition of building in high-risk areas and art. 136 CWATUP in Lessines,
- Defence measures: the Sigma Plan in Antwerp, dike infrastructure and renovation of sluices on the Dender river,
- Mitigation measures, albeit to a lesser extent: *e.g.* green roof requirements in the building code in Antwerp, FCAs in Lessines,

And preparation measures: GEIP, action plans, *etc.*
As mentioned in chapters 3 and 4, flood recovery is developed at local scale in neither of the two regions. However, citizens would benefit from a proactive information dispersal mechanism at local

[116] The CIW is the Flemish Coordination Committee on Integrated Water Policy, the GTI the Walloon Interdepartmental Flood Group. The ORBPs (Flanders) and PARISs (Wallonia) are tools used to develop integrated flood/water projects on a certain watercourse.

scale in this regard. The alignment between strategies in the Geraardsbergen FRGA is more present than it is in Antwerp and Lessines.

The findings at the regional and the local scales indicate that community resilience remains low, even though the Flemish Region aims to promote self-reliance among citizens and a shared government-citizens responsibility. In Antwerp, Geraardsbergen and Lessines, citizens look at the government for their protection. The action committees, which were founded in the wake of the 2010 floods in the Dender basin, assist in raising the flood awareness of citizens but are not aimed at increasing self-reliance.[117] An important driving force in community resilience is created through the river contracts, which attempt to raise awareness of water issues in citizens, thereby forming a communicative gate between citizens and water managers, *etc.* In most sub-basins, however, the river contracts focus on other water issues instead of on floods.

6.2.3 Capacity to adapt

The capacity to adapt refers to the question whether the applicable frameworks for FRM provide for sufficient opportunities for learning.

In both Flanders and Wallonia, expertise on water management is considerable but fragmented. In Flanders, both a coordination and information platform exists for research concerning maritime issues (i.e. VLIZ) but nothing similar exists for its freshwater counterpart. The CIW and GTI serve, to a certain extent, as platforms for knowledge exchange but in practice each water manager continues to develop its own expertise, which hampers the arrangements' capacity to adapt and its efficiency. An important step forwards, however, is www.waterinfo.be and infocrue.wallonie.be, which integrates data from navigable and non-navigable watercourses.

As mentioned above, the legal and policy frameworks for FRM have been subject to repeated evaluation, especially in the wake of flood events.[118] The FRMPs factor in the aspect of climate change. But in both regions, the historical backlog of spatial planning, caused by not adequately taking flood vulnerability into account in the past, makes it difficult to wipe the slate clean and enhance adaptive capacity from that point onwards. For spatial planners today, this situation is not easily reversible. Due to political and financial reasons, it is considered undesirable to change spatial destinations for whole areas. Moreover, decision-making processes are complex and lengthy, which is especially a barrier to resilience in the Flemish Region.

With the 2013 reform of the DIWP, capacity to adapt has been increased, as the modifying decree has increased flexibility in planning procedures and execution thereof. The then-asserted article 66bis ensures that plans allow for a certain degree of flexibility so that the competent authorities can react to unforeseen circumstances or changes therein. Actions can also be redirected where necessary. In that respect, the annual sub-basin progress report was replaced by a yearly water execution programme, which also provides for this factor of flexibility.

[117] They are focused more on putting pressure on the government to respect its responsibilities in terms of protecting the citizens.
[118] There has been an important evaluation in the context of the 2010 floods, after which several evaluation rounds were organised, *e.g.e.g.* in the Flemish Region.

6.3 Efficiency

Efficiency is an important outcome of legal and policy frameworks for flood risk management. In this section, efficiency will be subdivided into economic efficiency, which relates to the extent to which the Belgian FRGA uses financial resources in an efficient manner, and resource efficiency, which relates to the use of other resources, such as human capacity and legal instruments.

Economic efficiency

In the Flemish Region, cost-efficiency concerns comprise an important decision-making criterion for policy makers. Cost-benefit analysis has been used for the development of the Sigma Plan and the same methodology is expected to be applied to the FRMPs too. In contrast, CBA is rarely used in the Walloon Region; water management projects there are primarily determined by political decisions.

The federal Recovery Arrangement's economic efficiency has been improved with the transfer of ex-post compensation from being a governmental mechanism exclusively to the private insurance market. This transfer has led to resource efficiency as well as the economic efficiency.[119] Prior to the introduction of the insurance mechanism, citizens had to undergo a lengthy and complicated procedure to obtain compensation from the governmental disaster fund for flood related damages (Bruggeman, 2010).

Resource efficiency

In both regions, and at the case study levels, fragmentation is a barrier to resource efficiency in FRM. In water management, a general fragmentation problem exists at the national and local scales, which often results in overlaps in the implementation of projects of the respective water managers.
In their FREEMAN project, Schelfaut et al. (2011) stated that the institutional fragmentation of the Flemish Demer basin has been compensated for by effective coordination. In general however, our research findings indicate that the coordination between water managers remains insufficient at the local level. The Flemish DIWP have installed sub-basin boards for each sub-basin in order to improve this. The impact these organisations have had varies largely but in most sub-basins, their effectiveness is hampered by a lack of resources, rigid procedural requirements and a lack of willingness among water managers to cooperate. In Wallonia, coordination at the sub-basin level is provided for by the river contracts. These coordination platforms are perceived as being rather effective unlike the Flemish system. The main differences between the sub-basin boards include the river contracts' larger financial resources, more flexible procedural requirements and the fact that they have been developed from the bottom-up.

While Wallonia attempts to alleviate the fragmentation bottleneck through improved coordination, the Flemish FRGA puts more effort in reducing the number of water managers involved. Important steps in this direction include the transfer of most 3rd category watercourses to the provinces, the abolition of polders/wateringues and the planned merger of navigable watercourses departments. Most Flemish municipalities have opted to transfer their water management competences to the provinces, resulting in a reduction of not less than 184 water managers. This will probably significantly increase the efficiency of the FRGA because, as Vande Lanotte et al. (2010) point out,

[119] Through the Insurance Act of 27 September 2005.

'the small average size of municipalities constrains their capacity in terms of staff and other resources'.

Another issue concerning flood risk management is the lack of systemic coordination between water managers of the different regions. The case studies demonstrate that there are informal contacts across the border with regard to *e.g.* the Dender, but it is difficult to pin point the extent to which this coordination takes place as it is not structural and not steered from any legal requirements.[120]

From a procedural standpoint, the 2013 DIWP overhaul led to efficiency gains in the Flemish Region. This has led to increases in efficiency in the Flemish Region. The simplification of planning structures, through the integration of planning levels, has led to the streamlining of procedural requirements, *e.g.* in terms of public participation. Prior to the 2013 reform, planning and coordination burdens were significant with 11 sub-basins and 103 sub-sub-basins, each promulgating their own specific plans.

In the Preparation Arrangement, resource efficiency should become enhanced with the fire brigade reform, which began in January 2015. This reform should lead to a more efficient engagement of staff and equipment in crisis response.

6.4 Legitimacy

Participation and acceptability

The legitimacy of Belgian flood risk governance is primarily focused on output, rather than input legitimacy[121]. Water managers in Belgium are obliged to pay attention to certain forms of public participation, which is in keeping with EU legislation, *e.g.* the six-month public consultation procedure for the FRMPs. Moreover, civil society actors, *e.g.* farming and nature organisations, are consulted through institutionalised channels, *e.g.* the Flemish Council for the Environment and Nature, basin councils, river contracts.

However, these consultations actually take place only in a later phase of the decision-making process; namely, to allow reactions to be gauged on draft of plans which are already being developed. In earlier phases, the different sectors are (said to be) represented by way of deliberation with different governmental departments. However, participation by societal actors is, in some specific cases, included from the outset of the decision-making, *e.g.* the updated Sigma Plan or the project on Herk and Mombeek of the Demer sub-basin board. Participation by individual citizens is usually limited to a formal inquiry process and to the dissemination of information.

Not only citizen participation is underdeveloped, but local authorities also complain that involvement in decision-making, particularly in Flanders, is low. The FRMP-study, for example, determines the optimal flood risk measures for each non-navigable watercourse. Some municipalities and provinces

[120] The Flemish W&Z and its Walloon counterpart, DG02, meet twice a year in a formal setting.

[121] Input and output legitimacy are terms introduced by Scharpf (1999). Input legitimacy focuses on the process by which policy is made; did all relevant stakeholders have the opportunity take part in the decision-making, is their input taken into account, *etc.* Output legitimacy refers to the outcome of the decision-making process; are the decisions taken accepted by the relevant stakeholders?

show themselves to be reluctant to implementing though since they have not been consulted during the development of the study. In Wallonia, at first glance, local authorities appear to be more involved, due to the river contracts. An exception to this is the development of the PARISs[122], in which the river contracts, to their own surprise, have not been consulted at all. The non-navigable water managers at the level of the Walloon Region are obligated, on the basis of Circular 71, to organise information meetings for stakeholders and citizens for all types of water related projects. As this Circular and related requirements only applies to DG03, the non-navigable water manager, the new chapter 4 of the Water Code extends this scope to all water managers of non-navigable watercourses, i.e. the provinces and the municipalities as well.

The acceptability of flood risk management appears to be generally high even though the participation of the public is low. Traditionally, FRM in Belgium is considered to be an exclusive governmental responsibility. Consequently, citizen's interest in participating in the decision-making process is limited. We argue, however, that if the government wants to share this responsibility with non-governmental actors in the future, it will also need to provide additional opportunities for them to participate in the decision-making process. Whereas in general the public shows low interest in flooding issues, people living in regions regularly confronted with flooding can be very critical of the existing FRGA. This was particularly the case in Geraardsbergen, in which residents of the neighbourhoods affected feel themselves too infrequently consulted or involved in the decision-making process.

In order to reach a greater degree of legitimacy for FRM measures it would be important to improve the population's understanding of the risk of building in flood-prone zones, as this is often lacking, especially in areas that are only rarely flooded. Information dissemination in the Flemish Region has significantly improved since the introduction of the 'duty to inform' in 2013 regarding the location of buildings for sale or for rent for more than 9 years in flood prone areas.

Procedural justice, accountability, transparency, access to information

Procedural justice and accountability are not particularly problematic in the Belgian FRGA. All citizens have equal access to justice. The main issue is that, due to judicial backlog, judicial proceedings are time-intensive and usually take several years.

Social equity

In general, the Belgian FRM is based on solidarity; preventing flood damage is considered a government responsibility and is funded by general tax income. However, in the investigated period, some cracks appeared in this discourse. The clearest deviation of the publicly funded solidarity system was initiated in 2005 with the inclusion, by law, of flood damage in the fire insurance. There is solidarity built into the flood insurance coverage as all citizens contribute to this coverage, regardless of where their buildings are situated. But the mechanism includes a built-in awareness raising mechanism as well, according to which the limits to the insurance fees do not apply to buildings in

[122] *Programme d'Actions pour Rivières au sens large par une approche Integrée et Sectorisée* (Integrated and Sectorised Action Programme for Watercourses. PARISs are a type of management plans, striving for integrated and sustainable development of water resources.

flood prone areas built after 23 September 2008.[123] However, the mechanisms of the recovery strategy could involve citizens better through, for example, taking adaptive building measures in the insurance and disaster fund related legislative framework into account.

Through the duty to inform, the next big step has been taken in Flanders to raise citizens' flood awareness.[124] The scope of this information requirement is quite broad, and citizens are becoming more aware of flood risks through this instrument. In the Walloon Region, a similar requirement to provide information in real estate exists through art. 85 CWATUP. However, the scope of this requirement is limited to bilateral interactions and the information is only exchanged at the end of the transaction, i.e. at the time of the notary acts' conclusion. The Flemish instrument, in contrast, informs candidate buyers already through the advertisement of real estate.

6.5 Conclusion

In general terms, the Belgian FRGA can be evaluated positively. Floods are on the political agenda and the applicable legal frameworks at federal and regional level have implemented the requirements of the Floods Directive. A diversified set of strategies is employed to tackle flood risks head on. However, the bottlenecks that have been identified are persistent, such as the historical spatial planning backlog, and the high fragmentation level. Steps have been taken to remediate most of these bottlenecks, although this is still a work in progress throughout the FRGA.

[123] Built after the date of 23 September 2008 (18 months upon publication of the Royal Decree of 28 February 2007 determining the high-risk zones).
[124] Through the amendment to the DIWP via the Decree of 19 July 2013.

7. Conclusions - Looking back and moving forwards

7.1 Introduction

STAR-FLOOD investigates how flood risks in six European countries are being addressed and the extent to which these flood risk governance arrangements can be evaluated as being resilient, efficient and legitimate. In order to do so, a number of research questions, initiated in the introduction of this report (see 1.2), have been addressed in the preceding chapters. These chapters introduced the 5 arrangements involved in Belgian flood risk governance and explored them at the national (chapter 2) and local level (chapters 3 and 4). We evaluated the Belgian flood risk governance as highly dynamic (chapter 5). Throughout the years 1995 and 2015, important steps have been taken by which to increase resilience and we expect further improvements will follow in the near future (chapter 6). The arrangement scores rather well in terms of efficiency and legitimacy, although its focus at present lies too strongly on output legitimacy.

This concluding chapter looks back at the main strengths, weaknesses, opportunities and barriers of Belgian flood risk governance (7.2 and 7.3) and provides reflections about a possible way forwards (7.4). Finally, a number of practices which could potentially contribute to better FRG in other EU member states will be listed (7.5). An overview of the SWOT-analysis is given in Table 34.

Table 34: Overview of SWOT-analysis of Belgian FRG

STRENGTHS	WEAKNESSES
• Goodwill among policy makers for more ambitious policy • Variety of strategies pursued: development of spatial planning instruments (*e.g.* water assessment), adequate insurance policy • Instalment coordination for a • Steps towards integration water quality and quantity management	• Fragmentation of competences • Physical and legislative path dependency (defence infrastructure and spatial planning) • Limited integration preparation and recovery strategy • Lack of enforcement • Gap between policy-making and implementation level • Lack of resources emergency planning
• Acknowledgement of problems of fragmentation and spatial planning by main actors • Development of FRMPs • Legislative reforms in Wallonia (water code, CWATUP, *etc.*) • New spatial planning instruments in Flanders (*e.g.* of land decree) • State reform could lead to further integration of strategies	• Impact of economic crisis (primarily in Preparation Arrangement) • Increase of population and urbanisation • Impact of climate change • Lack of enforcement in the field
OPPORTUNITIES	BARRIERS

7.2 Identifying the strengths and limitations of current flood risk governance

In the past, flood risk policy in Belgium has not always received the attention it deserved. In contrast to the Netherlands, where flood risk governance has always represented a central element of its existence, flood risks rarely formed a priority for Belgian politicians. But a number of flood events (1998, 2003, 2010) raised awareness among policy makers at different levels about the necessity to pay more attention to flooding. Today, a significant amount of goodwill is present among politicians to develop a more ambitious flood risk policy. Important steps in that direction have been taken with the DIWP, the Plan PLUIES, the signal areas, the land organisation decree, *etc.*

The pursuit of an ambitious flood risk policy cannot succeed without addressing the principal weakness underpinning the Belgian FRGA; namely the fragmentation of competences. In 2003, the CIW and GTI were installed, which strengthened coordination among water managers and with the spatial planning domain. At the basin level, deliberation can take place via sub-basin boards and river contracts. Yet, despite these efforts, fragmentation remains an obstructive feature of the FRGA. Coordination between the arrangements is still in its infancy and information and knowledge exchange between the regions takes place only on an ad hoc basis, mainly through personal contacts.

Although coordination at the regional policy making level has increased significantly, its impact on FRG often remains insufficient in practice. A gap currently exists between the policy makers at the regional level, and the actors responsible for its implementation at local level. In Flanders particularly, FRG has been developed in a top-down manner, whereby new initiatives are designed at regionally and involve limited participation possibilities from local authorities. Since the actors from local authorities are largely responsible for the implementation of these initiatives, large-scale adoption is regularly lacking in the field. Municipalities are often unaware of the existence of new legislation and instruments, or are incapable or unwilling to apply them. Many local actors lack the resources necessary to pursue integrated flood risk management in terms of budget and expertise. In addition, municipalities are confronted with various claims from inhabitants which are not always in line with the principles of integrated water management.

Belgium has made reasonable attempts to clear arrears in its flood risk governance, but its physical and legislative path dependency remains the country's Achilles' heel. Despite their best intentions, it appears difficult for local authorities to strictly impose building regulations in flood prone areas. Most actors admit that ideally further constructions in flood risk areas would be prohibited but it is considered to be politically unfeasible and unjust to enforce this when the spatial plans state that these areas are designated for building. Instead, they prefer to impose conditions for adaptive building but their implementation is not sufficiently followed-up. Even if a further increase of flood risks in flood prone zones would be avoided entirely, already existing risks would remain and might even increase in the context of climate change. The legislative framework concerning spatial planning is currently not well adapted to deal with these risks.

Whereas policy makers in the Water System Arrangement have been very active in improving FRG, this is less the case in the Preparation Arrangement. With the Royal Decree of 2006 an important step has been taken towards the harmonisation and professionalization of crisis response, but it has not been accompanied by a corresponding rise in resources. While the Belgian FRGA has not been

significantly impacted by the economic crisis of 2008 in general, the Preparation Arrangement forms an exception to this rule. Both at municipal, provincial and federal level, crisis managers confirm that their financial and human resources have faced cutbacks.

The efficiency of the Recovery Arrangement has improved thanks to the transformation from an exclusively public ex-post compensation mechanism into a private insurance scheme with a public fall-back framework. The solvency of the scheme is guaranteed by linking it to the already existing fire insurance, which has a coverage rate of 90-95% of the population (Assuralia, personal communication). At the same time, it allows for risk differentiation as houses constructed in high risk areas after 23 September 2008 are not covered by the insurance limits set by the public Office of Tariffication. At present there exists only weak coordination between the insurance industry and the policymakers of the Water System Arrangement. The legislative and policy frameworks for prevention and recovery should be more attuned to one another with a view to increasing resilience.

7.3 Opportunities and barriers to moving forward

The main weaknesses of the Belgian FRGA, namely the deficit of coordination and the spatial planning's heritage, are widely recognised as a problem by the actors involved. This recognition in itself forms an opportunity for moving forwards. In recent years, flood risk governance in Flanders has been the subject of many symposia and workshops organised by different governmental actors. With the multi-layer water safety, the Flemish government has developed a holistic concept to express its flood risk approach. Also in Wallonia, the 3P-discourse is widely used in the development of the FRMPs. According to some interviewees, the FRMPs help to put flood risks back on the agenda and this will enhance deliberation between the actors involved. Some others, however, fear that they will only be comprised of a summation of all the actions taken by local water managers and will not provide any additional value.

A number of other promising legislative reforms are currently taking place in the Walloon region, *e.g.* the reform of the Water Code, CWATUP and the Act of 1967 on non-navigable watercourses. Moreover, the PARISs (see 2.3.2 B.) offer an important opportunity by which to enhance the cooperation between several domains in water management. Also in the Flemish Region, the spatial planning toolbox is gradually being elaborated and improved upon.

Since they pertain to the competence of federal and local actors, the Flood Preparation and Recovery Arrangements have until now operated largely independently of the regional Water System Arrangements. Initial steps towards increased coordination have, however, been taken and it is expected that further integration will take place in the future. With the transfer of the disaster fund to the regions in 2014, a window has been opened which might allow for the integration of flood recovery, albeit partially[125], in the Water System Arrangement. Promising is that the Flemish CIW presented a proposal to update the current flood risk maps used by the insurance sector in 2014, as is already the case in Wallonia.[126] This should lead to further alignment between the flood risk prevention and recovery strategies.

[125] This is because insurance remains a federal competence.
[126] Proposal of Flemish Minister of Environment Joke Schauvliege of 17 October 2014.

To overcome the barrier constructed by the current spatial planning, the Flemish government has introduced instruments to stimulate better land use (*e.g.* land re-parcelling with destination exchange, public easement, *etc.* (see 2.3.1 B.)). The land organisation decree only entered into force in 2014 and has not yet been put into practice, but it is believed that it can strengthen the toolbox of flood risk management considerably. The delineation of signal areas has also been applauded by all actors involved as an important tool which will guide further building expansion.

Whether these initiatives will suffice to tackle the challenges of flood risks today and in the future remains to be seen. In Flanders and Wallonia, a population growth of 16% and 11% respectively is expected by 2060, compared to 2013 (DG Statistics of Federal Government, 2014). According to Poelmans et al. (2010), land sealing in Flanders and Brussels will increase by 30-50% by the year 2050 in a business-as-usual scenario. An ambitious flood risk policy is, thus, indispensable.

The fact that the implementation of regulation by private actors has not been controlled for in the field, and thus not adequately enforced, mean that this potentially represents a large threat to effective FRG. This even more so in combination with another bottleneck, namely the discourse gap between (regional) governments and citizens. Governmental actors state more and more explicitly that FRM should be a shared responsibility between the government and its citizens, particularly in Flanders. Flood awareness is, however, generally low among the population and its management is considered to be a governmental task. Consequently, there is a risk that inhabitants will take insufficient action to protect themselves against future flooding.

The Flemish government has introduced the instrument of re-parcelling with planning swaps and the Rubicon fund, which both aim to help municipalities in financing spatial planning-related damages and to address the lack of resources that municipalities face in FRG. Moreover, reforming the fire brigade is supposed to lead to a more efficient use of resources in the Preparation Arrangement. Whether these initiatives will suffice to meet municipalities' concerns will have to be evaluated over time.

7.4 Recommendations for strengthening flood risk governance in Belgium

An observation that stems from this SWOT-analysis is that FRM in the two Belgian regions faces very similar challenges. Consequently, the regions have a lot to learn from one another by sharing their good practices. It is, therefore, advisable that more attention is paid to interregional knowledge exchange, *e.g.* through symposia, workshops, working groups, *etc.* It is remarkable that Flemish symposia on FRM generally focus on best practices from the Netherlands and the Walloon do likewise focus on events in France, whereas the similarity of governance structure between the two regions could offer a fruitful basis for intra-country comparison.

Knowledge exchange could not only improve between the two regions, but also within them. Today, expertise is spread over a large number of water managers and knowledge institutes. Innovations and data could be more efficiently shared through coordination platforms, such as the CIW and GTI. A supportive programme to integrate and export expertise, such as has been introduced in the Netherlands by the national government, would also be welcome.

A basin approach is advocated in the international flood risk policy domain. Since water management in Belgium is today divided along administrative boundaries, coordination bodies have been set up to coordinate the different water managers at sub-basin level. In Wallonia, these river contracts are evaluated positively by the actors of the FRGA in a major way. In Flanders, in contrast, the sub-basin boards do not seem to meet the need for deliberation at this governance scale. This difference could be due to the fact that the sub-basin boards have been imposed in a top-down manner by the Flemish government and have to fulfil a large range of formal duties, while the river contracts are developed through a bottom-up process and have a flexible governance structure. More importantly, perhaps, is that the river contracts are better equipped in terms of staff. They are therefore considered to be a good practice for Belgian FRG.

Despite the fact that the river contracts are widely applauded by the water managers, they are rarely used for public participation. In most cases, water managers prefer to organise participation processes outside of the river contract structure. We consider this to be a missed opportunity since the river contracts unite the most important stakeholders and are well connected to the local population.

In general, Belgian flood risk policymaking occurs in a technocratic way and is based on output rather than input legitimacy. Water managers aim to legitimise their actions by their contribution to flood safety, instead of involving the public into their decision-making. Traditionally, flood risk management was considered to be an exclusive governmental responsibility, which has led to low awareness and a low interest among citizens in flood issues. Today, however, more intensive public participation in flood risk policy could be recommended for two reasons. One is that the decision-making concerning integrated water management has become increasingly complex, which results in long decision-making and implementation procedures. Delays in the implementation of effective protection measures hamper the arrangement's output legitimacy. Secondly, a discourse is emergent particularly within the Flemish government, which states that citizens should share responsibility in FRM. If the government wants to involve residents more in the implementation of FRG, it will have to do the same for the decision-making process in order to compensate the decreasing output legitimacy by input legitimacy (as is also advocated in Steinführer et al. 2009 and White et al. 2010).

In Flanders, the number of water managers decreased in the investigated period from 424 to 196, thanks to a competence transfer from the majority of municipalities to the provinces and the abolition of several polders and wateringues. In Wallonia, a similar evolution has been absent. The transfer in Flanders could potentially act as a source of inspiration but it must be noticed that the fragmentation of competences is perceived less problematically by the Walloon water managers than it is by their Flemish counterparts. One factor that could explain this difference is the existence of the river contracts which contribute to coordination at sub-basin level.

A persistent problem concerning legislation in the two regions is the lack of attention for water issues in the enforcement of building requirements. It is estimated that this problem is even larger in Wallonia than in Flanders, considering that in this region no specific prescriptions for water storage compensation are determined in the building permit. The enforcement of water issues in spatial planning could be increased in several ways. For example, the control of conditions ensuing from the Flemish water assessment could be embedded into already existing control mechanisms, *e.g.* for the

separation of wastewater. Or the competences of the municipal environmental supervisor in Flanders could be broadened in the context of the currently in draft legislation on environmental enforcement. In the Walloon Region, more guidelines accompanying art. 136 CWATUP are necessary, preferably through an amendment to the provision as opposed to non-binding guidelines. These should set out more clearly the thresholds for advice, the elements to be included and how the advice should be translated concretely in the permit, including guidelines for follow-up.

Instruments such as the water assessment, signal areas, *etc.* help to limit further construction in flood plains. But also the already existing development in these areas, is expected to lead to serious flood damage in the context of climate change. The next step forward in the Belgian FRGA will, therefore, be to consider a more optimal spatial structure for its already built-up flood plains. This policy would include innovative instruments such as land swapping, tradable land rights, postponed expropriation, *etc.*

7.5 Good practices from flood risk governance in Belgium

Defining good practices for international application is an almost unfeasible task given that the effectiveness of certain instruments depends highly on the context in which they occur. In Belgium, this context is characterised by a specific spatial planning structure and a highly fragmented actor structure. Within this framework, the following instruments can be presented as good practices: the water assessment, duty to inform, integrated water management flood risk insurance policy and the river contracts.

The Flemish water assessment has been inspired by an analogous instrument in the Netherlands. But while in this neighbouring country it is only applied to spatial plans, the Flemish version is obligatory for every building permit. In practice, the water assessment does rarely lead to a refusal of building permits but it appears an appropriate tool to impose adaptive building measures.

Next to the water assessment, the duty for property owners to inform potential buyers about flood vulnerability in real estate announcements is considered to be an instrument which is inexpensive and easily to implement to increase flood awareness among inhabitants.

The Walloon river contracts have proven an effective platform for deliberation in order to overcome problems of actor fragmentation at basin level. They also offer opportunities for non-governmental stakeholder involvement in FRG, thereby enhancing community resilience.

Another best practice in the Belgian FRGA is the explicit choice for an integrated water management approach in the Flemish Region. The WFD and FD have been implemented in the same legal framework, the DIWP, the planning processes and outcomes have been integrated and streamlined, and both quantitative and qualitative aspects of water policy are tackled by the same organisation, the CIW. In the Walloon Region, the implementation of the Floods Directive has also been integrated into the Water Code, which serves as the implementing framework for the Water Framework Directive. The FRMPs and RBMPs, however, have not been integrated in the Walloon Region.

A final best practice is the Act of 2005, on the basis of which flood damage was included in the general fire insurance. Designing effective flood insurance is a difficult task because it raises (ethical)

questions about solvency, solidarity and personal responsibility. By excluding buildings in flood prone areas built after 23 September 2008 from the maximum tariff, the policy offers interesting opportunities to contribute to flood risk prevention.

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- Court of Cassation, 1 December 2011, AR C.10.0582.N.
- Court of Cassation, 8 March 2013

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- Council of State, Judgement nr. 179.933, of 20 February 2008, *Van Poucke a.o. v provincial deputation East Flanders & Flemish Region*.
- Council of State, Judgement nr. 187.450, 29 October 2008, RW 2007-2008.
- Council of State, Judgement nr. 201.565, 5 March 2010, *Maes v provincial deputation West Flanders & Municipality Zwevegem*.
- Council of State, Judgement nr. 212.266, 28 March 2011, *De win and De Boek v Flemish Region*.
- Council of State, Judgement nr. 217.125, 6 January 2012, *Jorens v Flemish Region*.
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- Council for licensing disputes, Judgement nr. A/2012/0117, 27 March 2012, X v provincial deputation Antwerp.

- Court of Appeal Brussels, 31 March 2009, *R.D. v Halle*.

- Peace Justice of Tournai of 6 January 2009, *J.-P.C and S.G. v Province of Hainaut and the Walloon Region*, [2010] Revue Générale des Assurances et des Responsabilités.

Annex A. List of interviews

In total, we have conducted 70 interviews with employees from all relevant governmental levels and departments, as well as with civil society actors. The interviews have been collected between December 2013 and March 2015. The interviews have been recorded and transcribed.

Interviews at Flemish level

Organisation	Respondent	Date	Interviewer(s)
VMM	Sven Verbeke & Neel Devroede	3/12/2013	Hannelore Mees
VMM	Annelies Haesevoets	29/01/2014	Hannelore Mees and Cathy Suykens
VMM	Filip Raymaekers	13/12/2013	Hannelore Mees and Ann Crabbé
VMM	Bram Vogels & Joost Dewelde	9/04/2014	Hannelore Mees and Cathy Suykens
De Scheepvaart/ CIW	Koen Maeghe	26/03/2014	Hannelore Mees and Cathy Suykens
Department Space Flanders	Robin De Smedt & Katia De Bock	17/12/2014	Hannelore Mees and Cathy Suykens
Flemish Parliament	Bart Martens (sp.a)	11/06/2014	Hannelore Mees and Cathy Suykens
Flemish Parliament	Jos De Meyer (CD&V)	14/07/2014, by telephone	Hannelore Mees
Grenzeloze Schelde	Delores Baita & Mieke De Leeuw	6/01/2014	Hannelore Mees and Cathy Suykens
Province Antwerp	Didier Soens	19/03/2014	Hannelore Mees and Cathy Suykens
W&Z	Wim Dauwe & Stefaan Nollet	8/01/2014	Hannelore Mees
UA	Patrick Meire	30/01/2014	Hannelore Mees and Jean-Christophe Beyers
ANB	Lieven Nachtergale	6/01/2014	Hannelore Mees
CCVO	Manu Steens & Wilfried Van den Acker	27/08/2014	Hannelore Mees
Sub-Basin Board Brugse Polders	Katrien Thomaes & Mathias Vanden Bulcke	20/02/2015	Hannelore Mees and Cathy Suykens
Sub-Basin Board Nete	Tom Gabriëls	02/03/2015	Hannelore Mees
Sub-Basin Board Demer	Jan Vanvelk	17/02/2015	Hannelore Mees and Cathy Suykens

Interviews at Walloon level

Organisation	Respondent	Date	Interviewer(s)
DGO3	Didier De Thysebaert	31/01/2014	Hannelore Mees and Cathy Suykens
DGO3	Audrey Lahousse	26/05/2014	Hannelore Mees and Cathy Suykens
DGO3	Olivier Desteucq	26/05/2014	Hannelore Mees and Cathy Suykens
DGO3	Augustin Smoos	26/05/2014	Hannelore Mees and Cathy Suykens
DGO4	Fréderic Van Dijck & Benoit Gervasoni	24/10/2014	Hannelore Mees and Cathy Suykens
DGO2	Philippe Dierickx	27/08/2014	Hannelore Mees
Regional Crisis Centre	Charles Regnier	20/08/2014	Hannelore Mees
Grenzeloze Schelde	David Kuborn	18/08/2014	Hannelore Mees
Province Walloon Brabant	Pierre Pirlot, Marc Mauclet & Damien Dubois	03/09/2014	Hannelore Mees and Cathy Suykens
Province Namur	Yanni Xanthoulis	31/07/2014	Hannelore Mees
Province Liège	Bernard Balon & Bruno Khuat Duy	11/03/2015	Hannelore Mees
River Contract Senne	Carole Van Roy	29/08/2014	Hannelore Mees
River Contract Vesdre	Florence Hauregard	12/02/2015	Hannelore Mees
River Contract Meuse Aval	Edmée Lambert & Sandra Godfroid	19/02/2015	Hannelore Mees
River Contract Dyle-Gette	Jean-Marie Tricot & Jeremy Guyon	05/03/2015	Hannelore Mees
AwAC	Julien Hoyaux	21/08/2014, by telephone	Hannelore Mees
Crisis Centre Walloon Brabant	Cathérine Baudinet	05/03/2015	Hannelore Mees

Interviews at Brussels level

Organisation	Respondent	Date	Interviewer(s)
BIM	Sofie Bracke	25/11/2014	Hannelore Mees and Jean-Christophe Beyers

Interviews at federal level

Organisation	Respondent	Date	Interviewer(s)
National Crisis Centre	Christoffel Merckx & Koen De Budt	13/05/2014	Hannelore Mees and Jean-Christophe Beyers
KBC Insurances	Luc Nijs	5/03/2014	Hannelore Mees and Cathy Suykens

Interviews at Antwerp case study level

Organisation	Respondent	Date	Interviewer(s)
City Antwerp – City Planning	Philippe Teughels	28/01/2014	Hannelore Mees and Ann Crabbé
City Antwerp – Disaster Planning	Bart Bruelemans	6/03/2014	Hannelore Mees
City Antwerp – Fire Brigade	Bert Brugghemans	08/07/2014	Hannelore Mees
City Antwerp – Public Domain	Marcello Serrao	8/04/2014	Hannelore Mees and Cathy Suykens
City Antwerp - Environment	Iris Gommers & Griet Lambrechts	19/02/2014	Hannelore Mees, Ann Crabbé and Cathy Suykens
City Antwerp – Spatial Planning	Filip Smits, Katrijn Apostel & Veva Roessems	08/05/2014	Hannelore Mees and Cathy Suykens
City Antwerp – City in Dialogue	Piet Van Laecke	27/05/2014	Hannelore Mees
W&Z	Reinhilde Van Hooydonck	13/01/2014	Hannelore Mees and Ann Crabbé
Governor Antwerp - Emergency Planning	Christel Haex & Fred Van Immerseel	22/05/2014	Hannelore Mees
Sub-Basin Board Low Scheldt	Evelien De Vylder & Guido Janssen	06/05/2014	Hannelore Mees and Cathy Suykens
Antwerpen aan het Woord	Koen Kuylen	18/03/2014	Hannelore Mees and Jean-Christophe Beyers
rio-link	Heleen Geeraert	15/04/2014	Hannelore Mees
Action group of flooded citizens in Merksem	Michel Pradolini	19/05/2014	Hannelore Mees

Interviews at Geraardsbergen case study level

Organisation	Respondent	Date	Interviewer(s)
City Geraardsbergen – Public Works & Environment	Liesbet Van de Casteele	29/08/2014	Hannelore Mees
City Geraardsbergen – Disaster Planning	Guido De Rycke	08/09/2014	Hannelore Mees
City Geraardsbergen – Fire Brigade	Bert De Clercq	12/09/2014	Hannelore Mees
City Geraardsbergen – Spatial Planning	Davina Van den Bossche	06/11/2014	Hannelore Mees and Jean-Christophe Beyers
Omer Wattez	Davy De Groote	09/09/2014	Hannelore Mees
W&Z Upper Scheldt	Elizabeth Vogelaers	22/09/2014	Hannelore Mees
Sub-Basin Board Dender	Kristof Decoene	30/09/2014	Hannelore Mees
VMM Dender	Karel Leliaert & Inge De Jongh	10/09/2014	Hannelore Mees
Province East-Flanders	Luc De Winne & Ignace Walckiers	15/09/2014	Hannelore Mees and Cathy Suykens
Governor East-Flanders – Emergency Planning	Luc Bauwens & Elke Allaert	15/09/2014	Hannelore Mees
Committee of Flooded Overboelare	Debby Hulshoff and 7 others	22/09/2014	Hannelore Mees
Town Council Zandbergen	Hans De Smet	02/10/2014	Hannelore Mees

Interviews at Lessines case study level

Organisation	Respondent	Date	Interviewer(s)
City Lessines – Spatial Planning	Jean-Marie Hantson	11/12/2014	Hannelore Mees and Cathy Suykens
City Lessines – Fire Brigade	Baudouin Vervaecke	06/11/2014	Hannelore Mees and Cathy Suykens
City Lessines – Public Works	Guy Leerens	19/11/2014	Hannelore Mees
City Lessines – Emergency	Virginie Fantoni	11/12/2014	Hannelore Mees and Cathy Suykens

Planning			
DGO2	Didier Descamps	25/11/2014	Hannelore Mees
DGO3	Jean Lecomte	04/11/2014	Hannelore Mees and Cathy Suykens
Province Hainaut	Julien Lecomte	17/12/2014	Hannelore Mees and Cathy Suykens
Governor Hainaut – Emergency Planning	Thierry Lebacq	19/11/2014	Hannelore Mees
Committee of Flooded Deux-Acren	Christian Marchand & Alex Vandenbergh	21/11/2014	Hannelore Mees
River Contract Dendre	Maxime Colin & Marie Amorison	04/11/2014	Hannelore Mees and Jean-Christophe Beyers

Annex B. Topic list for interviews

For each interview, a specific questionnaire has been drafted but this list provides a non-exhaustive overview of the main questions posed (translated from Dutch and French).

Questions on the **actor dimension**:

- What is the role of your organisation in flood risk management?
- How do you evaluate the cooperation with other actors (*e.g.* with DGO3, W&Z, provinces, *etc.*)?
- The amount of water managers is large, do you consider this problematic?
- Is there need for more coordination between the actors, or to reduce their number?
- Are there sufficient contacts with crisis managers?
- Is there enough attention among spatial planners for FRM?
- Is your organization sufficiently represented in the CIW/GTI? What is the added value of this forum?
- Is there sufficient interest for flood risk management at political level?
- How are non-governmental actors involvement in FRM?
- Are there regular contacts with Flanders/Wallonia on flood issues? How do you evaluate this cooperation?

Questions on the **rules dimension**:

- Which have been the most important legal initiatives in recent times?
- How do you evaluate the application of the water assessment/art. 136 CWATUP?
- How do you evaluate the reform of the legal framework (*e.g.* the reform of the Decree Integrated Water Policy in July 2013)
- Are legal conditions sufficiently followed up and enforced in the field?
- Can you talk about challenges to decisions of your administration before the relevant courts?
- Do you make use of expropriation measures?
- What is the impact of the WFD/FD on FRM?
- What do you believe will be the impact of the FRMPs on FRM?
- Which further legislative steps could be taken to improve FRM?

Questions on the **resources dimension**:

- Do you dispose of enough budget to take all the actions necessary to reduce flood risks?
- Has your organization been impacted by the economic crisis? Were cuts in budget/staff in proportion with other departments?
- Do you make use of cost-benefit analyses?
- Does your organisation possesses sufficient expertise on FRM? If not, do you rely on external sources of expertise (other governmental organisations, consultancy firms, universities, *etc.*)?
- What are the main sources of inspiration for innovation?
- Is there enough exchange of expertise between the actors involved in FRM?

Questions on the **discourse dimension**:

- Do you know the 3Ps of FRM? Do you apply them in your organization?

- Have you heard already of the multi-layer water safety? Do you apply it in your organization?
- Do you know/use the term resilience?
- According to some, citizens should take on responsibility in FRM as well. Do you agree with this statement?

Questions on **change and stability/evaluation** of FRM:

- Which evolutions have taken place in FRM since you are active in the field?
- What has caused these changes according to you?
- What are the main strengths of the current FRM?
- On which points does Flanders/Wallonia better than neighbouring countries?
- What could be still improved? Where could we learn from other countries?
- How are future flood risks taken into account?