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

Flood Risk Management in Europe – similarities and differences between the STAR-FLOOD consortium countries

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Preface

This report is the first 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 and Scotland in the UK, Belgium, France, The Netherlands, Poland and Sweden. The project is assessing the institutional embedding of these strategies from a combined public administration and legal perspective, with the aim to make European regions more resilient to flood risks.

Within the first Work Package of STAR-FLOOD, four reports have been prepared providing an extended problem analysis related to flood risk governance in Europe:

i) Flood Risk Management in Europe: actual flood risks in the STAR-FLOOD consortium countries (report no D1.1.1: Green et al. 2013);
ii) Flood Risk Management in Europe: governance challenges related to flood risk management (report no D1.1.2: Dieperink et al. 2013);
iii) Flood Risk Management in Europe: European flood regulation (report no D1.1.3: Bakker et al. 2013);
iv) Flood risk management in Europe: similarities and differences between the STAR-FLOOD consortium countries (report no D1.1.4, this report).

The four reports together aim to provide a problem analysis of flood risk governance in Europe. In so doing, they give a further specification of the scope of the STAR-FLOOD project and raise some preliminary conclusions, expectations and assumptions to be challenged in the subsequent Work Packages of the project. Furthermore, the reports identify relevant issues, questions and themes that are considered to be in need of further research and will be taken up in WP2 and WP3 of STAR-FLOOD.

Reports number D1.1.1 and D1.1.2 focus on the main trends and challenges that occur. D1.1.1 discusses the nature of the flood risks as well as the developments to be expected therein (e.g. increased vulnerability due to urbanisation and climate change). D1.1.2 approaches multi-level, multi-sector and multi-actor governance challenges related to Flood Risk Management from a theoretical perspective. Report number D1.1.3 focuses on European flood regulation, including the Water Framework Directive and the Floods Directive. The report discusses, amongst other things, the relationship between the Floods Directive and the Water Framework Directive as well as national law, how different EU Member States deal with the FD, the state of affairs concerning implementation of the FD in these Member States and what this may tell about their ambitions regarding the FD.

This report (D1.1.4) highlights essential similarities and differences between the consortium countries. Issues addressed include: i) the countries' background situation in terms of their flood experiences; ii) potentially relevant factors for understanding the institutional organisation of water governance in each country, including the competent authorities for different Flood Risk Management Strategies and their actual competences, and the way in which the discourse on flood management has actually evolved in these countries; iii) the Flood Risk Management Strategies that are in place. The report conveys the message that each strategy is not feasible (appropriate) everywhere. It also raises some preliminary assumptions regarding the factors explaining (lack of) appropriateness of interest to actors at the national and regional level in EU Member States.

Yours sincerely,

Prof. Colin Green
Leader of WP1

Prof. Peter Driessen
STAR-FLOOD Project Coordinator

Executive summary

This report has been compiled as part of the STAR-FLOOD project, a European FP7 project focused on flood risk governance. The project investigates strategies for dealing with flood risks in 18 vulnerable urban regions in six European countries: Belgium, The UK (more precisely: England and Scotland), France, The Netherlands, Poland and Sweden.

The report highlights the main similarities and differences between the six STAR-FLOOD consortium countries, complemented with some interesting examples from other European countries. Amongst other things, the report discusses the Flood Risk Management Strategies and Flood Risk Governance Arrangements that are in place. The report intends to contribute to an extended problem analysis of flood risk governance in Europe. STAR-FLOOD researchers in each country wrote a text on the situation in their country (included in the annex). Based on this input, eight salient themes have been identified according to which the countries seem to differ:

i) The countries' baseline situation in terms of their actual flood experiences (chapter 2);
ii) Designated competent authorities and the actual competences that actors have for implementing Flood Risk Management Strategies (chapter 3);
iii) Resources for flood risk governance: the financing arrangements that are in place (chapter 4);
iv) The degree and ways in which integration between water management and spatial planning is taking place (chapter 5);
v) The extent to which stakeholder involvement takes place and the ways in which it is done (chapter 6);
vi) The substantive and procedural norms and goals that are in place (chapter 7);
vii) The way in which discourses on flood management have evolved in each of the consortium countries and how this relates to discourses on flood management more generally (chapter 8).
viii) The Flood Risk Management Strategies that are actually in place (chapter 9);

The findings suggest mutual influences (but not necessarily causal relations) between experiences with floods (item i), the institutional organisation of water governance (item ii-vii) and the types of Flood Risk Management Strategies actually applied (item viii). Notwithstanding the differences, similarities between The Netherlands, France, the UK and Belgium have been identified. All these countries went through some similar stages from a dominant civil engineering paradigm, via a shift towards 'non-structural measures' and a wish to accommodate water, towards an acknowledgement of the need to take consequences of climate change into account. In Sweden, on the contrary, the significance of floods has been relatively low until recently (but its importance is expected to increase due to the expected consequences of climate change). On the other extreme, Poland is known to be short on resources for dealing with flood risks.

Together with the findings of the other three reports produced within Work Package 1 of STAR-FLOOD, this report will serve as input for the development of an assessment framework for flood risk governance (WP2) and as a reference for the case study research (WP3). The report provides interesting conclusions, assumptions and questions to be taken up. In particular, policymakers, practitioners and the STAR-FLOOD consortium can derive the following lessons from this report:

- Every Flood Risk Management Strategy is not feasible everywhere. The report has identified differences in the **appropriateness** of flood risk management strategies in specific contexts;
- Item i-vii above constitute an initial check list of potential factors explaining stability and dynamics in flood risk governance;
- A detailed list of practical questions has been derived, which researchers studying flood risk governance in the six STAR-FLOOD consortium countries are invited to consider.

Table of contents

List of figures

List of tables

1. Introduction

1.1 Shifts in Flood Risk Management

Climate change is expected to result in sea-level rise and to induce more extreme weather events. As a result, modifications in frequency, severity and duration of hydro-meteorological hazards will occur (IPCC 2011). The potential consequences of these weather events are intensified due to population growth, economic growth, urbanization and in some cases also soil subsidence (e.g., The Netherlands, Jakarta) (Mitchell 2003). Urban areas in particular face increasing flood risks.

It is therefore argued, both in literature and in practice that flood risks can no longer be dealt with by focusing solely on flood defences (building dikes, dams, embankments etc.). Actors at various levels (international, European, national as well as regional) wish for and make efforts at a diversification of Flood Risk Management Strategies, in which multiple strategies are applied simultaneously and linked together. These strategies include pro-active spatial planning (building permits), flood mitigation in various ways (e.g. urban green infrastructures, adaptive buildings), flood preparation and flood recovery. Literature suggests that such a diversification of FRMSs may lead to more resilience to flood hazards (Aerts et al. 2008; Innocenti & Albrito 2011; Van Den Brink, Termeer & Meijerink 2011).

1.2 Position of this report

This report is deliverable D1.1.4 of STAR-FLOOD, a project within the EU 7th Framework Programme (www.starflood.eu). 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: Belgium, The UK (more precisely: England and Scotland), France, The Netherlands, Poland and Sweden. The project assesses the institutional embedding of these strategies. The researchers within the project analyse this institutional embedding from a combined public administration and legal perspective, with the aim to make European regions more resilient to flood risks.

This report is the fourth and final from a series of reports providing an extended problem analysis related to flood risk governance in Europe. The three other reports focus on the nature of the flood risks in the STAR-FLOOD consortium countries (D1.1.1: Green et al. 2013), theoretical governance challenges related to flood risk management (D1.1.2: Dieperink et al. 2013) and European flood regulation (D1.1.3: Bakker et al. 2013). The focus of the current report is on essential similarities and differences between the STAR-FLOOD consortium countries.

The four reports together give a further specification of the scope of the STAR-FLOOD project and raise some preliminary conclusions, expectations and assumptions to be challenged in the subsequent Work Packages of the project. Furthermore, the reports identify relevant issues, questions and themes that are considered to be in need of further research and will be taken up in WP2 and WP3 of STAR-FLOOD.

The more detailed analyses on country level governance processes (by conducting case studies, interviewing and talking to people, observing meetings and attending conferences) will be done in WP3. WP1 restricts itself to seminal literature and policy documents, general information at country level as well as the main similarities and differences between countries. In WP2 a protocol will be developed which will be applied in the case studies in WP3. WP1 provides the basis for these next steps.

1.3 Analysing national shifts in FRM

Flood Risk Management Strategies are embedded, in one way or the other, in society. We will label this institutional embedding the Flood Risk Governance Arrangement (FRGA). As has been argued, amongst others in deliverable D1.1.2 (Dieperink et al. 2013), both optimizing existing strategies as well as changing the combination of strategies is a governance challenge as several levels and sectors of policy making as well as several societal actors will (have to) be involved in policy making processes.

A prominent definition of governance is the one by the UNDP (1997): "*It comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences".* The UNDP definition is an often-cited one. However, based on more recent governance literature (Hysing 2009; Arnouts et al. 2012; Driessen et al. 2012; Lange et al. 2013) it can be criticised for its one-sided focus on public authorities as being the main governing actors. In is rightly argued (ibid) that governing actors can be found in the domains of state, market and civil society. In practice, we will likely find manifestations of various ideal-typical so-called 'modes of governance'. The aforementioned authors converge in their expectation that these modes of governance may be placed on a continuum from, on the one hand, ´hierarchical governance' that is mainly carried out by governmental actors to, on the other hand, self-governance by non-governmental actors. Obviously, various different hybrids may exist, including "decentralised governance", "public-private governance" and "interactive governance" (Lange et al. 2013: 14). Lange et al. define governance as "a process of – more or less institutionalised – interaction between public and/or private entities ultimately aiming at the realisation of collective goals" (ibid: 4).

We hold that this definition of governance is a more adequate one for analysing, explaining and evaluating shifts in flood risk governance than the UNDP definition. It is also compatible with Hegger et al.'s (2013) definition of Flood Risk Governance Arrangements, which we will use as our operational definition: *"the constellation resulting from a dynamic interplay between actors and actor coalitions involved in all policy domains relevant for 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*".

Our operational definition of Flood Risk Governance Arrangements highlights two main points. First, developments in various sectors relevant for Flood Risk Management will be considered. Besides traditional sectors such as water management, these may include other sectors such as risk management, spatial planning, disaster management etc. Second, there are several dimensions of policy making (Arts, Leroy & Van Tatenhove 2006; Wiering & Arts 2006): the **actors** and actor coalitions involved; the **power and resource base** of the actors involved; substantive and procedural **rules of the game** as well as prominent **discourses** in flood risk governance. These four dimensions draw our attention to the types of issues that are relevant when trying to identify main similarities and differences between countries. For that reason, this report is structured according to these four dimensions.

1.4 Outline of the report

The outline of this report is as follows. Chapter 2 sketches the consortium countries' **background situation** in terms of their experiences with flooding in the past 50 years or so. The subsequent chapters focus, consecutively, on some aspects of each of the four dimensions of Flood Risk Governance Arrangements: actors, resources, rules and discourses. It should be noted that the aspects that are discussed are a starting point only as each of the four dimensions should be

interpreted in a broader sense than what is discussed in the current report. A more detailed analysis of Flood Risk Governance Arrangements is foreseen for WP3.
Chapter 3 focuses on the **actors** dimension of flood risk governance. It discusses each country's designated competent authorities for the implementation of the floods directive. It furthermore gives a first sketch of which actors have which competences for implementing different types of Flood Risk Management Strategies. Chapter 4 deals with **resources** for flood risk management, addressing the question what financing arrangements for Flood Risk Management are currently in place in each country. Chapter 5 zooms in on a specific type of procedural **rules** by paying attention to the extent to which the countries managed to achieve integration between water management and spatial planning, as well as the ways in which they managed to do so. Chapter 6 discusses some substantive and procedural norms and goals (**rules**) that are in place in the STAR-FLOOD consortium countries. The focus of chapter 7 is both on **rules** and **discourses** as it discusses the extent to which and how different countries managed to achieve stakeholder involvement in flood risk management. Chapter 8 deals with developments in dominant **discourses** of flood risk management. In chapter 9, an overview is given of the **Flood Risk Management Strategies** that are in place. The chapter draws on the five categories of strategies that have been identified within STAR-FLOOD: 1 pro-active spatial planning; 2 flood protection; 3 flood mitigation; 4 flood preparation and 5 flood recovery (http://www.starflood.eu/about-the-project/research-topic/, accessed 31 May 2013). It is shown that the countries differ considerably in the extent to which they apply different strategies and link them together. The analysis is concluded in chapter 10. Finally, chapter 11 addresses the relevance of this analysis for the next Work Packages of STAR-FLOOD and highlights some specific points of attention to be taken up in these WPs. Table 1 summarises the main logic of the outline of this report.

Table 1: overview and logic of the report

What?	Where addressed?
Background situation in the six STAR-FLOOD consortium countries	Chapter 2: flood experiences
Actors involved in flood governance	Chapter 3: competent authorities
Resources	Chapter 4: resources for Flood Risk Management: financing arrangements
Procedural and substantive rules of the game	Chapter 5: procedural rules – integration between water and spatial planning Chapter 6: substantive and procedural norms and goals Chapter 7: stakeholder engagement in flood risk management
Discourses	Chapter 8: discourses of flood risk management
The extent to which countries have broadened their Flood Risk Management Strategies	Chapter 9: flood risk management strategies
Conclusion and next steps	Chapter 10: Conclusions Chapter 11: Relevance for next Work Packages

2 The context of Flood Risk Management: actual flood experiences

2.1 What is the challenge?

Countries and regions, including the STAR-FLOOD consortium countries and regions, differ in the nature and significance of flood risks that are present. Also, their actual experiences with flood events differ. Below, we will give an overview of the main similarities and differences between the STAR-FLOOD consortium countries in this respect.

2.2 Country comparison

All STAR-FLOOD consortium countries are vulnerable to flooding at least to some extent. However, there are large differences in the types of flooding that occur. All countries encounter pluvial and fluvial flooding (although the occurrence of floods has been significantly reduced in Sweden due to the extensive development of hydropower establishments). Some countries, e.g. The Netherlands, The UK and Belgium, can also encounter tidal and surge flooding. France is the only country in the consortium in which flash floods in mountainous regions occur. In Sweden there is melting snow in spring in the north of the country. In European countries outside of the consortium, ice jam flooding is a significant problem (e.g. in Hungary, see Racz 2011). A more detailed overview of flood experiences in all countries is provided in the annex.

There are huge differences between the countries in terms of the significance of flooding, and related to this, the presence of recent experience with flood events. In Poland, floods constitute the main natural disaster (Ostrowski & Dobrowolski 2000). In recent history, major floods of large economic and social significance occurred in 1980, 1997 and 2010. The July 1997 inundation was an all-time high in Poland as far as economic losses are concerned. On the other extreme, in Sweden there is limited experience with disastrous floods (but there is a potential for flooding which is expected to increase due to climate change) (Swedish Civil Contingency Agencies 2012). The Netherlands, The United Kingdom, Belgium and France all seem to fall between both extremes. The large 1953 flood struck The Netherlands (1,800 casualties), The United Kingdom (308 casualties) and Belgium (14-22 casualties). The latter event acted as a shock event for all three countries, although as we will see, the precise responses to the event vary. Other shock events include the 1952 flood affecting Lynmouth (UK), the 1976 storm in Belgium, the 1993/1995 (near) floods in The Netherlands, the 1993/1994 floods in the Rhone valley (France) and the 2007 floods in England and Wales. All these events were more or less directly followed by political and often societal debate and, in some cases, policy changes. Historians may teach us, however, that we have to be careful to see these shock events as the sole explanatory factor for policy change. As we will argue in the next chapters, the countries' background situation can be expected to interact with institutional factors in various complex ways.

2.3 Conclusions

To be able to understand Flood Risk Governance Arrangements in the STAR-FLOOD consortium countries and cases, it will be crucial to take into account these countries' background situation in terms of flood experiences. This should be done next to an elaboration of the general background situation (e.g. in terms of geography) as it is discussed, amongst other things, in deliverable D1.1.1 (Green et al. 2013).

3 The actors dimension: competent authorities for delivering Flood Risk Management

3.1 What is the challenge?

The term 'competent authority' is used in different ways in practice. The European Commission uses it to indicate which public authorities in which countries have been given the responsibility for the implementation of the Floods Directive and the Water Framework Directive (http://www.wise-rtd.info/en/info/annex-i-information-required-list-competent-authorities, accessed 26 April 2013). But the term 'competency' is also understood in a broader sense (Green and Fernández-Bilbao 2006). It then refers to the extent to which institutions have the power to "undertake, to fund, to regulate or otherwise influence" interventions (ibid. p69), in our case Flood Risk Management interventions. In other words: which actors have which possibilities to 'steer'? Some others would label this interpretation of 'competence' as 'capability' (Burger & Christen 2011).

Both interpretations are valid and hence this chapter looks at competent authorities in both ways. It first gives an overview of the designated competent authorities for the implementation of the floods directive in each country (3.2). Note that more detailed information on European flood regulation, including the WFD and the FD is provided in Deliverable D1.1.3 (Bakker et al. 2013). Next, an overview is given of current authorities and their actual competences (or capabilities) more generally for each of the STAR-FLOOD consortium countries (3.3). This overview is concluded in 3.4.

3.2 Designated competent authorities under the Floods Directive

EU Member States differ in what organisation they have designated as the 'Competent Authority' under the Directive (A working paper of the Working Group on Floods of the Common Implementation Strategy of the Water Framework Directive states (p22) that many European countries have appointed more competent authorities for the FD than for the WFD, "due to the need to cover functions such as crisis management, civilian risk related to floods and flood protection of coastal areas" (WGF13-10 FD-WFD Paper - Rev A - October2012 - Consolidated Comments April 2013, accessed 14 May 2013). Also, "some WFD Competent Authorities have not been reported as Floods Directive Competent Authorities, in cases where their function was primarily in water quality or environmental protection".

Table 2: Competent authorities for delivering Flood Risk Management: Designated Competent Authorities under the Floods Directive**)** and the particular focus of that organisation. Notably, in Sweden, the designated 'Competent Authority' is the Swedish Civil Contingencies Agency (MSB) and in this country the designated Competent Authorities under the WFD and Floods Directive differ; the Competent Authority under the WFD being the Swedish Water Authority for each of the five River Basin Districts (EC Commission Staff Working Document 2007). On the contrary, in the Flanders region in Belgium, the competent authority for the implementation of the Floods Directive is the same as for the implementation of the Water Framework Directive: the Coordination Commission on Integrated Water Policy. Both in England & Wales, Scotland and The Netherlands, we see that the main authority lies in the hands of the 'environmental' departments: the Environment Agency, the Scottish Environmental Protection Agency and the Ministry of Infrastructure and the Environment respectively. Poland, finally, has designated a very large number of competent authorities, partly overlapping with those of the WFD.

A working paper of the Working Group on Floods of the Common Implementation Strategy of the Water Framework Directive states (p22) that many European countries have appointed more competent authorities for the FD than for the WFD, "due to the need to cover functions such as crisis management, civilian risk related to floods and flood protection of coastal areas" (WGF13-10 FD-WFD Paper - Rev A - October2012 - Consolidated Comments April 2013, accessed 14 May 2013). Also, "some WFD Competent Authorities have not been reported as Floods Directive Competent Authorities, in cases where their function was primarily in water quality or environmental protection".

Table 2: Competent authorities for delivering Flood Risk Management: Designated Competent Authorities under the Floods Directive & present Flood Risk Management competences and divisions of responsibilities more generally.

Coun -try	Designated Competent Authorities under the Floods Directive	Authorities and their actual competences in the STAR-FLOOD consortium countries
BE	**Flemish region**: Coordination Commission on Integrated Water Policy (CIW) (also responsible for the implementation of the WFD), including a Working Group on the Floods Directive; **Brussels capital region**: Brussels Institute for management of the environment; **Walloon region**: Directorate-general for Agriculture, Natural Resources and the Environment; Environment and Water Department.	Centrally organised water management with an important role for the three regions (Flanders, Brussels and Walloon region); Non-navigable watercourses are managed by Regional Administrations for Public Works, navigable watercourses by the Regional Ministries of The Environment.
UK	Environment Agency and the Scottish Environmental Protection Agency	Key actor in flood issues in **England** is the Environment Agency; still some Drainage Boards exist; institutional organisation of flood management is complex; Strategic funding of flood management is done by the Ministry of the Environment, Food and Rural Affairs (DEFRA); In **Scotland**, the Scottish Environmental Protection Agency (SEPA) is the main actor involved in flood management.
FR	Working group "Floods Directive" (GTDI)	Cooperation between **State** and **local authorities** has increased since the Ministry of the Environment has started to fund local action plans for flood preservation (PAPI); Riparian property owners have various responsibilities, including the one to inform potential buyers or tenants of the flood character of their property.
NL	Interdepartmental working group on the Implementation of the Floods Directive, chaired by the Ministry of Infrastructure and the Environment; Provinces are involved in coordinating the production of flood hazard and flood risk maps (but not Designated Competent Authority under the FD)	Main actors are the Department of Public Works and the 25 Water Boards responsible for flood protection; The role of the so-called safety regions involved in crisis and emergency management is increasing; Municipalities have been attributed an important role in flood warning and in developing and practicing evacuation plan
PL	Poland has 46 FD Competent authorities which includes 8 WFD competent authorities	Central government authorities (via KZGW & RZGWs, national and regional agencies) collaborate with local authorities; local authorities have to coordinate and – initially – fund activities during floods including those of the police and fire fighters.
SE	Swedish Civil Contingencies Agency (MSB)	Main body involved in flood issues is the Swedish Civil Contingencies Agency; Another important agency is the Swedish Meteorological and Hydrological Institute (SMHI) (responsible for various types of forecasts).

3.3 Authorities and their actual competences in the six STAR-FLOOD consortium countries

3.3.1 Belgium

Belgium is a federal state divided into three regions, Flanders, Walloon and the Brussels-Capital region. Given the selected cities and the limited timeframe, the main focus in WP1 is on the (regulatory) framework of the Flemish region. In the following work packages, the administrative and legal landscape in the Flemish, Walloon and Brussels Capital region will be extensively studied. Each of these regions is competent to install its own water policies and the role of the federal government in this is relatively limited (Maes & Lavrysen 2003: 47). The role of the regions has been strengthened especially since the state reforms in 1980. The organisation of water management in Belgium has remained highly centralised, but the regional governments have replaced the federal government in their role of the central actor.

The management of watercourses in Belgium can be characterised by a sharp institutional separation between navigable and non-navigable watercourses. The former are managed by the regional Administrations for Public Works, the latter by the regional Ministries of the Environment. Regarding non-navigable water courses, in 1950 a division has been made into three categories that still exist today, each of them with their own responsible authority. Formerly, these managing authorities predominantly focused on agricultural goals (drainage and irrigation), later ecological goals have been added. They have ownership rights of the watercourses, implying that riparian owners are not financially responsible for maintaining and managing the stream. As a consequence, the managing authorities can execute single authority and deliver more efficient management.

Especially in the 1970s and 1980s the environmental movement in Belgium severely criticised the existing institutional arrangements for water management: too many competent authorities, intergovernmental competition and lack of cooperation, absence of stakeholder dialogue and an integrated vision in spatial planning, and 'old school' policy instruments that hinder ecological water management (Abts & Maene 1984).

3.3.2 England and Scotland

Both England and Scotland are countries part of the United Kingdom. They have a separate institutional organisation of flood management issues, although there are similarities between the two countries. In England (and Wales which is part of the same regime) the government has no statutory duty to protect land or property from flooding: all powers are permissive. Catchment boards were established in 1930 and successively replaced by first river boards, then by the Water Authorities, which were succeeded by the National Rivers Authority and finally by the Environment Agency. In some parts of the country we can still find some of the Drainage Boards that were established by the land drainage act of 1930.

The division of responsibilities amongst actors can be said to be very complex, with different individuals and organisations responsible for different types of watercourses and flooding problems (e.g. non tidal main rivers, non-tidal non main rivers, tidal rivers, navigable rivers etc.). This large degree of complexity, especially in the field of flood defence, is being criticised for inducing high transaction costs and distracting attention from the substantive issue of establishing flood defence works. Nevertheless, at the same time, a broader movement towards the development of an overarching approach to flood risk management is reflected in institutional change. In 1996 the Environment Agency has been established. Initially the EA's main authority lied in the domain of flood defence. The EA and its precursors were active in the flood proofing of properties, storage on flood plains and river restoration amongst others. Currently, the EA also has permissive powers in the

area of flood warnings. It took over these powers from the National Rivers Authority which in turn inherited those powers from the Water Authorities. This is said to have taken away much legal complexity and uncertainty (Parker & Hagett 2001). Strategic and funding responsibilities for flood risk management remain centrally organised with the Ministry of Agriculture, Food and Rural Affairs (DEFRA), previously the Ministry of Agriculture, Fisheries and Food (MAFF).

In Scotland, the Scottish Environmental Protection Agency (SEPA) has powers under the Environment Act 1995 to both assess and advise on the risk of flooding and it has an overall responsibility for all flooding issues in Scotland. From 1995 onwards SEPA was granted a greater say on planning decisions a few years before similar powers were granted to the EA in England (The Scottish Office 1995). It was not until 1999 that SEPA developed a Flood Warning Strategy and at that time they reported that the police were the best organisation to disseminate flood warnings and were reluctant to take on this role due to resource constraints.

3.3.3 France

In France, since the late nineteenth century, the powers and responsibilities in the field of floods have been divided between three actors: the State and its decentralized services, local authorities and the riparian, especially when he owns a property located in a flood prone area. In the 1980s, contrary to decentralising tendencies in other policy domains in France, the state received additional competences in the field of flood risk management, both in the development of regulatory risk mapping and vis-à-vis the established compensation system (system CATNAT). Solidarity has always been an important guiding principle for flood policies. It is also the leading principle of the CATNAT system obliging all citizens to contribute to a fund, guaranteed by the state that guarantees the presence of an insurance system in case of disasters.

In 1995, following the law Barnier, the state has created a new regulatory instrument, promoting the development of flooding PPRs, local action plans for flooding. PPRs are intended to reduce or stop urbanization in flood plain areas (depending on the level of hazard) and to impose measures to reduce the vulnerability of already built properties. They also respond to the logic of preserving flood plain areas. Under this logic, municipalities covered by a Flood PPR have important responsibilities for flood management, including the provision of information on major risks through an information report (DICRIM), the organisation of public communication campaigns and the instalment or maintenance of flood marks on their territory. The mayor of a locality covered by a Flood PPR is identified as responsible for the management of the crisis and post-crisis on his territory. This mission returns back to the Prefect as soon as the flooding exceeds the limits of the municipality. To accomplish this mission, each municipality covered by a "Flood PPR" must make a local Conservation Plan (PCS).

Local and state agencies increasingly collaborate in preserving natural flood plain areas. This movement towards more collaboration has intensified especially through the funding by the Ministry of the Environment of local Action Plans for Flood Prevention (PAPI) from 2002 onwards. PAPI are action programmes designed at watershed scale, aiming to combine improved protection devices, improvement of the provision of information to the public and approaches to reducing vulnerability. Besides, a more and more active role is played by the EPTB (Etablissement Territorial de Bassin – water agency at the level of watershed). These play a role in methodological issues, but also in the drafting of financial plans for projects and technical assistance.

The third pillar of flood risk management is the riparian owner. Since the law of 1808, the riparian is responsible for his own safety. Since then, his obligations have increased. The Act of 30 July 2003 on the prevention of technological and natural risks and the repair of damage has empowered private owners, lessors or sellers of goods located in a flood prone area. Those have now an obligation to inform potential buyers or tenants of the flood character of their property.

3.3.4 The Netherlands

In the Netherlands, the main actors involved in flood risk management are the department of Public Works and the after several mergers resulting 25 Water Boards, as well as the associated knowledge institutes (Delft University, Deltares) (Wiering & Arts 2006). The public works department is responsible for the main water courses and for coastal protection, while the Water Boards are responsible for regional water bodies. Water boards are called "functional authorities" that have tax raising power (Van Rijswick & Havekes 2012). In principle, the government is only responsible for the habitability and safety of areas *behind* the primary defence structures and *within* dike-protected areas. In most cases, people live and work in areas outside these primary defences and dike-protected areas at their own risk. The provinces have the responsibility to oversee the state of the primary flood defences (article 3.9 of the Water Act). Besides these traditionally involved actors, the role of the 25 so-called "safety regions" is becoming increasingly important. In these regions, based on the 25 former police regions of The Netherlands, several organisations collaborate in the field of crisis and emergency management. Provinces have an important responsibility for coordinating the production of flood hazard and flood risk maps. Municipalities have been attributed an important role in flood warning and in developing and practicing evacuation plans (http://veiligheidsregios.nl/infotheek, accessed 1 May 2013).

3.3.5 Poland

An important characteristic of Poland is that the country is in transition from a former communist system towards a market economy. Central government plays the main role in Polish flood protection, in cooperation with local authorities. According to Polish legal arrangements it is their responsibility to undertake and coordinate flood protection. Central government conducts its activities by national and regional water management agencies (KZGW and RZGWs, respectively). The decisions made by the agencies in case of increased flood risk have to be agreed with central administration on the regional level. When a flood occurs, different bodies are involved and local authorities have to afford the cost of activities during the flood with the help of police and fire fighters, financed from the central budget (some fire units are financially dependent from local governments). Typically, after a flood event local authorities get partly reimbursed from the central crisis reserve budget funds for recovery actions.

3.3.6 Sweden

In Sweden, competences regarding floods are divided among authorities at local, regional and central level. Since many of the larger Swedish rivers are regulated for the production of electrical power, dam owners/power companies or water regulation companies as well as insurance companies are also important actors. The municipalities have, in accordance with the Planning and Building Act (SFS 2010:900) responsibility for spatial planning and regulate the use of land and water areas within their borders. The Act includes explicit requirements to consider the risk of accidents, floods and erosion when determining the suitability of the land where buildings and structures are to be located. In some cases, municipalities must also consult with the county administrative boards, which represent the national Swedish Government in each of the country's twenty-one counties. Municipalities are also primarily responsible for emergency planning and preparedness. Another piece of legislation, the Act on Extraordinary Incidents (Act on Measures to be taken by Municipalities and County Councils in Preparedness for and during Extraordinary Incidents during Peacetime and Periods of Heightened Alert - SFS (2006:544), regulates the municipalities' and the county councils' (regional governments) obligations in relation to complex, extraordinary incidents that disrupt or can severely disrupt vital societal functions. In particular, municipalities and county councils are required to perform a risk and vulnerability analysis accounting for the extraordinary incidents at peacetime that can occur within their borders and, on the basis of that, establish a plan for how such incidents will be managed.

The Swedish Civil Contingencies Agency (MSB) works at a central level to prevent and mitigate the effects of natural disasters such as floods. This Agency has the overall responsibility for the implementation of the Floods Directive and, in this function, cooperates closely with the county administrative boards. Special responsibilities lie with the five county administrative boards that were designated Water Authorities as a result of the implementation of the Water Framework Directive (Swedish Civil Contingencies Agency 2012). The MSB also compiles and maintains general flood maps illustrating the areas that can be flooded when the water rises to certain levels. These maps are provided to the municipalities and county administrative boards to serve as a basis for spatial and emergency planning. Finally, The MSB promotes the establishment of local river groups which function as forums for cooperation and coordination for relevant stakeholders in a river basin (https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Alvgrupper/, accessed 29 April 2013). International tendencies and debates regarding flood risk management are known to MSB (Nyberg 2008). The extent to which they are considered at the implementation stage is however undetermined.

Another national government agency with functions related to flood risk management is the Swedish Meteorological and Hydrological Institute (SMHI), which is responsible for producing forecasts of weather, wind, water, climate and environment. SMHI has a three level warning system for extreme weather forecasts (http://www.smhi.se/vadret/vadret-i-sverige/Varningar, accessed 29 April 2013).
While the main responsibilities lie with national public agencies at central and regional level, the Ordinance states that affected municipalities and other particularly affected stakeholders must be given the possibility to participate by submitting material or considerations.

3.4 Conclusions

This chapter has provided a first sketch of the competences of various public authorities in each of the STAR-FLOOD consortium countries in relation to different Flood Risk Management Strategies and in relation to the implementation of the Floods Directive. These countries have appointed different types of authorities for the implementation of the Floods directive. This tells something about historically grown institutional structures, but also whether they see flood issues for instance as an 'environmental' problem, a 'safety' problem or otherwise. With the exception of Poland, the competent authority under the Floods Directive is generally the entity that is seen as the key actor in flood issues – or a committee formally residing under that entity. This actor, however, cannot achieve shifts in FRM on its own. To diversify and align Flood Risk Management Strategies, a large number of actors with different types of competences (or capabilities) is needed. In all countries except Sweden the key role is played by water management actors. However, there are huge differences in the exact division of responsibilities amongst actors, partly related to the more general administrative structure of these countries (e.g. highly centralised in France vs. less centralised in The Netherlands) and especially in the more 'federal' countries (Belgium, UK) the regions and countries, respectively, have relatively much autonomy in flood management issues.

In all countries, the division of responsibilities amongst actors is complex. This complexity is sometimes (e.g. UK, France, Poland, Belgium) referred to in negative terms. But in England/Wales and Scotland, there appears to be a counter-movement in the sense that responsibilities for flood issues have been placed with a single authority (the EA in England/Wales, SEPA in Scotland). It is, however, too early to make any conclusions about this development in an evaluative sense. One would logically assume that the institutional complexity of flood management will have a tendency to increase once countries start to make attempts at diversifying Flood Risk Management Strategies (FRMSs). This raises the question of how to deal with such complexity and which bridging mechanisms between different institutions, jurisdictions and issues can be identified. This question of bridging is probably the key question emanating from the current chapter and it definitely deserves to be further addressed in the next WPs of STAR-FLOOD.

4 Rules and resources for Flood Risk Management: financing arrangements

4.1 What is the challenge?

Financing arrangements are an important component of flood-related policies. The question "who pays for what and why" may reveal how things have been arranged and what might be potential driving forces (policy utopias, deep core beliefs) behind the arrangements. In terms of the four dimensions of the Policy Arrangements Approach, financing arrangements reveal something about financial resources. Who has how many of them? Who has the power to generate them and on what basis (e.g. tax raising power)? But they also reveal something about a specific type of rules, namely the normative principles that are in use (see also Deliverable D1.1.2: Dieperink et al. 2013).

4.2 Comparison between the countries

The current report restricts itself to a general quick scan. Table 3 on the next page shows, for each country, a number of the public authorities discussed in 3.3, their financial and – if apparent – the apparent financing principle. Although this overview will have to be extended and refined in WP3, it already provides ground for two observations. First, as we have seen also in the previous chapter, there is a huge diversity between the countries in terms of the number and types of actors involved. This diversity is partly related to the administrative structures and cultures of the countries. For instance, in Belgium the regions play a more prominent role than in the other countries. But the diversity is also related to the extent to which certain Flood Risk Management Strategies (FRMSs) are applied (see also chapter 9). In France, Sweden, Belgium and England, there is a clearly identifiable insurance regime (although the English system is currently under negotiation because the insurance industry does not consider it to be sustainable (http://www.parliament.uk/business/committees/committees-a-z/commons-select/environment-food-and-rural-affairs-committee/inquiries/parliament-2010/flooding/flood-funding---further-information-/, accessed 31 May 2013). In The Netherlands, an insurance regime is virtually absent. In France (CAT-NAT) and Belgium there is an earmarked disaster fund, whereas in other STAR-FLOOD consortium countries such an earmarked fund is not in place (but it is in some other countries, including Spain).

Second, normative principles also differ. A prominent principle in all countries is the solidarity principle, being the principle that society as a whole should cover certain flood-related costs. Another principle is the private interest principle, being the principle that costs should be carried by those who encounter most risk or benefit most from FRM measures. Both principles are to be seen as end points on a continuum. In none of the countries there is a one-sided focus on only one of these end points. It may make intuitive sense to argue that England will be most inclined to emphasise the private interest principle, but the flood warning systems of the Environment Agency are financed by society as a whole. Poland seems to attach much importance to solidarity. But as we will see in chapter 9, Poland lacks resources for flood management. In a certain situation, a disadvantaged home owner might in the end carry the financial burden of recovering from floods. Also France seems to attach much importance to solidarity, but also here we see various "private interest-based" financing mechanisms (e.g. insurance through public-private partnerships). Also, as Botzen & Van Den Bergh (2008) have shown, insurance systems still allow for a certain bandwidth in terms of the underlying principles that can be followed. E.g. one can think of an arrangement in which the height of premiums are or are not related to flood risks. As part of the insurance policy, one can make certain property level protection measures obligatory or not etc.

4.3 Conclusion

So a nuanced analysis of financing arrangements will be necessary without jumping to conclusions too quickly. Furthermore, the financing arrangements are a clear illustration of the institutional diversity and complexity between – and maybe also within – countries. This is an argument for being very cautious when making claims about the feasibility of a certain Flood Risk Management Strategy.

Table 3: first sketch of financing arrangements in the six STAR-FLOOD consortium countries (financing principle in BOLD & CAPITAL)

Country	Important actors	Sources of revenue & financing principle (if apparent)
Belgium (Flemish region)	Regional authorities	Levy on the capture of water and on the extraction of groundwater(deposited in MINA fund) – **ATTEMPT AT COST RECOVERY** Rubicon fund (floods)
	Operators of public water distribution networks (outsourced to municipalities and NV Aquafin)	Levies on the pollution of surface water (deposited in MINS fund) – **POLLUTER PAYS PRINCIPLE**
England and Scotland	Central government	General tax payer (flood warnings)
		Charge payers (conventional sewage connections)
	Purchasers and renters of apartments	Capital costs of SuDS
	Local authorities	O & M costs of SuDs
	Partnerships	Contributing partners (depending on the water course)
	Insurance companies	Home owners
France	Various public authorities	Fonds BARNIER (partly financed by CATNAT funds) – compensation of owners after a natural disaster, financing of projects dealing with flood management – **SOLIDARITY PRINCIPLE**
	Owners of dikes	Pay themselves for dike maintenance, backed up by public authorities – **PRIVATE INTEREST & SOLIDARITY PRINCIPLE**.
	Various actors involved in local planning processes	Partnership funding, important role for local authorities, European funds (FEDER) – **SOLIDARITY PRINCIPLE**
	State	Various funds dedicated to flood warning and recovery, a.o. CATNAT and as last resort the "Caisse Centrale de Réassurance" – **SOLIDARITY PRINCIPLE**.
The Netherlands	Regional water authorities	Taxes from property owners – **FULL COST RECOVERY PRINCIPLE**
	Department of public works	Taxes; Delta fund – **FULL COST RECOVERY PRINCIPLE**
Poland	Central governments (through national and regional agencies, KZGW and RZGWs)	Taxes – **SOLIDARITY PRINCIPLE**
	Local authorities	Taxes, reimbursement from central crisis reserve budget funds – **SOLIDARITY PRINCIPLE**
Sweden	National governments; Regional governments; Local governments	Taxes, government grants (both for establishing flood protection and for emergency management) charges – **SOLIDARITY PRINCIPLE**
	Private insurance market	Premiums

5 Procedural rules: Integration of water and spatial planning

5.1 What is the challenge?

In many countries water has always been managed largely in order to make the best use of land, with the way in which we use land then having major and often catastrophic, impacts on the waterine environment. Historically, water management has been the servant of land management. But the integration of land and water management is perhaps the key requirement for the delivery of Integrated Water Resource Management (IWRM) (GWP 2000).

The need for integration between water and spatial planning also becomes apparent when looking at the five Flood Risk Management Strategies that will be discussed in chapter 9. This holds especially for the strategies of risk prevention through pro-active spatial planning and flood mitigation. In both cases, the main point is to take water, more specifically the possibility of flooding, into account in spatial developments. But as we will see, there are different ways to do this. Below, we will provide a first sketch of the mechanisms, if any, that are in place in different countries to bring about such integration.

5.2 Current efforts at integration

5.2.1 Belgium

Water managers and spatial planners are actively instructed to reduce flood risks in areas with high potential damage costs (residential areas and industry zones), at the expense of areas in which potential damage is small or non-existent (range land, nature areas). The 'water test' is a procedural step in the adaptation of plans and programmes and the licencing of permits. The aim of the water test is to allow the competent authorities to take fully into account the possible damaging effects that may occur in the water system. Communication campaigns are installed to inform people on flood risks in low lying land. Also, the drafting of flood hazard and flood risk plans in the framework of the Floods Directive is expected to contribute to integration between water and spatial planning. In the spring of 2012, the first draft maps for the river basin of the Yser were presented to the members of the Coordination Commission on Integrated Water Policy (CIW).

5.2.2 England and Scotland

In England, land and water management are carried out by different bodies (water by the Environment Agency, spatial planning by the local authority) under the supervision of different ministries, on different time cycles and under different procedures. Here, the experience of other countries should provide new insights and possibly better practice. Some first steps towards further integration have been taken. After the autumn 2000 floods, poor spatial planning and development control in flood risk areas was raised as a key issue. In 2001, the Department of Transport, Local Government and the Regions issued a Policy Planning Guidance entitled *Development and Flood Risk* introducing a sequential test and necessitating flood risk assessments for development in areas at significant risk of flooding.

5.2.3 France

The principle of the conservation of natural flood plain areas was emphasized under the law n ° 2003-699 of 30 July 2003 on the prevention of technological and natural risks and the repair of damage called "Risks law". This Law promotes the establishment or restoration of such areas. It provides in particular the creation of a flooding easement for instance for loss of flooded crops. Also,

this type of development has been strongly encouraged from 2002 onwards through the funding by the Ministry of the Environment of local Action Plans for Flood Prevention (PAPI) (see also chapter 4 on competent authorities).

5.2.4 The Netherlands

The fourth Policy Memorandum on Water Management (1998) stressed the need for an integrated approach to water management. The latter has as its main implication that the government expects water managers to collaborate with other policy domains including spatial planning (Correljé et al. 2010). In 2000, the governmental committee "Water Policy for the 21st Century" made a range of recommendations, including the recommendation to make a Water Test (Watertoets in Dutch) obligatory in spatial planning procedures. This procedural instrument requires the inclusion of a 'water paragraph' in municipal zoning plans and hence in principle it enables water policy makers to specify and politicize their interests. In practice, until recently, the instrument was approached as a formality which could be quite easily bypassed by using a 'standard text'. Recent discussions within some of the sub-programmes of the Dutch Delta committee suggest, however, that some provinces (the governmental entities overseeing the development of municipal zoning plans) are seriously considering to put stricter requirements to municipalities when it comes to water related issues, and hence the significance of the Water Test is expected to increase in the future (Frank Wagemans, policy advisor on water and spatial planning, IPO and Dutch Delta Programme, personal communication).

5.2.5 Poland

It seems that in Poland water has always been managed largely in order to make the best use of land. Issues of the widely understood water management are met with superficial interest of the society and media. This subject most often moves by the way of protests of environmentalists in relation to planned investments or following extreme weather events. After major and disastrous floods, when "bad" space management had awful impact on the water environment, experts issue opinions about the need for the interaction between specialists from the spatial planning and the water management/planning.

Until today at the ministerial level, both management areas are still a subject of the different ministries – of Infrastructure and of Environment, respectively. It seems, though, that the implementation process of European directives will enhance closer collaboration between specialists from these two areas. The Preliminary Flood Risk Assessments, for instance, have ensured that areas exposed to flood danger, i.e. areas, where significant flood risk exists or where occurrence of flooding is probable become identified.

The preliminary flood risk assessment was drawn up as part of the project Computer System of National Defence against extraordinary threats (ISOK) of the operational programme financed from the EU Regional Development Fund in the framework of Innovative Economy. The project is being carried out by the Institute of Meteorology and Water Management - (IMGW PIB) in the consortium with the National Board of Water Management (KZGW), Central Office of Geodesy and Cartography (GUGiK), the Government Centre of the Security (RCB) and the National Institute of Telecommunication.

5.2.6 Sweden

In Sweden, in accordance with the Planning and Building Act (SFS 2010:900), the municipalities have responsibility for spatial planning and regulate the use of land and water areas within their borders. The Act includes explicit requirements to consider the risk of accidents, floods and erosion when determining the suitability of the land where buildings and structures are to be located. In some cases, municipalities must also consult with the county administrative boards, which represent the

national Swedish Government in each of the country's twenty-one counties. These county administrative boards coordinate national and inter-municipal interests, provide the municipalities with relevant data and advice, and have a specific responsibility to control that flood and other risks are sufficiently taken into account in planning processes.

5.3 Conclusion

The need to integrate water and spatial planning has been acknowledged in all consortium countries at least to some extent. Various procedural instruments have been developed to enable this integration. Experiences with this differ, however. In Sweden, this integration seems to have taken off, possibly due to the fact that this country is quite sparsely populated. In other countries, integration between water and spatial planning seems to be a cumbersome process. This may be due to vested interests of actors carrying out activities in flood plains, the need to gain experience with the consideration of water management equal to land management and probably also with the persistence of the historically grown expectation that water managers will continue to come up with technical solutions to enable spatial planning processes. This latter expectation, however, will likely become less and less realistic, especially in the light of on-going urbanisation in combination with the expected effects of climate change. The next WPs of STAR-FLOOD will therefore have to look for integration mechanisms that work. For instance, which procedural instruments have proven to be successful?

6 Substantive and procedural norms and goals

6.1 What is the challenge?

The STAR-FLOOD researchers are facing the challenge to gain insight in prevailing discourses in floor risk management. The absence or presence of certain substantive and procedural norms and goals can be seen as a manifestation of such discourses. In this report we will not discuss these norms and goals in great detail. Instead, we will only list some salient norms and goals. These may also be an indicator of the degree and way in which Flood Risk Management Strategies have (not) been institutionalised.

6.2 Country comparison

In **Belgium**, there are norms regarding the potential of buildings to store rainwater. In some cases the instalment of rainwater cisterns is obligatory, of which the storage volume should be proportional to the horizontal roof surface of dwellings. There are also norms regarding flood insurance. For instance, there is a maximum put to the height of insurance premiums. Furthermore, there are some designated areas with high flood risks in which insurers are not obliged to provide flood insurance.

In **France**, substantive norms and goals related to the strategies of pro-active spatial planning, flood mitigation and flood recovery can be distinguished. Related to pro-active spatial planning, regulatory mapping based on the «Plus Hautes Eaux Connues» PHEC (Highest Flood Ever Known) is obligatory. This is the case in areas which are not or scarcely built, located in those areas which have been flooded at least once in history (PHEC), new buildings are forbidden. New buildings are also forbidden in areas with a very high risk (height/speed of water: on the Loire river, water level is at least 2m high). In the case of flood defence, the French use a hierarchy of dikes (above 1m height). Class A dikes are the ones that protect more than 50,000 inhabitants; class B dikes protect between 1,000 and 50,000 inhabitants, class C dikes protect less than 1,000 inhabitants and finally class D dikes protect less than 10 inhabitants. Priority is given to class A dikes. In the case of flood recovery, when a flood event is recognized at the national scale (Ministry of Interior) as a natural disaster (arrêté CATNAT), victims must declare the disaster within 10 days to their insurance company. The insurance company must give compensation within 3 months.

In **the Netherlands** substantive norms are strongly focused on the safety norms of flood defence works. There are different safety levels related to the 'probability of exceeding a certain water level' ranging from 1:2500 to 1:10000. Discussions on the height of these levels as well as the systematic on which they are based (from probability of exceeding a certain water level to probability of flooding) are currently on-going. Another prominent example of a substantive goal is the goal of the Dutch Room for the River programme to enable a discharge capacity of the Dutch major rivers of 16,000 m3/s.

In **Poland**, according to article 79 of the WATER LAW of 2011, a study of flood protection is the first mandatory step, in which the areas requiring flood protection are determined, for their social, economic, or cultural value. Areas of particular social, economic, or cultural importance should be protected against flood with return period at least 100 years (article 84.2). Article 82 of the WATER LAW of 2011 specifies flood risk areas. This information is taken into account in spatial planning (spatial arrangement of a voivodship, a commune, or a locality) and in the process of making decisions on conditions of management of terrain.

In **Sweden**, in 2007, the government proposed a modification to the Planning and Building Act to include clearer requirements for municipalities to work with flood risk management (Regeringens proposition- Ett första steg för en enklare plan- och bygglag, Prop. 2006/07:122). The Act now expressly states that flood risks must be taken into account by municipalities in the spatial planning process. This is to be seen as a procedural rather than a substantive rule.

6.3 Conclusion

Again, we see a large diversity between the countries. With regard to the norms and goals, there is diversity in terms of which issues have been subjected to norms, how high the norms are (in case of substantive norms) and what they are based on. More importantly, the underlying normative end-goal that the norms should help to achieve remains very implicit. Countries seem to differ in terms of beliefs about what flood-related policies should achieve. Should they aim to maximise safety by increasing protection levels, as seems to be the case in The Netherlands? Or is the goal merely to detect and minimise vulnerabilities? In addition to the finding of Deliverable D1.1.3 (Bakker et al. 2013) that the end-goal of European flood policies is unclear, we can say that the end-goals of flood-related policies at country level are unclear as well. A challenge for the next WPs of STAR-FLOOD will therefore be to try to identify these policy utopias of various actor groups. This can also be expected to provide a positive contribution to discussions that are taking place in practice.

7 Rules or discourse? Stakeholder engagement in flood risk management.

7.1 What is the challenge?

As Deliverable D1.1.3 (Bakker et al. 2013) has shown, the engagement of stakeholders is generally seen as a key to successful water management. It is proclaimed by various international organisations (e.g. UN Office on Disaster Risk Reduction, Global Water Partnership). The EC has committed itself to the UNECE Convention on Access to information, Public Participation in Decision Making and Access to Justice in Environmental Matters (better known as the 'Aarhus Convention', http://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf, accessed 2 May 2013). Various principles of stakeholder engagement are also observable within the Water Framework Directive (WFD). The WFD encourages the active involvement of 'interested parties' in the implementation of its provisions and requirements (Article 14.1) and requires Member States to ensure that they make available to the public, for each river basin district, a timetable and work programme for the production of the plan, an overview of the significant water management issues in the river basin for a period of two years prior to the period to which the plan refers, and draft copies of the river basin management plan. Moreover, Member States should allow at least six months commenting on the documents (article 14.2). Also the Floods Directive is said to provide a window of opportunity to more strategically systematize and formalize already existing participatory approaches (see Bakker et al. 2013). The question can be raised of how to 'do' stakeholder involvement. The current chapter provides a first sketch of this issue, drawing on examples from the STAR-FLOOD consortium countries.

7.2 Stakeholder engagement in the consortium countries

7.2.1 Belgium

In Belgium, in the 1970s and 1980s there were strong pleas from especially the environmental movement for increased stakeholder involvement in water management. This was seen as something that could contribute towards the establishment of a more integrated and holistic vision. The specific discourse on 'integrated water policy' was introduced by advocating pioneers within the environment administration. In 1990-1991, they installed pilot river basin committees for five river basins (Demer, Yser, Dender, Nete and Upperscheldt), aiming at multi-stakeholder dialogue between representatives of private and public organizations on diverse but interlinked water management problems in the river basin (Crabbé 2005). Enthusiastic on the emergence of multi-stakeholder dialogue and integrated policy planning, the environment administration aimed at stronger institutionalization of integrated water policy. The same and new advocates within the environment administration and academia pleaded for the introduction of a legal status of river basin committees and integrated policy plans, the creation and formalization of new (eco-friendly) policy instruments and reorientation of standard operating procedures in other policy domains (like the public works departments and spatial planning). This formalization proved a cumbersome process wherein three legislative attempts were needed, before a 2003 attempt succeeded (Crabbé 2008). The latter success has been attributed to the legal obligation to transpose the European Water Framework Directive.

7.2.2 England and Scotland

The government consultation Making space for water (DEFRA 2005) focuses explicitly on the inclusion of stakeholders at all levels, next to other tenets of the strategy: a focus on all sources of flooding, adopting a whole catchment/shoreline approach and recognition of the impacts of social,

economic and environmental consequences. In the past decade or so, we also see a move to re-position flood risk responsibility from being primarily centrally controlled towards more local flood risk management and increasing the self-help roles for both communities and individuals at flood risk. A key principle in these efforts to strengthen local resilience of communities has been efforts to increase stakeholder engagement in flood risk management decisions (Lenister & Long n.d.).

In Scotland, the Flood Risk Management Act of 2009 (SEPA 2012b) and subsequent strategies reinforce the movement towards managing risk sustainably. This movement includes the introduction of flood risk management plans which will consider flood risk from all sources and supports the need for increased community engagement. In particular, flood managers in Scotland have showed an increased attention to managing floods through better land use and practices and managing catchments (SEPA 2012c). The FRR (2009) also provides additional definitions about the list of institutions which need to be consulted (reg. 36 (3)) as well as the public (reg. 27 (7)).

7.2.3 France

In France, legal arrangements for stakeholder involvement have been laid down in the law of 12 July 2010 (art. L. 566-12 II C. envir.). This law states that public comments on the draft Flood Risk Management Plans to be composed as obligation under the Floods Directive are to be submitted to "stakeholders" by the basin coordinator Prefect. The procedures of public consultation on the draft plan are also detailed, particularly regarding the applicable relatively long time limits (public consultation at least one year before the date scheduled for the commencement of the plan, for a period of six months, announcement of the consultation at least fifteen days before the beginning), places and means to collect comments from the public (including a website). The views of stakeholders, solicited during the period of public consultation are deemed favourable in the absence of response after four months. Changes to update the plan come after the basin committee information and a procedure for informing and consulting the public only performed electronically, for a period of two months. However, even if it appears that, following the 2007 Directive, Article L. 566-2 II of the Environmental Code states a principle of collaboration of all local authorities and will involve all the "stakeholders" and make effective public consultation; in reality those texts give a leading role to the State, as it is usually the case for risk management in France.

7.2.4 The Netherlands

In the Netherlands, much experience has been gained with stakeholder participation in water management. The most recent experiences date from Room for the River projects (Warner et al. 2012) as well as the currently running Delta Programme. Within the latter programme, it is stated that stakeholder engagement is essential given the nature of water and flood problems (Vreugdenhil & Wijermans 2013). Contrary to for instance France, the implementation of the Floods Directive is not explicitly seen as a reason for new initiatives to involve stakeholders. It is even stated that new participatory processes or consultation forums are not necessary (http://deltaproof.stowa.nl/pdf/Floods_Directive?rId=28, accessed 29 April 2013).

7.2.5 Poland

In Poland, before the system transformation in 1989, the water management issues were managed by central government (through its regional representatives). Hardly any local stakeholder participation occurred. During the last twenty years, Polish Flood Risk Management has struggled with this existing context of high centralisation. Having entered the European Union in 2004, Poland became obliged to implement the Water Framework Directive. Before that time, no stakeholder participation was even mentioned in the Polish national Water Law. Also, the Floods Directive gave an impulse to participation of the wider public in the process of flood risk management activities. In 2011, the modified Polish Water Law was passed and now it takes into account active social participation and transparency of the procedure. The preliminary flood risk assessment, maps of

flood risk and flood risk management plans should be made available to the public, so that everyone willing could consult it (including experts and NGO's).

7.2.6 Sweden

In accordance with the Planning and Building Act (SFS 2010:900), Swedish municipalities carry the responsibility for spatial planning and regulate the use of land and water areas within their borders. The Act includes explicit requirements to consider the risk of accidents, floods and erosion when determining the suitability of the land where buildings and structures are to be located. In some cases, municipalities must also consult with the county administrative boards, which represent the national Swedish Government in each of the country's twenty-one counties. These county administrative boards coordinate national and inter-municipal interests, provide the municipalities with relevant data and advice, and have a specific responsibility to control that flood and other risks are sufficiently taken into account in planning processes.

7.3 Conclusion

Stakeholder participation and engagement is generally endorsed. To some extent, it has also been regulated. European flood regulation is important in this respect (see also D1.1.3). Besides that, we see examples in which stakeholder processes have acquired a legal status at national level (e.g. Belgium). Just like in previous chapters, the quick scan in this chapter has shown much diversity. The quick scan also raises a number of questions. An important one is, to what extent stakeholders *actually* participate? How inclusive is the participation and how can the participation be characterised (e.g. consulting, co-deciding, informing etc.)? And: to what extent does the participation contribute to or on the other hand pose a threat to democratic legitimacy (e.g. because *stakeholders* are generally not elected authorities)?

Besides the question of democratic legitimacy, there is also the question of the functionality of stakeholder engagement. In short: can stakeholder participation make regions more resilient to flooding? An intuitive answer might be "yes", but one can also assume that participation in some cases has little to contribute or may even work out in a counter-productive way. Lamers et al. (2010), for instance, have shown that stakeholders at the beginning of a policy process may see their own participation as unnecessary, complicating their involvement.

8 A prominent Flood Risk Management discourse: preferred intervention strategies

8.1 What is the challenge?

The previous sections of this report have – often implicitly – discussed a number of emerging and contested discourses in Flood Risk Management (see also deliverable D1.1.2: Dieperink et al. 2013). These include discourses on: The public private divide – which authorities should have what competences; and do societal actors prefer collective or individual approaches? The framing and communication of risks and uncertainties. The interpretation and translation of normative principles. What are appropriate standards of protection? The role of cost-benefit analysis in priority setting. Who should pay – both from a moral perspective and from the perspective of efficiency and effectiveness? Should FRM be a form of engineering or should it try to connect to natural processes? A challenge for the STAR-FLOOD researchers will be to try to make these discourses explicit. This is no easy task because the process through which actors give meaning to the world around them, which is what discourses are about, often takes place at an unconscious level and becomes taken for granted. However, in the current chapter we will address a hitherto not discussed form of discourse, the one on the preferred intervention strategies. As the chapter will show, this form of discourse is the one that has most often led to societal debates.

8.2 Societal debates about preferred intervention strategies

When discussing the preferred intervention strategies, five more general threads can be identified which developed successively in various countries:

- **Changing the challenge**: the traditional methods of channel modification, dikes and other forms of structural intervention. After the Second World War, in various countries much emphasis was placed on such civil engineering measures in the interest of water safety, transport and agriculture. In various STAR-FLOOD consortium countries, examples can be given of major floods that seem to have acted as drivers for new public works and dike enhancement, most notably the floods in 1953 (The Netherlands, Belgium, UK), 1976 (Belgium) and those of 1993/1995 (The Netherlands);
- **Non-structural methods**: development control, building regulation, flood warnings, insurance. This followed from the influential work of White (1964) and other North American geographers;
- **River restoration**: the river restoration movement spread from Denmark (Hansen 1996) and Germany (Schneider 2000) to the UK (Brooks 1988, Purseglove 1988, Gardiner 1991) and the Netherlands and to other countries. The application of the river restoration movement in the UK and the Netherlands had different foci. Whilst in both countries, the watercourses had been canalised, in the UK, in large parts of the country, the rural flood plain had not been disconnected from the river. Hence, in England, the emphasis was on rehabilitating the river channel. In the Netherlands, in the very different conditions prevailing, the flood plain had been constrained. Therefore, in the Netherlands, there was much greater focus on rehabilitating the flood plain (Ministerie van Landbouw, Natuur en Voedselkwaliteit 2006). In The Netherlands and Belgium, the movement towards river restoration seems to have been part of a broader environmental and ecological turn. In The Netherlands this shift took place in the 1980s and 1990s, exemplified with iconic parts of the Dutch Delta Works (e.g. Eastern Scheldt storm surge barrier); in Belgium it was argued that the classic policy approach created new flood risks by straightening, widening and deepening water courses;
- **Catchment approach**: the current emphasis is upon considering the catchment as a dynamic system and hence to include changing the amount and rates of runoff before it reaches the river,

and a general emphasis on using natural processes. This approach is particularly emphasised in Scotland (RSPB & WWF 2007, Johnstonova 2009).

- **Green infrastructure**: the catchment approach is increasingly being rolled into the wider approach of the adoption of green infrastructure (Hammer et al. 2011). " Green infrastructure is the interconnected network of open spaces and natural areas, such as greenways, wetlands, parks, forest preserves and native plant vegetation, that naturally manages storm water, reduces flooding risk and improves water quality" (http://greenvalues.cnt.org/green-infrastructure, accessed 14 May 2013).

The degree to which each of these threads offers a complete substitute for each of the other strands, and particularly the first, or the degree to which they are complements, is commonly contested. The appropriate approach is increasingly seen to require a multi-layered strategy, using a combination of approaches (Green et al. 2000).

8.3 Debates on intervention strategies in the STAR-FLOOD consortium countries

Zooming in on the six STAR-FLOOD consortium countries, there appear to be some similarities between France, UK, The Netherlands and Belgium. In these countries, debates on flood management seem to have gone through five similar stages roughly along the lines sketched in the previous section. Recently, in these four countries, also discussions have started on the potential consequences of climate change and in some cases programmes for dealing with the consequences of climate change have started. At the same time, in the debates we see a shift towards flood risk management and away from flood defence and reduced reliance on engineered solutions (Netherlands, UK). However, with regard to this issue the question emerges to what extent we can really speak of a shift in practice as opposed to what some would call 'empty policy talk'. This is an empirical question that will have to be addressed in the STAR-FLOOD project.

It also seems that the nature of the societal debates on flooding is somewhat different in Poland and Sweden as compared to Belgium, The UK, France and The Netherlands. Societal discussion on floods seems to be virtually absent in Sweden, whereas the debate in Poland – due to the occurrence of recent devastating floods – seems to be held entirely in terms of flood protection and water safety. A picture emerges in which the inclusion of concerns on 'spatial quality', environmental concerns or even the future consequences of climate change are seen as a luxury which the Polish are unable to afford at present time. The difference seems to lie in the venues in which the flood issue is debated. On the one extreme, in Poland, floods have from time to time been the dominating topic in the press and the principal theme of cover stories of weekly magazines. In the other consortium countries, water management debates were more restricted to specific actor groups and interests. For instance, in The Netherlands the environmental movement played an important role in the ecological turn in the 1980s. Also, there are some examples of local resistance, controversies and complexities, for instance in some Room for The River projects. In France, debates arose when prohibitive actions for building in flood plains were taken.

8.4 Conclusion

The issue of the preferred FRM intervention options has been the most salient form of societal debate on flood issues. In the countries and cases that will be assessed in more detail, we will have to investigate how debates on flood management have evolved. Our initial assumption set out here that the situation in Poland and Sweden is somewhat different from the situation in the four other consortium countries will have to be scrutinised. Furthermore, when analysing Flood Risk Governance Arrangements (FRGAs), we will have to assess to what extent changes in discourse (to be found in text, speeches etc.) are mirrored by changes in other dimensions of policy arrangements:

the actors participating in flood risk governance, their power and resource base and the actual content and force of the rules of the game that are in place. In other words, the challenge is to substantiate if shifts in governance have occurred, what constitutes these shifts and how substantial they are.

Another point to be addressed in the next Work Packages is the question why the debate on preferred intervention options has been the most prominent one hitherto. We expect this to be due to the fact that the dominant approach to flood management has been a technologically oriented one. From an engineering perspective, it makes sense to talk about concrete intervention options. This dominance of an engineering perspective can be thought to be still present, but slightly weakened. In line with this, in our empirical research we expect to also find a shift in discourses whereby the other, more implicit, forms of discourse are gaining prominence.

9 Flood Risk Management Strategies

9.1 What is the challenge?

Within the STAR-FLOOD project, five ideal typical Flood Risk Management Strategies have been identified. These strategies have been derived from our observation of developments in literature and practice. Systems literature (e.g. Klijn et al. 2009) and climate change adaptation literature (e.g. Vis et al. 2003; Samuels et al. 2006; Wardekker et al. 2010) stress the importance of a diversification of Flood Risk Management Strategies. This wish is also visible in European policies (e.g. the EU Floods Directive). For more background information on the strategies, see Green et al. (2013), Hegger et al. (2013) and Bakker et al. (2013).

Figure 1: five ideal typical Flood Risk Management Strategies

A challenge is to gain insight in the consortium countries' state of affairs regarding the implementation of various Flood Risk Management Strategies and underlying intervention options. These five strategies will be refined and detailed throughout the STAR-FLOOD project. The current chapter provides a first impression of the extent to which the strategies are actually applied in the six STAR-FLOOD consortium countries and their degree of institutionalisation. All consortium countries to some extent make use of structural flood defence measures (flood protection, the second type of Flood Risk Management Strategies distinguished within our typology). They differ, however, in the degree in which other strategies have been implemented.

9.2 Country comparison

9.2.1 Belgium

In Belgium, the establishment of flood defence measures goes hand in hand with a broadening of Flood Risk Management Strategies towards risk prevention, flood mitigation and flood preparation. Belgium invests in decreasing the probability of flooding by fortifying dikes along the Scheldt and its contributory rivers, developing a 'chain' of controlled flooding areas, installing computer-controlled management of retention basins, building pumping stations etc. But in contrast to before, emphasis is no longer one-sidedly on fast drainage. Measures have to fit into a broader multi-step strategy of (first) holding the water, e.g. by infiltration measures, (then) water storage and retention, and (finally) slow transport and drainage. Next to flood defence policies, Belgian policy-makers stress the importance of risk prevention by pro-active spatial planning. Authorities, for example, focus on issuance of a regulatory framework to prevent construction in areas with high flood risks. Governments also underline the importance of *preparedness*. We witnessed the development of flood forecasting and warning systems. Belgium is further rather unique in its legal obligation to insure natural disasters within the fire insurance policy of owners and tenants.

9.2.2 England and Scotland

In the UK, nearly the complete spectrum of Flood Risk Management Strategies has been adopted. The 1980s and 1990s saw a movement away from a focus on rural protection and land drainage and an increased focus on flood risk management (then termed 'flood alleviation'). This has led to a greater reliance on flood defences (flood protection). The largest example was the Jubilee river, a multi-form bypass channel for part of the non-tidal Thames which began construction in 1991 and was completed in 2002 (Royal Academy of Engineering 2005). Reliance on structural interventions at a large scale was coupled with an increased effort to manage the exposure of people on the floodplain (pro-active spatial planning). From the 1980s onwards, we see a shift towards more sustainable flood risk management. It is argued that this can only be achieved by better working with the natural system. 'Making Space for Water', in place since 2004 (Defra 2007), formalised this process and itself derived from the earlier policy document 'Managing the Flow' (Defra 2002) which emphasised the Integrated Water Resources Management (IWRM) approach. At the same time, it is argued that policymakers and civilians should accept that floods cannot be prevented and that communities at flood risk must learn to live with flooding. All these recent developments are said to have benefitted from the on-going climate change adaptation debate. Both in England and Wales as well as Scotland, much experience has been gained in the past decades with flood warning strategies and the difficulties of implementing an effective flood warning system (Von Lany et al. 2009). In terms of recovery, in the UK all those with a mortgage are obliged to have at least structural flood insurance. The insurance system was provided through a fully privatised mode of provision (as opposed to the situation in, for instance, France and Germany where insurance is offered through a public-private partnership (Botzen & Van den Bergh 2008)) but the insurance industry in the UK is now insisting that flood insurance for dwellings can only be provided on the basis of a public-private partnership (www.guardian.co.uk/money/2012/nov/26/flood-insurance-talks-reach-crisis-point, accessed 26 April 2013).

9.2.3 France

In France, the complete spectrum of Flood Risk Management Strategies also exists. The two oldest strategies are Flood preparation (warning systems and prevision) and Flood Defence. The former has been institutionalized since the second half of the 19th century. The State civil engineers (Ponts et Chaussées) started to monitor the Seine and Loire rivers at that time and progressively expanded their monitoring system to all rivers (except small streams). Up to 56 *Systèmes d'Annonces de Crues* were created and covered the French territory. This system has been transformed and simplified in 2006. There are now only 22 *Services de Prévision des Crues* (therefore with larger perimeters than before). Flood defence is also quite a traditional strategy in France. However, the situation is very different from one river to another. On some rivers, like the Loire river, the State administration is the owner of most dikes. On some other rivers, like in the South-eastern part of France, many dikes are owned by private owners or groupings of private owners, sometimes by local authorities. Generally speaking, responsibilities are very much divided between different individuals and agencies.

Flood prevention via spatial planning is not so new either. Before the PPRi (*Plans de Prévention des Risques d'inondation* 1995), *Plans de Surfaces Submersibles* (PSS 1935) and *Plans d'Exposition aux Risques* (PER 1982) had already existed. All those documents consist of maps of flood-prone areas and rules for building (or not). Still, there is one major difference: PER were implemented by the local authorities and depending on their will. PPRi are implemented by the State administration and impose their rules to local authorities.

More recently, the issue of flood recovery has been tackled. Since 1982, 7 natural events (among them floods) have been identified as major natural disaster. As such, damages deriving from such events are covered by a national solidarity system and fund (CATNAT). The main rules are the

followings: every individual finances this fund via own its insurance on car or house (about 10% of the insurance premium). After a natural event, this latter must be recognised first (at the national scale) as a major natural disaster (ten-year occurrence). When recognised as such, it is possible for the mayors and individuals to ask for compensation. The main shift in Flood Risk Management Strategies is towards flood mitigation and vulnerability reduction. There are very different measures in this field. Some are compulsory (public information for instance) while others are voluntary (such as vulnerability reduction measures for buildings (except when they are integrated into the PPRi)). As a matter of fact, those measures are mainly taken and implemented by the local authorities, on a voluntary basis. This is still quite a new field within which experiments are numerous. Local authorities are also more and more involved in flood preparation. Since the beginning of the 2000s, communes are responsible for the local evacuation plans (Plans Communaux de Sauvegarde).

At last, those Strategies involve many stakeholders (at local, regional or national scale) whose administrative perimeters and competences are not always clearly defined. Since 2006, in order to coordinate actions between stakeholders and plan flood management at the scale of rivers, *Plans de Prévention du Risque d'Inondation* were created (PAPI). They are partly financed and supported by the State administration; in the official documents, PAPIs with strong measures dealing with vulnerability reduction and flood retention areas were preferred to PAPIs promoting dikes reinforcement. Strong involvement from local authorities is also seen to be a good point for such plans.

9.2.4 The Netherlands

After recent discussions, in The Netherlands it was decided that flood prevention should remain the main pillar of Dutch water safety policy. Discussions about a shift towards flood mitigation and preparation are on-going and we see these strategies actually emerging. However, the Minister of Infrastructure and the Environment has recently announced that every Dutch citizen should be entitled to a 'basic' degree of safety and that 'other types of strategies' may not serve as an excuse to cut budgets for dike maintenance (http://www.waterforum.net/Nieuws/6939-Schultz-realiseert-doorbraak-in-debat-meerlaagsveiligheid, accessed 3 May 2013). The strategy of flood recovery is hardly discussed in The Netherlands as is the strategy of pro-active spatial planning. Only initial experiments with flood insurance have started. And especially pro-active spatial planning is not taking place. This strategy, after all, entails that 'people are kept away from water' by not initiating economic/urban developments in areas that are considered vulnerable. In The Netherlands, a highly densely populated country of which 2/3 can potentially be flooded (Pieterse et al. 2009) such a strategy is in most cases not feasible.

9.2.5 Poland

In Poland, flood defences are mostly structural and include embankments and storage reservoirs (with a relatively limited storage capacity though). Also flood forecasting and warning systems, including radars, are operational in Poland. There is a recognised need to strengthen flood protection systems for larger towns, on the Vistula and the Odra, such as Sandomierz, Opole, and Wroclaw. Past floods such as the one in 1997 have shown the inadequacy of existing structures. At the same time, Poland has to comply with requirement stemming from the EU Floods Directive as well as the need to adapt to climate change.

9.2.6 Sweden

In Sweden large infrastructural works are in place. Current legislation on spatial planning seems to lean towards prevention measures, with explicit requirements for municipalities to take account of flood risks when deciding on the suitability of the land in which buildings and structures are to be located. These are now being complemented with the establishment of general contingency

strategies (e.g. local rescue activities) in each municipality. Warning systems are managed at national level.

9.3 Conclusion

Table 4 on the next page summarizes the degree in which the five types of Flood Risk Management Strategies have been institutionalised in each of the six STAR-FLOOD consortium countries. As the table shows, in the UK (England, Wales and Scotland) all strategies have been institutionalised at least to some extent. Poland and Sweden, for different reasons, seem to rely mostly on structural measures but have made a start with setting-up flood warning systems. France, Belgium and The Netherlands are all trying to broaden their strategies with especially flood mitigation and preparation (and pro-active spatial planning in France).

Of course, the table provides only a first impression. Nevertheless, it is instructive in giving an idea of each country's point of departure. This point of departure will have consequences for the possibilities for broadening Flood Risk Management Strategies (e.g. due to path dependency).

Box 1: Unembanked areas in Rotterdam (based on a presentation of Peter van Veelen, Municipality of Rotterdam, at the 'Knowledge Conference' of the Dutch Delta Programme, 23 April 2013)

A large part of the city of Rotterdam has been built in the former port area. This area is not protected by primary flood defences and has to deal with temporary flooding due to high water in the river. The main flood protection strategy when urbanizing this area has been to raise the level of the public space to a design water level with a probability of 1/10.000 a year. In some cases the unembanked area has been lifted to even safer levels. This strategy is, however, facing its limits. Existing housing stock is increasingly being renovated or sold to renters. Second, the level to which already elevated buildings have been raised is already too low, according to current standards. This problem will be aggravated in the face of climate change. Rotterdam now faces the challenge to choose appropriate strategies for dealing with flood risks in these areas. Options that are discussed include the establishment of adaptive buildings but also the building of quay walls. However, if the latter option is chosen, the former option is considered less efficient and therefore less useful.

Table 4: Degree of institutionalisation of each of the five Flood Risk Management Strategies in the STAR-FLOOD consortium countries.

Country	**Risk prevention through pro-active spatial planning/allocation politics**	**Flood protection – dikes, dams, embankments, sand suppletion**	**Flood Mitigation – urban green infrastructure, flood retention, urban management**	**Flood Preparation – warning systems, disaster planning, evacuation plans**	**Flood Recovery – rebuilding areas, insurance systems**
Belgium	Present	Present, with deep historical roots	Present	Present	Present
England and Scotland	Highly institutionalised:	Highly institutionalised:	Highly institutionalised:	Highly institutionalised:	Present:
France	Present	Institutionalised	Emerging	Institutionalised	Institutionalised
The Netherlands	Present	Highly institutionalised	Present/Emerging	Present/Emerging	Discussed but not practiced
Poland	Absent	Present	Discussed but not practiced (except for some pilot sites)	Emerging	Absent
Sweden	Present	Highly institutionalised	Emerging	Present	Present

10 Conclusions

In the previous chapters we have reported the results of our quest into what might be essential similarities and critical differences between the STAR-FLOOD consortium countries. This quest has focused on issues related to the institutional embedding of the five types of Flood Risk Management Strategies that are being distinguished within the STAR-FLOOD project: risk management through pro-active spatial planning, flood protection, flood mitigation, flood preparation and flood recovery (see the previous chapter).

As we argued in the introduction section, the institutional embedding of Flood Risk Management Strategies should be analysed from a governance perspective that acknowledges that not only public authorities but also various private actors (NGOs, businesses, citizens) can govern and hence (may) play a role in flood risk governance. In line with this, we have adopted Lange et al.'s (2013:4) definition of governance: "a process of – more or less institutionalised – interaction between public and/or private entities ultimately aiming at the realisation of collective goals". This notion to our opinion fits well with Hegger et al.'s (2013) definition of Flood Risk Governance Arrangements (FRGAs): "*the constellation resulting from a dynamic interplay between actors and actor coalitions involved in all policy domains relevant for 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). We have structured our argument with the help of these four dimensions of governance arrangements: actors, resources, rules and discourses.

In this concluding chapter, we intend to provide some preliminary conclusions, expectations and assumptions. These are of course to be seen as work in progress, since the first WP of STAR-FLOOD has only provided for a start of the empirical analysis that should be continued in the next WPs. The next section (10.1) first sketches some common challenges and essential similarities. This is followed by an overview of critical differences (10.2). Section 10.3 depicts the main research challenge of finding a balance between idiosyncrasy and over-generalisation.

10.1 Common challenges and essential similarities

Despite the presence of differences, we have encountered some common challenges for all STAR-FLOOD consortium countries (and probably also other European countries). Flood Risk Management is on the agenda in all countries, even those in which the significance of flooding is relatively low. Frequently referred-to drivers are urbanisation and the expected consequences of climate change. The general tendency seems to be that actors find that 'things should be done better' and in most cases we actually witness efforts to achieve a broadening of the types of Flood Risk Management Strategies that are in place as well as the underlying concrete intervention options (although for instance in Poland the focus seems to lie on generating resources for flood defence in the first place). Chapter 8 has shown that the debate on FRM is mainly held in terms of these concrete intervention options rather than the more 'softer' issues such as the normative principles that should underlie FRM or the final end goal that FRM should achieve (e.g. reducing vulnerability vs. ensuring safety).

The previous chapters have also shown that all consortium countries have to deal with large institutional complexity. With regard to this complexity, there seem to be two movements in opposite directions. On the one hand, we have found examples of developments potentially reducing the complexity, including mergers, centralisation of powers in one authority etc. On the other hand, complexity seems to have a tendency to increase when actors attempt to diversify, link together and align Flood Risk Management Strategies. This puts the question of what would be useful bridging mechanisms (e.g. between actors and domains) on the research agenda.

All countries interact with the international level. They are dealing with international and EU policies, and they tap from and contribute to broader discourses on Flood Risk Management. Obvious examples are that all countries are currently implementing the Floods Directive and the Water Framework Directive and have committed themselves, via the EU, to the Aarhus Convention (on Access to information, Public Participation in Decision Making and Access to Justice in Environmental Matters). As a consequence, actors in all countries are considering, or at least paying lip service to issues such as achieving integration between water and spatial planning as well as the involvement of stakeholders in Flood Risk Management. We have also seen, however, that the precise way in which these issues have 'landed' in the countries differs. This has implications for the next steps to be taken in researching Flood Risk Governance, but also, as we will see, for the types of practical recommendations for improving FRM practices that can ultimately be made.

10.2 Critical differences

An obvious difference between the countries is the experience with floods. Looking at actual losses and casualties in the past decades, a pattern emerges in which Poland was hit fiercely and Sweden had limited flood experiences, with the other countries somewhere in between. This flood experience will undoubtedly influence – but often probably in subtle and intractable ways – how and in which venues flood issues are debated, which strategies and intervention options are being discussed and the degree in which public authorities, businesses, NGOs but also the public at large have internalised 'flood consciousness' in their everyday practical consciousness.

Second, as we have seen in chapter 9, each country's departure point in terms of the strategies and intervention options that are in place and which actors have experience with which strategies differs. This can partly be attributed to historically grown developments, besides of course the physical possibilities and impossibilities in various countries (e.g. pro-active spatial planning is a much more logical strategy in a loosely populated country like Sweden than in a densely populated country like The Netherlands). A prominent difference that has been laid down in table 4 on p. 34 is the extent to which countries have already broadened their strategies from a dominant focus on flood defence towards the application and alignment of different types of strategies and intervention options. England and Belgium seem to have advanced in this respect, as intervention options from all five types of strategies can be found there, while the range of strategies applied is much narrower in Poland. It should be noted though, that this picture may change once we zoom in, as we will do in the next WPs of STAR-FLOOD, from the five categories of strategies to the level of concrete intervention options.

Third, in this report we have made a first exploration of what might be relevant institutional factors to look at when we want to understand the possibilities for changing and hopefully improving flood risk governance. At the most general level, the expectation can be raised that each strategy and each intervention option will not be feasible everywhere, and if it is feasible, not everywhere in the same way. This can partly be attributed to institutional factors that, in turn, can be understood by looking at the broader administrative and legal context in the various countries. These have been identified by collecting country-specific reports on the main characteristics of flood risk governance debates. From these reports, some salient points have been derived.

Based on the analysis of the country-specific contributions, the current report has provided a sketch of the designated competent authorities and the actual competences that actors actually have for implementing Flood Risk Management Strategies (chapter 3), financing arrangements (chapter 4), integration between water management and spatial planning (chapter 5), substantive and procedural norms and goals (chapter 6), stakeholder engagement in Flood Risk Management (chapter 7) and societal debates on preferred intervention strategies (chapter 8). As we will discuss in somewhat more detail in the final chapter of this report, each of the discussed issues needs to be further

scrutinized in the next Work Packages of STAR-FLOOD. In all cases, the question should be posed *what* is taking place, both at country and case level, *why* it is taking place and to what effect? These issues are often hard to disentangle. For instance, it can be hard to distinguish a stated commitment to stakeholder involvement from an analysis of how this stakeholder involvement actually takes place and to what effect. What is more, apparently similar developments in different countries may on closer inspection turn out to be more different than expected.

At this point, we want to raise the tentative expectation that there are some patterns of differences between i) Belgium, the UK, France and The Netherlands; ii) Poland and iii) Sweden. It seems that Flood Risk Management discourses and practices in the first group of countries, after the Second World War, went through some similar stages: from an emphasis on civil engineering measures, via the introduction of non-structural measures and a broader environmental and ecological turn, to a shift towards accommodating water, adopting a risk management approach and starting to take into account the consequences of climate change. In Poland on the contrary, the focus remained on the (absence of resources for) establishing flood defence, while Sweden can be said to lack broader societal debates on flood governance.

10.3 The research challenge: finding a balance between idiosyncrasy and over-generalisation

This report's main implication for the next Work Packages of STAR-FLOOD is that case study research should be thoroughgoing, critical and precise to be able to make a substantiated distinction between developments and approaches that are more generally applicable (design principles) vis-à-vis more context-specific issues. Various strategies and intervention options, in theory, have a large bandwidth in terms of how they can be institutionally embedded. The strategy of flood mitigation, for example, can in principle be embedded in various Flood Risk Governance Arrangements. The construction of urban green infrastructure will likely require the involvement of municipalities. But individual measures at the level of single dwellings (adaptive building) could be done together with housing corporations, project developers but also with citizens. However, due to different institutional contexts, we might find that the actual bandwidth for choosing strategies is much smaller than theoretically possible when we zoom in at the level of countries, cases and specific areas within the case study regions.

As a general rule of thumb, we expect the possibilities for changing FRMSs in European countries and regions to be small, amongst other things because of the stability in governance regimes caused by vested interests and path dependencies. It will require a great deal of precision from the part of the STAR-FLOOD researchers to determine *whether* changes have taken place, *to what extent* and *when such changes are desirable and possible*. Sometimes the levers for action will lie at the national level and sometimes at the regional level. Sometimes windows of opportunity can be very small. Throughout the research, we expect to find that an opportunity that is seized at one place and at one moment is not seized in another context while the differences between both situations seemed to be limited. The practical implication of this is that our recommendations for appropriate governance arrangements in some cases can be quite general, whereas in other cases they should be very specific.

In all cases, the STAR-FLOOD researchers will have to remain critical on one of the project's points of departure, the expectation that a diversification of Flood Risk Management Strategies leads to more resilient urban areas. For instance, in the case of England one could on the one hand make the argument that England is a frontrunner in terms of resilient flood risk management, because the country has succeeded in implementing options from all five types of strategies. But on the other hand, one could argue that England did so because the strategy of flood defence has failed.

11 Relevance for next Work Packages

This last chapter formulates some specific questions and points of attention which the STAR-FLOOD researchers can take into account in the next Work Packages. These points are especially relevant for WP2, the development of an assessment framework and WP3, the case studies. The next section (11.1) presents these points of attention according to the four dimensions of Flood Risk Governance Arrangements: actors (11.1.1), resources (11.1.2), rules (11.1.3) and discourses (11.1.4). Also, a number of questions related to Flood Risk Management Strategies is raised (11.1.5). In 11.2 we close off with a final remark.

11.1 Specific points of attention

11.1.1 The actors dimension

As we have seen, in all countries a large number of actors is involved in flood risk governance. Especially the chapter on competent authorities has suggested tremendous differences in who is responsible for what, who has the competency to do what and which mechanisms could explain if parties actually use their competences. This type of issues has to be analysed in more detail throughout the empirical research. Also, the question arises whether, to what extent and how the division of competences and responsibilities is embedded in the more general administrative and legal structures and cultures of the countries. General questions pertaining to the actors dimension include:

1. Which actors are involved in which Flood Risk Management Strategies? Who *participates* in governance processes? Who is *affected* by these processes and to what extent do the latter type of actors participate?
2. What type of actors is involved in what kinds of issues? For instance, are all aspects of water management undertaken by the same organisation? Notably, are floods and droughts both treated as part of the inherent variability of the meteorological system?
3. Are catchment and coastal zone management plans prepared through the relevant stakeholders (those with the powers to implement/resist them plus those who ought to have power)?
4. Who controls development? How does this take flood risks into account? What designations are used for risk zones within the flood plain and what limitations are applied to development within each of those zones?

11.1.2 Resources

Actors are the carriers of specific kinds of resources. These include financial resources (money), formal authority, competences (both in the – juridical – sense of being allowed to or responsible for taking actions, and in the sense of having the necessary knowledge and skills to take these actions). Empirical questions pertaining to resources would then include:

5. Who has which powers over what/whom in which areas? What are the incentives to use these powers? For instance, who has powers to promote which forms of urban Sustainable Drainage Systems (SuDS)? Who has powers to promote river rehabilitation? Who can construct multi-form channels? Bypass channels? (obviously this includes land acquisition)? Who has powers to implement flood plain forests? Who has powers to promote conservation agriculture? Who can do what in the river (including building bridges, weirs, locks and other potential obstructions); who can do what to the bed of the river; who can do what on the banks of the river?
6. In what way have actors learnt from previous experiences with designing and implementing Flood Risk Management Strategies elsewhere?

7. Did involved actors bring about economies of scale and scope in organisations? Are these economies of scale and scope compatible with the need for stakeholder engagement?
8. What is the role of scientific knowledge and how can this knowledge effectively be taken in to account in decision-making processes in the case of specific strategies?
9. Who can buy properties because they are at extreme risk of flooding?
10. Who compensates whom for flood losses, and on what basis (e.g. the French CATNAT system)?

11.1.3 Rules

We have seen in the previous chapters and concluded in 10.1 there will likely be two opposing movements in the STAR-FLOOD countries: one towards reducing complexity and one towards increasing complexity. Parties face the challenge to develop mechanisms for dealing with this. Empirical research will have to assess to what extent both movements are actually present in specific countries and regions, why (not), and how they can be evaluated? A recurring issue, for instance when we discussed stakeholder involvement and integration of water and spatial planning is the debate of involving all types of actors in flood issues for whom their involvement used to be less obvious. At this point several questions emerge. For instance, how can one interest actors in spatial planning processes in becoming involved in flood issues? This has turned out to be difficult and there are mixed experiences with procedural instruments that could 'force' these actors to become involved. The question arises if we can find examples of more positive (carrot) incentives besides these negative (stick) incentives. Stakeholder engagement is widely endorsed on paper, but to what extent does it happen in practice? How does it take place? And how can we evaluate stakeholder processes, both from an instrumental point of view (does it lead to more efficient and effective flood risk governance) and from the perspective of democratic legitimacy?

All these issues relate to the question of rules: including legislation, constitutional norms, procedural norms, substantive norms, procedural instruments, legal traditions, cross-country and cross-sector alignment of rules, policy and legal principles and informal norms. Amongst other things, the following questions can be asked:

11. Which (normative) principles do public and private actors take into account in designing Flood Risk Management Strategies (as laid down in EU Directives and national rules and legislation)?
12. Which instruments can be used to effectuate a specific Flood Risk Management Strategy?
13. How have responsibilities for Flood Risk Management Strategies between public and private actors been divided? For instance, do building construction regulations either include provisions for flood proofing or for incorporating robust construction? What are these requirements and where do they apply? Who is responsible for coordinating response in different grades of emergency (e.g. the Bronze, Silver, Gold system)? How is the flood warning system arranged, perhaps the archetypal problem of bridging (who operates weather radar, rainfall gauging, stream flow gauging, models? How is meteorological/hydrological forecasting integrated? Who disseminates the forecasts to whom? Who prepares the warnings? Who disseminates the warnings? Who plans for evacuation? Who undertakes the evacuations?
14. How is flood risk management integrated with spatial planning? For instance, how are certain areas determined, e.g. areas where managed retreat will be adopted or areas for emergency flood-storage? Who has to designate areas for sacrificial flooding? What is the compensation mechanism for those areas?
15. Who is/can be compensated for what losses from what kinds of flood (e.g. in Hungary, flood insurance was available but only for flooding as a consequence of dike failure); by whom, through what mechanism, under what conditions (e.g. in France, after the declaration of catastrophe)?
16. What legal barriers against a broadening of Flood Risk Management Strategies can be identified? For instance, what are the key planning cycles (e.g. how often are legislative and regulatory changes and plan reviews)?

17. What are the different categories of watercourses applied? What are the edges of the watercourse in each category? Who is responsible for doing what in each category (where the what includes capital works, maintenance, dredging, water quality, the flow regime etc.)?
18. How are safety risks calculated as well as the related damage? How are the norms that are used for risk management determined? What are the dynamics in these norm settings as well as the way in which the norms are communicated to the public?

11.1.4 Discourses

As we have seen in chapter 8, with regard to FRM a number of emerging and contested discourses can be distinguished (see also deliverable D1.1.2: Dieperink et al. 2013). A number of questions can be raised:

19. What forms of discourse can be identified, e.g. on preferred intervention strategies, priority setting, appropriate standards of protection, who should pay, should FRM be a form of engineering or should it try to connect to natural processes?
20. Which actors adhere to what types of discourse? Is any of the discourses dominant and how can this be explained?
21. How are uncertainties inherent in dealing with flood risks dealt with?
22. How are potential shifts in Flood Risk Management Strategies portrayed by societal actors (e.g. positive/negative)?
23. What political barriers against a broadening of Flood Risk Management Strategies can be identified?

11.1.5 Flood Risk Management Strategies

24. Which concrete intervention options can be taken under each of the five Flood Risk Management Strategies? To what extent would these be feasible in a specific region?
25. At which spatial scale is a specific strategy (e.g. reduction of flood risks, flood preparation) dealt with (local, regional, transboundary)? Is this the most appropriate scale?
26. Which time scale should be used for designing and implementing a specific Flood Risk Management Strategy?
27. Which shifts are actually taking place and how can these be characterised (e.g. at which level of policymaking; in which dimensions (actors, discourses, rules, resources)?
28. Is a (proclaimed) shift in Flood Risk Management Strategies backed up with scientific input? And do scientists stimulate (or oppose) shifts in or a diversification of Flood Risk Management Strategies?

11.2 Final remark

The previous sections of this last chapter have provided a long but by far not exhaustive list of empirical questions which researchers who want to study Flood Risk Governance may want to take into account. The list can be seen as a first exploration of what would be relevant points to address, especially given that they pertain to seemingly important similarities and differences between the STAR-FLOOD consortium countries. This list is of course work in progress. In the course of the research, new questions may arise, others may be nuanced and refined and – occasionally – answered. At this point we would like to stress that this list of questions should not be used as a list of boxes that just has to be 'checked'. On the contrary, a creative and critical attitude of the researchers using the questions will be necessary. We encourage the STAR-FLOOD colleagues and other researchers interested in the issue to join us in the process of using the questions as a starting point to further develop an empirical basis of flood risk governance in Europe.

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Annex A: National Flood Risk Governance Debates and main characteristics of the implementation of the Floods Directive in the STAR-FLOOD consortium countries

A1 Belgium

A1.1 Flood risk management debates

Until 1953: Water management primarily focused on transport and agriculture (based on Crabbé 2008)

Water management in Belgium is characterized by a historically constructed division between the organization of navigable waterways on the one hand and the organization of and non-navigable water courses on the other.

Management of navigable waterways historically mainly served the transport of materials and thus the economy. When the Belgian state was established in 1830, a period in which industrialization radically changed society, the young Belgian state served economic life by means of public works (Willems et al. 1949). Between 1830 and 1880, major investments in renewal and expansion of the waterways network stimulated the economy www.wenz.be/opencms/export/sites/default/publications/Eeuwfeestboek_LR_2.pdf, consulted 27 April 2013). This 'serving' role of the state had implications for the organization of water management: in the 19th century, the Belgian Ministry of Public Works had developed into a big, powerful administration, not in the least because competences on water ways were centralized from provincial and local levels to the national level. By the end of the 19th century, the tendency to invest in waterways changed. Notwithstanding the fear for flooding by changes in the hydraulic system, society was intrigued by a new mode of transport: the iron road. But after World War I, modernization of water ways was back on the agenda to stimulate economic revival (ibid).

Management of the non-navigable water courses focused on drainage and irrigation for agriculture (Vannieuwenhuyse 2001). As was already legally established in the Napoleontic Code Civil, riparian owners were financially and organizationally responsible for maintenance and management of the (non-navigable) water courses on their land. In the last quarter of the 19th century however, there was an important shift of responsibilities from private to public actors. Because riparian owners did not live up to the maintenance obligations as described in the Code Civil, a new law in 1877 shifted responsibility for the management of non-navigable water courses to the municipal authorities; costs for maintenance were still to be financed by riparian owners (Vannieuwenhuyse 2001: 27). In the same law, provincial governments were attributed the task to supervise municipal governments in their management of non-navigable water courses. Provinces were also instructed to create policy supporting material: maps and information files on the characteristics and precise location of water courses, on water quantity flows etc. (Vannieuwenhuyse 2001: 9). General supervision and strategic organization of the management of non-navigable water courses was a legal competence of the Ministry of Agriculture.

Because of the organizational task division between 'Public Works' and 'Agriculture', two relatively separated policy arrangements were created and continuously strengthened their position. Each arrangement had its own network of actors, its own discursive frames of reference, separate rules and routines and its proper power bases (personnel, competences, financial means, and

infrastructure). And this organization setting was even further strengthened after World War II because the economic revival incited investments in (development and renovation of) waterways, agreements on international standards for transport over water etc. (Ministerie van Openbare Werken 1985: 34).

Floods of 1953 and 1976: drivers for more public works

The impactful North-West storm in the night of 31 January on 1 February 1953, that caused massive loss of human lives and enormous damage to infrastructure in the Netherlands, also hit Belgium. On 37 locations in Belgium dikes broke. Diverse small and bigger cities on the Belgian coast and along the river Scheldt were partly flooded. In Ostend the coastal defence infrastructure broke down en brought big volumes of sea water into the city centre. Flanders' biggest city, the city of Antwerp, also suffered from water damage. Data on the number of victims vary from 14 till 22 (Afdeling Waterwegen Kust 2005). In the higher parts of Belgium – e.g. the Ardennes – the North-West blizzard storm resulted in 2 meters high piled up snow.

The storm flood of 1953 was an important event, both for society, politics and policy in Belgium. The Ministry of Public Works was instructed to work on a safer and more reliable protection system against flooding. The extra tasks had a positive effect on the available means and expertise in the Ministry. Along the coast and along the river Scheldt, dikes were repaired and heightened after the flood. The criticism on the then existing infrastructure was sharp and painful, but the existing policy arrangement for the management of the navigable waterways was kept in place and was further strengthened.

After the Second World War, the management of non-navigable water courses was changed in two laws. In the law of 15 March 1950, the political government introduced a formal division of three types of non-navigable water courses: first, second and third category, a categorization that is still in place today. For each category of non-navigable water course, one government actor was attributed responsibility. The law of 1967 shifted these responsibilities, but the task dividing principles were kept. The laws of 1950 and 1967 in fact reaffirmed that the management of non-navigable water courses was focused primarily on reaching agricultural aims: drainage and irrigation. One other important aspect of the 1967 law is that the managing authorities received owner rights on the water course, while these rights were formerly in the hands of riparians (Vannieuwenhuyse 2001: 36). By making the water courses the property of the managing authorities, riparians were formally exempted of the (financial) responsibility to maintain and manage the stream. For public water managers the ownership of the water course enabled executing single authority and more efficient management.

On 3 January 1976, a new North-West storm hit the Belgian coast and the inland. The entire Scheldt river basin suffered from flooding. In Antwerp water levels increased with more than 3,5 meters above average high water levels. The city had to deal with power cuts, two lives were lost and the cost of material damage was enormous. There were breaches of 12 meters in dikes along the Scheldt (in the provinces of Antwerp and East-Flanders). The village of Ruisbroek (Puurs) was totally flooded during several days (www.tv-visie.be/inhoud/belgie/binnenkort-in-thuis_13115/, last consulted 27 April 2013). High water levels made inhabitants climb their roofs, awaiting emergency rescue. Those affected by the floods were angry and upset: they expected better protection and pointed fingers to the political class. One confrontation of angry inhabitants of Ruisbroek with King Baudouin is legendary. On his visit on 6 January 1976, they addressed King Baudouin with the words "30 billion Belgian francs are available for [military] planes raging over our heads, but no money is available for fortification of our dikes" (http://euscreen.eu/play.jsp?id=EUS_BDECFC2821DD4C629000823141600B54, last consulted 27 April 2013).

Because of the major impact of the 1976 storm, the Belgian government decided that more efficient rescue planning and better protection was necessary. Inspired by the impressing Delta plan in the Netherlands, the Belgian government developed its own Sigma plan. Sigma refers to the Greek letter sigma, because of the first letter of the word Scheldt (www.sigmaplan.be/nl/sigmaplan/hoe-is-het-sigmaplan-ontstaan, last consulted 27 April 2013). The Sigma plan included three measures to protect the lowland of Belgium against flooding: (1) higher and more solid dikes over more than 500 km; (2) thirteen areas for controlled flooding to temporary store water; (3) a storm barrier on the Scheldt, located along the former village of Oosterweel, near Antwerp. During the implementation of the Sigma plan, the government reconsidered and decided to postpone the installation of the Oosterweel storm barrier for an indefinite period. Analyses had indicated that the benefits would not outweigh the costs (http://ec.europa.eu/ourcoast/download.cfm?fileID=802, last consulted 27 April 2013). Dike fortification works and installing controlled flooding areas (measures 1 and 2) were implemented as scheduled, with exception of the 650 hectare controlled flooding area Kruibeke-Bazel-Rupelmonde: due to local protests the works got behind on schedule (new planning: operational in 2013 or 2014).

The eighties: emerging criticism on water management, neglected due to state reforms

In the late 1970s and in the 1980s, the young environmental movement increasingly insisted on installing another policy approach in water management, taking into account other interests than transport and agriculture. The environment movement repeatedly stressed that the classic policy approach created new flood risks by straightening, widening and deepening water courses. This viewpoint was rather new in the Belgian context: till the late 1970s, the then dominant opinion was that the classic engineering approach was the best way to reduce safety risks to an acceptable and affordable level. Environmental and nature protection groups, on the other hand, insisted on using a more holistic approach based on the idea of river basin management. They advocated for an all-inclusive policy approach in which solving water quality problems and nature/landscape conservation and restoration could go hand in hand with integrated water quantity management 'from source to mouth' (Abts & Maene 1984) The environmental movement also criticized the existing institutional arrangements for water management: too many competent authorities, intergovernmental competition and lack of cooperation, absence of stakeholders dialogue and an integrated vision in spatial planning, and 'old school' policy instruments that hinder ecological water management (Abts & Maene 1984).

Pressured by the environmental movement, classic water management thus suffered from loss of legitimacy in the seventies and eighties. The strong criticism on the classic approach did not immediately lead to changes in water management, however. In contrast to water quality management that received more political attention – amongst others due to EU pressure (Veestraeten 1999) – the reorganization of water quantity management was less a political priority at the time, not in the least because the political debate was dominated by discussions on state reforms and economic crises.

Under the Belgian federal state structure, the *ratione materiae* competences of the regions under Article 6.1 of the Special Institutional Reform Act, broadly include the town and country planning, the environment, land use and nature conservation, housing, water policy, agriculture policy and fisheries, economic affairs, employment policy, energy policy, subordinate authorities (provinces and municipalities), employment policy, public works and transport. Consequently, in Belgium the Flemish Region, the Walloon Region and the Brussels-Capital Region are competent to install a water policy. However, it must be noted that the federal level remains competent for certain aspects in this context (Maes & Lavrysen 2003: 47).

The sequential reforms of the Belgian state affected the organization of water management. Due to the state reforms of 1980, for example, competences in water management shifted from the national to the regional governments. The general management of the non-navigable watercourses moved in the 1980s from the national Ministry of Agriculture to the regional ministries. Administrations for management of the navigable waterways remained operational on the national level a bit longer. Only after the installation of new regional administrative services in 1989, the administration for Public Works became operational on the regional level. The regionalization of former national competences did not evoke decentralization of powers but rather a replacement of the former central actor to a new central actor: the role of the national government in water management was quasi entirely taken over by the regional governments.

The nineties: from mono-functional to multifunctional water management
In the 1990s, another administrative evolution was witnessed. General management of the non-navigable water courses, that was formerly coordinated by the Ministry of Agriculture, was gradually embedded within the regional administration for the environment and nature policy (Afdeling Water 2003: 9). This affected the perspective on the management of the non-navigable water courses: management to serve agricultural aims was not so self-evident anymore, while ecological restoration and river basin management came more into the picture.

In the 1990s, we further witness a gradual shift from monofunctional water management to integrated water policy, not in the least inspired by a broader discourse on sustainable management of scarce resources (injected by the 1987 Brundtland report and the Rio summit on sustainable development in 1992). The specific discourse on 'integrated water policy' was introduced by advocating pioneers within the environment administration. In 1990-1991, they installed pilot river basin committees for five river basins (Demer, Yser, Dender, Nete and Upperscheldt), aiming at multi-stakeholder dialogue between representatives of private and public organizations on diverse but interlinked water management problems in the river basin (Crabbé 2005). In May 1996, the Flemish minister for the environment, Theo Kelchtermans, installed an interdepartmental committee (VIWC), discussing methods and measures to promote integrated water policy for the entire Flemish region (VIWC 2000: 3). The Environmental Policy Plan for Flanders 1997-2001, put the development of 11 river basin management plans (for each of the 11 river basins in Flanders) on the policy agenda (www.vlaanderen.be/nl/publicaties/detail/mina-plan-2-het-vlaamse-milieubeleidsplan-1997-2001-boek, last accessed 27 April 2013). The river basin management policy plans aimed to create a common and holistic view on the nature and solution of water problems in the river basin.

Enthusiastic on the emergence of multi-stakeholder dialogue and integrated policy planning, the environment administration aimed at stronger institutionalization of integrated water policy. The same and new advocates within the environment administration and academia pleaded for the introduction of a legal status of river basin committees and integrated policy plans, the creation and formalization of new (eco-friendly) policy instruments and reorientation of standard operating procedures in other policy domains (like the public works departments and spatial planning). This formalization proved a cumbersome process (Crabbé 2008). Three legislative attempts were needed. In 1994 and 1998 respectively, two draft texts of decrees were politically rejected. The 2003 attempt succeeded. Pushed by the legal obligation to transpose the European Water Framework Directive (2000), the Flemish government and the Flemish Parliament agreed upon the introduction of a Decree on Integrated Water Policy (2003). The decree is in a sense more ambitious than the WFD: it frames water quality problems and the need for ecological restoration much more explicitly in an integrated, holistic approach.

Recent discussions: renewed concerns for safety due to anticipated climate change consequences
Since the first decade of the 21st century (2000), the Flemish government has ordered and participated in various research projects on the potential impact of climate change consequences (Crabbé 2011). We now know for Flanders that climate change will induce rising water levels, both at our coast and in our rivers. We will further also experience more extreme weather events. And even though some problems of scientific uncertainty remain unsolved, there is a political consensus that additional measures are necessary to guarantee safety.

On 22 July 2005, the Flemish Government agreed upon the *updated Sigmaplan* (www.vlaanderen.be/servlet/Satellite?c=NB_Nieuwsbericht&cid=1140238237495&p=1106040582718&pagename=nieuwsberichten%2FNB_Nieuwsbericht%2FNieuwsbericht, last consulted 27 April 2013). This plan builds upon the 1977 version. It focuses on safety measures, but additionally stresses the importance of restoration of natural values. The main idea is that – as the implementation of the plan furthers – the protection of residential and industry zones in the Seascheldt area will incrementally be improved. Dikes along the Scheldt and its contributory rivers will be fortified and heightened. A chain of controlled flooding areas will create more space for the river. At the same time (and pressured by European nature policy goals), infrastructure works for safety will go hand in hand with nature development. Controlled flooding areas, wetlands and de-poldering will gradually support the development of 1.650 hectares of nature in 2030 (www.sigmaplan.be/nl/sigmaplan/hoe-is-het-sigmaplan-ontstaan, last consulted 27 April 2013). The updated Sigmaplan also programs measures for recreation and rural economy, and it actively promotes transport. The updated Sigmaplan thus contributes to a "multifunctional and sustainable use of the Scheldt" (www.sigmaplan.be/nl/sigmaplan/hoe-is-het-sigmaplan-ontstaan, last consulted 27 April 2013).

In January 2013, the Flemish government has agreed upon the concept ideas of the climate policy plan (www.jokeschauvliege.be/content/vlaams-klimaatbeleidsplan-2013-2020-nieuwe-stap-strijd-tegen-klimaatverandering, last consulted 27 April 2013). This draft plan combines a climate change mitigation plan and a climate change adaptation plan for Flanders. In this plan, the Flemish government stresses the importance of win-win solutions. No measures are taken solely in view of climate change adaptation; they must also contribute to other societal projects and aims, for example climate change mitigation. Besides win-win solutions, the Flemish Government – as other governments in Europe – focuses on no regret and low regret measures. Even if the impact of climate change on water levels is not as big as anticipated, the measures should be useful for reaching other goals. If the impact is more substantial than anticipated, then it should be easy to adapt, accelerate, and intensify the existing measures.

The Flemish government is clearly willing to diversify policy strategies for flood management (www.lne.be/themas/klimaatverandering/vlaams-klimaatbeleidsplan-2013-2020/eerste-ontwerp/2013-02-01_Eerste_ontwerp_VAP.pdf, last consulted 27 April 2013). *Flood prevention* is considered important, even though historically grown chaotic land-use hinders flood resilient spatial planning. Water managers and spatial planners are actively instructed to reduce flood risks in areas with high potential damage costs (residential areas and industry zones), at the expense of areas in which potential damage is small or non-existent (range land, nature areas). The 'water test' is a procedural step in the adaptation of plans and programmes and the licensing of permits. The aim of the water test is to allow the competent authorities to take fully into account the possible damaging effects that may occur in the water system. Communication campaigns are installed to inform people on flood risks in low lying land. Further, the Flemish government invests in *flood protection* measures that help to reduce flood risks, e.g. retention zones, dikes, pumping stations etc. These measures fit into a broader multi-step strategy of retention, slow transport, storage and drainage. Finally, the Flemish government stresses the importance of *preparedness*. Investments are made in warning systems that help to safeguard inhabitants and their goods in case of flood danger. Interaction with

other governments on disaster planning will be needed, as will be: measures to support resilience of all inhabitants.

A particularly point of policy attention is the risk of water shortage. Impact studies for Flanders recommend that, besides an active management of flood risks, policy makers should take sufficient measures to reduce the threat of water shortage. These problems of water shortage are both socially and politically insufficiently acknowledged, mainly because they are – until now – less frequent and less invasive in daily live. Low water problems are however anticipated to become increasingly important during the 21st century. The Flemish government therefore considers new legislation on water capitation, norm-setting and economic instruments such as water pricing aiming at rational water use.

A1.2 Debate on the implementation of the FD in Belgium

Flemish Region

In the Flemish Region the legislator adopted on 18 July 2003 the Decree on Integrated Water Policy (BSG, 14 November 2003) in order to implement the Directive 2000/60/EC establishing a framework for Community action in the field of water policy (European Parliament & the council 2000). For the implementation of the Directive 2007/60/EC on the assessment and management of flood risks (European Parliament & the council 2007) the Flemish legislator opted for a Decree amending the Decree of 18 July 2003 instead of adopting a separate legal framework dealing with floods (Flemish legislator 2010).

Walloon Region

In the Walloon region the government adopted since January 2003 several decisions which created the so-called rain plan (plan Prévention et Lutte contre les Inondations et leurs Effets sur les Sinistrés, hereinafter PLUIES) (http://environnement.wallonie.be/de/dcenn/plan_pluies/index.htm, accessed 27 April 2013). The purpose of this plan was (a) to improve knowledge of flood risk; (b) to reduce and slow down the flooding of rain water in catchment areas; (c) to improve crisis management in the event of disasters and (d) to reduce vulnerability to flooding in flooding areas and (e) to improve river beds and alluvial plains. These objectives were translated into thirty actions such as defining the flood risk areas.

After the adoption of the rain plan, the legislator in the Walloon region adopted a Water Code (le code de l'eau) on 27 May 2004 (*B.S.G.*, 23 September 2004). This Water Code provides the main regulatory framework for water management in the Walloon Region. Since its adoption this code has been modified several times, including by the Decree to implement Directive 2000/60/EC and Directive 2007/60/EC. The main provisions concerning the evaluation and management of flood risks can be found in the articles D 53-1 to D54 of the Water Code.

Brussels-Capital Region

In the Brussels Capital Region the legislator implemented Directive 2000/60/EC with the adoption of the Ordinance of 20 October 2006 establishing a framework for the water policy (*B.S.G.,* 3 November 2006). With respect to flood risk management it should be noted that this Ordinance states that one of the objectives of the integrated water policy in the Brussels Capital Region is to weaken the risks and consequences of floods.

On 11 December 2008 the government of the Brussels-Capital Region adopted a Rain plan 2008-2011 concerning floods. The objectives of this plan are (a) fighting against the consequences of the impermeabilization of the soils; (b) restoring the waste water collect network and achieving the building of storm basins; (c) restoring the network of surface water bodies and the natural zones of controlled flooding and (d) discouraging the buildings in flooding areas or adapting those buildings

with specific measures. The Flood Directive has been implemented in the Brussels-Capital Region through a governmental decision adopted on 24 September 2010 concerning the evaluation and management of flood risks (*B.S.G.*, 5 October 2010).

Practical implementation of Directives 2000/60/EC and 2007/60/EC in Flanders
Flanders opted to integrate the transposition of Directive 2007/60/EC into the Statute Decree of 18 July 2003 instead of adopting a separate legal framework dealing with floods. The same level of efficiency in organization is sought for the practical implementation of the Directive.

Preliminary flood risk assessment – The Flemish government has opted for the possibility (offered by article 13 §1 of the Directive) to skip the phase of preliminary flood risk assessment. This decision is supported by the socio-economic council of Flanders (SERV) and the regional environment council (MINA-raad) in their common advice of January 2010 (SERV & MINA-raad 2010). These councils bring in that already much work is done: many detailed data and digital height models have already been developed in the framework of the updated Sigmaplan.

Flood risk maps – The Flemish government has adopted an approach in which flood damage assessment maps and flood risk assessment maps will be developed and made available for the public by the end of 2013 (www.integraalwaterbeleid.be/nl/nieuwsbrief/ciw-nieuwsbrief/jaargang-9-nummer-4-september-2012/#ank_2, last consulted 27 April 2013). Flood damage assessment maps describe physical characteristics of floods; flood risk assessment maps map the consequences of floods for people, ecology, economy and cultural heritage. In the spring of 2012, the first draft maps for the river basin of the Yser were presented to the members of the Coordination Commission on Integrated Water Policy (CIW). The basin of the Yser was selected as pilot case because floods in this basin arise from both the sea and navigable and non-navigable water courses. Maps from the Yser basin are considered to be a good indicator for the integration of separate modelling results into one global flood map (ibid).

Flood risk management plans – The Flemish government has decided to integrate the flood risk management plans into the (second generation of) river basin management plans. This decision is supported by SERV and MINA-raad, as it is the opinion of the council members that Flanders already has more than enough water policy plans (SERV & MINA-raad 2010). In response to that criticism, the Flemish government has decided to integrate the sub river basin plans into the two river basin management plans for Scheldt and Meuse. The ambition to integrate as much as possible is also visible in how Flanders deals with flood risks as the coastal zone: measures for coastal flood risk management are integrated in the management plan for the river basin of the Scheldt.

The Floods directive (article 3 §2) offers member states the opportunity to appoint another competent authority than the authorities that were appointed responsible for the implementation of the Water Framework Directive. Flanders has chosen not to do so. On the international level, the Scheldt and Meuse commissions are responsible. In Flanders, the Coordination Commission on Integrated water Policy (CIW) is the competent authority. Within CIW a working group is installed on the Floods Directive. This working group is, amongst others, responsible for the actual implementation of the Floods Directive, the follow-up of the project on crisis communication in case of acute flood risks and the follow-up of European and international discussions on high water levels (http://www.integraalwaterbeleid.be/nl/nieuwsbrief/nieuwsbrieven_CIW/Nieuwsbrief_CIW_jrg7_nr2.pdf/at_download/file, last accessed 27 April 2013).

A2 England and Scotland

A2.1 Flood risk management debates in England

There has been a decentralisation of political decisions occurring in the UK including the creation of both the Scottish Parliament and the Welsh National Assembly. The management of flooding has therefore been affected by these shifts in responsibility and power. In some cases different legislation covers flood management and for many functions different guidance and strategic and delivery organisations exist. The text below will focus primarily on England with the systems in Wales, Scotland and Northern Ireland being somewhat different. Therefore, when we speak about the national level, we are referring to England.

Traditional approaches: Land drainage to flood defence (19th Century to mid-1990s)

Traditional approaches to flood risk management prevailed in England for a considerable period of time. Initial management focused mainly on rural land drainage as specified by a number of pieces of legislation and a Royal Commission in 1927 culminating in the Land Drainage Act 1930 (HM Government 1930) which established catchment boards. This was the beginning of the strong influence of river basin management and implementing flood management at a catchment scale. At this time there was an established viewpoint that flooding was a relatively minor problem in the UK and that it was a primarily winter phenomenon, thereby its influence on agriculture was low. Whereas land drainage regulations dealt with inland flooding, 1949 saw the passing of the Coast Protection Act 1949 (HM Government 1949) which set out responsibilities with regard to coastal erosion and encroachment by the sea.

One important guiding principle is that there is no statutory duty on the government to protect land or property from flooding and all powers are therefore permissive. There has never been any official provision for the compensation of flood victims and in this period there was little consideration for the problem of flooding for citizens; those impacted by flooding had to recover on their own. Any flood defence activities during this period were undertaken in a relatively *ad hoc* way with defences being implemented in isolation without a clear strategic overview. Where defences were implemented, there was a concerted focus on providing protection for flooding which would have severely affected crop production and therefore food cultivation.

Flood insurance was available in England and Wales as part of a composite insurance policy from 1922 (Arnell et al. 1984), however initial penetration of this cover was low. An informal agreement between insurers and government was made in the 1960s, to provide universal cover, however penetration of this insurance initially remained low. The repeated need for the UK Government to make money available to provide informal financial assistance to uninsured flood victims in the 1960s raised questions about the effectiveness of insurance. This led to an advertising campaign and eventually the requirement for all those with a mortgage to have at least structural flood insurance.

Flood events affecting Lynmouth in 1952 and the East Coast of England in 1953 causing 34 (Prosser 2001) and 308 (Baxter 2005) fatalities respectively refocused attention on the human impacts of disasters. Until these events occurred there was little overt consideration for the social consequences of flooding (Nye et al. 2011). Neither of these instances had a flood warning and the Department on Coastal Flooding established after the 1953 flood suggested that if a flood warning system had been in place the loss of life would have been reduced if not averted altogether. This led to the establishment of the national storm tide warning service (STWS) operated by the Meteorological Office (Parker et al. 1995). The event also led to an Emergency Act of Parliament (HM Government 1953) enabling and detailing the repair of defences along the east coast.

During this whole period responsibilities for managing flood management were extremely complex and evolved in a very piecemeal way. Different individuals and organisations assumed responsibility for different types of watercourse or flooding problem (e.g. non tidal main rivers, non-tidal non main rivers, tidal rivers, navigable rivers etc.) each of which were governed by a range of Acts and Amendments (E.g. HM Government, 1948/1961/1976).

The 1980s and 1990s saw a movement away from a focus on rural protection and land drainage and an increased focus on flood management. This shift was tied to a reduction in the importance of agriculture and a rise in the importance of manufacturing and the need to better address flood issues in urban areas. This led to a greater reliance on flood defences at a large scale coupled with an increased effort to manage the exposure of people on the floodplain. Greater Government intervention meant that self-help systems and community resilience to flooding that existed previously were lost. However, Government was somewhat more involved in preventative flood management, rather a reactive approach, and there was little change to flood incident management. Responsibilities for responding to flooding remained in the most part with the police and other emergency services following existing civil defence requirements. There was some focus on environmental impacts of flood defence activates, although economic considerations still dominated flood management decision-making.

Broadening the scope: move towards more holistic flood risk management (post c. mid-1990s)
This period of flood risk management is characterised by the beginning of a movement away from purely focussing on flood defence towards a more integrated and strategic system of flood management (Nye et al. 2011). Similar to the situation in the Netherlands in the same period, there was a shift away from focussing on purely civil engineering solutions to a broader and more holistic approach to flood risk management. This included placing an increasing importance on the environmental and social consequences of flooding.

Strategic and funding responsibilities for flood risk management remained centrally organised with the Ministry of Agriculture, Fisheries and Food (MAFF), later becoming the Department for Environment, Food and Rural Affairs (Defra). This period saw one of the first documents detailing a tailored and specific strategy for how to tackle flooding. The *Strategy for flood and coastal defence in England and Wales* (Ministry of Agriculture, Fisheries and Food (MAFF) & Welsh Office 1993), was the first in a series of strategies (latterly developed by the Environment Agency) which presented a considered and overarching approach to the management of flood risk management.

Recognising the need to manage the whole environment, one of the major changes to flood management within this period was the creation of the Environment Agency (EA) which was established as the main operational body for flood risk management in England and Wales, taking over from the then disbanded National Rivers Authority (NRA). The EA was created in 1996 as part of the Environment Act 1995 and inherited a range of responsibilities for flood defence stemming principally from the Water Resources Act 1991 (HM Government 1991) and the Land Drainage Act. These powers were initially limited to 'flood defence' activities rather than a wider range of flood risk management activities but did include some provision for flood mapping.

Prior to 1996, the police were responsible for disseminating flood warnings issued by meteorological agencies to the media, other organisations such as other emergency services, local authorities and industry; no organisation had the specific duty to provide flood warnings to the public. The system of flood warning was complicated by legal complexity and an uncertainty about precise roles and responsibilities (Parker et al. 1995). On 1st September 1996, the Environment Agency took on new permissive powers for the dissemination of flood warnings. Many improvements to flood warning were planned and an Automated Voice Messaging (AVM) service was launched which provided the

public with a service of flood warning. However, the planned flood warning changes were only partly implemented before flooding was experienced in Easter 1998.

1998 and the 2000 floods – increasing the focus on flood warning, incident management and development control

Significant flooding events had a clear impact on the direction of flood risk management during the early years of this century and acted as drivers and catalysts for policy change (Nye et al. 2011). Widespread flooding at Easter 1998 impacted over 5000 km^2, killed five people and caused over £400 million damages. The Bye Report (Bye & Horner 1998) commissioned in the aftermath of the flooding by the Environment Agency concluded that although the organisation's staff performed well in extreme circumstances there were failings in certain areas including: inadequate flood warnings, poor communication and coordination with emergency services, poor spatial planning and poor defence performance. New guidance documentation on flood and coastal defence project appraisal was published by MAFF (1999a/b; 2000a/b; 2001a/b), to encourage a consistent approach to the appraisal of defence schemes and provide more transparent and balanced decision-making for flood risk management. 1999 also saw the publication of the Flood Estimation Handbook (Reed et al. 2000) which was one of the first major advances in the estimation of the flood hazard in the UK since the 1975 Flood Studies Report (Institute of Hydrology 1975). The investment in gauging telemetry, a longer data record and an increased capacity to model and process these data meant significant advancements in flood risk assessment. This improved approach to identifying and understanding flood risk provided the foundation for a much more targeted approach to flood management at the strategic as well as emergency level.

In direct response to criticisms of flood warning in 1998, in September 1999 the EA published a five-year Flood Warning Strategy for England and Wales (Environment Agency 1999). The strategy advocated a comprehensive step-change to the service, had investment of £100 million and included all aspects of flood warning from messaging, dissemination, flood risk mapping, addressing skill shortages and reviewing all internal management structures. The strategy created a more structured approach to flood forecasting and warning, with 8 forecasting and 27 flood warning centres and introduced a minimum standard for providing flood warning to recipients. It also led to the wider use of information and communication technologies, with the coverage and the accuracy of the warnings provided by AVM continuing to improve in this period. In addition, the Floodline service was introduced in 1999 which provided a service to the public which people could call for locally specific flood risk and flood warning information. During 2000 the EA launched a new flood warning system as well as a public awareness campaign (Parker & Hagett 2001). In September, new graduated flood warning codes were introduced to replace the previous colour-coded (yellow, amber, red) system which was considered to be ineffective and poorly understood by both the public and professional organisations (ibid). These new codes were almost immediately tested during the floods experienced in autumn/winter 2000.

Further significant flooding during October and November affected over 10 000 properties, caused huge disruption and maintained political attention on flooding. Although this event served to increase the awareness of flooding it is debateable whether any substantive management lessons were learnt from the event itself (Clark et al. 2002). Despite the fact that changes to management procedures were underway, concern about flooding was heightened and flood management strategies increasingly challenged. Poor spatial planning and development control in flood risk areas was raised as a key issue following the autumn 2000 floods. Consultation about better management of development on floodplains had begun prior to the flood event (Department of the Environment, Transport and the Regions 2001) but culminated in new Policy Planning Guidance *Development and Flood Risk* (Department of Transport, Local Government and the Regions 2001) in 2001 which

introduced a sequential test and necessitated flood risk assessments for development in areas at significant risk of flooding.

The new government department with the remit for flooding, the Department for the Environment, Food and Rural Affairs (Defra), commissioned an independent review of the flooding by the Institution of Civil Engineers (2001) primarily to examine the continued reliance on defences and whether natural processes could be better used to manage flood risk. The findings from this review reinforced the continued move towards the desire for more sustainable flood risk management and that this can only be achieved by better working with the natural system, the acceptance of the fact that floods cannot be prevented and that communities at flood risk must learn to live with flooding. The fragmentation of organisations and responsibilities for flood defence also continued to cause concern. A National Audit Office (2001) investigation into the state of inland flood defences highlighted this: "The number of bodies involved and the fact that they have separate budgets rather than a single flood protection programme causes confusion and absorbs energy and resources that might otherwise be devoted to planning and implementing flood defences" (p2).

Sustainable flood management solutions: Making Space for Water (post-2004)
Frequent flooding events during the preceding years raised concerns about the future exposure of flood risk in the UK under different drivers including climate change and different social-economic futures. The Foresight *Future Flooding Reports* (Evans et al. 2004) commissioned by the UK Government Office of Science and Technology explored this risk at a national level and presented the key finding that continuing with existing policies was unsustainable under future flood risk scenarios and that a significant increase in investment in flood management was needed and/or a need to better live with increased flooding.

This independent scientific work and the frequent flooding in the intervening period led to a change in policy and a large-scale consultation *Making Space for Water* in 2004 (Department of Environment, Food and Rural Affairs 2005). This aimed to develop a comprehensive, integrated and forward-thinking strategy for managing future flood and coastal erosion risk in England and integrating these activities into an overall approach to managing flooding more generally. The consultation resulted in the adoption of a more holistic strategy for flood risk management for the following 20 years. The approach had a number of central tenets including: a focus on all sources of flooding, adopting a whole catchment/shoreline approach which was consistent with the implementation of the Water Framework Directive, inclusion of stakeholders at all levels and recognition of the impacts of social, economic and environmental consequences. The strategy established the first movement towards giving the EA a more overarching strategic role for flooding and coastal erosion risks, rather than purely operational responsibilities. The *Making Space for Water* strategy (ibid.) advocated a multi-functional use of floodplains and the adoption of an integrated approach to managing river and catchment management, including wildlife protection and the provision of recreational areas as well as for managing flood risk. It reinforced the paradigm shift towards flood *risk* management away from flood defence and reduced reliance on engineered solutions. More emphasis was given to regulation, development control and non-structural solutions to flood risk management such as flood warning and property-level resistance and resilience.

There was also a concerted move to re-position flood risk responsibility from being primarily centrally controlled towards more local flood risk management and increasing the self-help roles for both communities and individuals at flood risk. The period is characterised by a number of efforts to explore different approaches to flood management and expanding the profile of measures used to manage flooding. Initiatives included pilot schemes exploring local drainage solutions (Halcrow 2008) and grant funding for property-level flood protection measures (Department of Environment, Food and Rural Affairs 2008), aiming to increase flood resistance and resilience within communities. This was also the beginning of efforts to increase stakeholder engagement in flood risk management

decisions (Lenister & Long n.d.), a philosophy which has been built on and continues to remain a key principle.

The Civil Contingencies Act (2004) also became law during this period and was a key change in the way floods were to be managed into the future. The new legislation promoted a much more co-ordinated approach to responding to different types of emergency situation including flood risk. The Act sets out the responsibilities of different agencies (named Category 1 and Category 2 responders) when reacting to flooding and necessitates a multi-agency response to flooding, as well as creating new regional Local Resilience Fora. Although not a direct response to previous flood events the Act reinforced many of the incident management lessons coming from the reviews into the 1998 and 2000 flood events; that flood incident management needed to include a whole range of organisations in a much more co-ordinated way.

Investment in flood management and defence had been steadily increasing and in response the activities and the effectiveness of the Environment Agency was scrutinised. The National Audit Office (2007) reported some failings of the organisation to improve the conditions of flood defence assets and the production of catchment plans, despite the extra investment requested. The report suggested that the Environment Agency should improve the cost effectiveness of its activities rather than continuing to invest additional funding. This criticism of the EA continued with an interrogation by the Committee of Public Accounts in June 2007 following the publication of the NAO report which concluded that the organisation had not done enough to improve protection from flood management. This increasing pressure on the Environment Agency to deliver better cost effectiveness was interrupted by severe flooding experienced in England and Wales which began later that same month.

2007 floods, renewing the focus on all sources of flooding and flood risk management post Pitt-Review

The 2007 flooding experienced in June and July 2007 affected hundreds of thousands of people in England and Wales, with 13 people killed, 48 000 residential and 7 300 commercial properties flooded (Pitt 2008), considerable disruption to critical infrastructure and £3 billion damage (ABI 2007). Not only were the 2007 floods the most costly and widespread flood event experienced in England and Wales, it also placed increased focus on all sources of flooding as only a third of the flooding was attributed to main rivers or a combination of main river and surface water flooding; the remaining two-thirds being attributed to inadequacies in surface water drainage systems (Pitt 2008). An independent review was commissioned by the Government following the flooding undertaken by Sir Michael Pitt. The resulting review (ibid.) provided a comprehensive investigation into the causes of the event and the performance of organisations and procedures for managing flooding. The report provided a total of 92 recommendations covering a range of issues over six categories: knowing where and when it will flood, reducing the risk of flooding and its impact, being rescued and cared for during an emergency, maintaining power and water supplies, protecting essential services and staying healthy and speeding up recovery. In particular the review prioritised the interests of the victims of the floods. The Government has made significant inroads into answering these recommendations (Department for Environment, Food and Rural Affairs 2008/2012).

The Flood and Water Management Act (FWMA) (HM Government 2010) was passed in 2010 partly as a response to the summer 2007 floods and along with the Flood Risk Regulations 2009 (HM Government 2009) as a response to the need to transpose the EU Floods Directive. The FWMA aims to reinforce the shift towards more localised flood management and set out the roles and responsibilities of flood risk management at these levels. However, there is still the requirement for local plans to be consistent with national strategies and therefore this potentially limits activities at

the local level. Flood management is also seen to be benefiting from being associated as part of the climate change adaptation debate.

Funding for flood risk management has evolved a number of times over the periods described above. Initially Regional Water Authorities distributed funds for defences with contributions from both regional and national funds. Following the establishment of the NRA and then the EA, although defences continued to be prioritised at a regional level, ultimately decisions about which should receive funding was taken at a national level. The process of prioritisation has also changed over this period in which a 'scientific' CBA approach was preferred. This was subsequently revised to one based on outcome measures to better account for non-economic benefits and costs; with environmental and social vulnerability aspects both being added. It is difficult to say however, whether these approaches have really led to decision-making taking better account of issues of fairness and social justice. Arrangements for funding of flood defences and how to allocate these funds have also undergone more recent modifications.

The shifting of risk responsibility to communities and away from state-funded flood defences was reinforced following the change in UK Government in 2010 and the subsequent Spending Review (HM Treasury 2010). The review led to spending cuts across all government departments, including a reduction in flood defence investment. The new Conservative Government's Localism philosophy was embedded within National Flood and Coastal Erosion Risk Management Strategy (approved in July 2011) (Environment Agency 2011) through the adoption of a partnership approach (Department of Environment, Food and Rural Affairs 2012) to flood management funding. This requires a proportion of investment to be raised at the local level (e.g. from local authorities, industry, businesses or the public) for all projects commencing after March 2012. The approach has the potential to fundamentally influence decisions about investment and where defences are likely to be built in the future, although the implications of this change in policy are still to be realised.

The performance of flood incident management and flood warning was one area heavily criticised by the Pitt Review which called for a step-change in the quality of flood warnings. A lack of preparation and information was considered in some cases to have contributed to poor performance, particularly in the case of critical infrastructure. Exercise Watermark, a national week long real-time multi-agency training exercise, was held in 2011 to better enable joined up emergency planning for flood events. Many of the lessons from this exercise are currently being embedded into emergency plans for responding to flooding (Exercise Watermark Review Team 2011). Specific criticism of flood warning performance led to the creation of the Joint Environment Agency/Meteorological Office Flood Forecasting Centre in 2008, the introduction of a number of new flood warning services (including Flood Guidance Statements and 3 day-ahead warnings) as well as an overhaul of the Environment Agency's flood warning and flood mapping websites. In particular, a change in policy whereby residents are required to 'opt out' of the Flood Warning Direct (FWD) service, rather than 'opt in' to it will have increased the numbers receiving flood warnings.

Ultimately, the question is where, how and when to intervene to reduce the likelihood of a damaging flood occurring. The different discourses about FRM proposed different means of intervention which are either intended as complements or substitutes to each other. Table 5 is an inventory of possible forms of intervention with a summary of the current state of adoption in England. Since the technologies are common, differences in the adoption of each technology in the different countries of the EU must lie in other factors including governance.

For example, Flood Storage Areas (FSAs) are a traditional and common strategy in England but the introduction of their use is causing considerable controversy in the Netherlands and Hungary. Flood insurance is only possible in some form of public-private partnership (Botzen & Van Den Bergh 2008). Arguably France is the only country in Europe where a universally available and viable system has

emerged (ibid). The obvious question is then: why has an equivalent system not developed in other countries? A converse question is: what were the conditions that resulted in the development of the approach in France? The acquisition of properties which are at a high risk of flooding has been adopted in France but the Treasury Rules have prohibited the same approach in the UK although there have been some recent experiments (Regeneris Consulting 2011). Again, whilst the adoption of flood plain forests to provide live flood storage on flood plains has been promoted in a number of countries (Hughes 2003) their use in England is relatively rare (http://webarchive.nationalarchives.gov.uk/20110118095356/http:/www.cabe.org.uk/case-studies/floodplain-forest, accessed 31 May 2013). One possible reason is that wetlands are an alternative approach and within the biodiversity action programme priorities in England, the establishment of wetlands, and the replacement of those lost through coastal squeeze is seen as a more urgent priority. Other differences simply reflect physical differences. For example, the small number of flood storage reservoirs in England is a consequence of predominantly lowland character of the country.

Table 5 Intervention strategies employed in England

Intervention	Status in England	Notes for England
rural source control	trialling	e.g. FRMC2
on farm storage	trialling	being trialled in the Parrett plan
afforestation of	trialling	but generally seen as bad practice because of risk of
urban source control	being adopted	in new developments, very limited consideration yet
check dams	not used	by definition, an upland technique, may be some
use of agricultural	traditional	agricultural land is traditionally not protected from
instream storage	traditional	
wetlands for live	not used	wetlands largely drained in the Medieval period but
flood storage	traditional	Over 1000 in existence
offline storage	conventional	not common
flood plain forests	trialling	some trials but wetlands preferred for ecological
river rehabilitation	being adopted	many examples, often funded from flood defence
river deepening	conventional	now seen as bad practice
river widening	conventional	now seen as bad practice
river straightening	conventional	now seen as bad practice
bypass channels	conventional	limited scope for use because of requirements for
multi-form channels	conventional	
flood warning	conventional	being extended to pluvial flooding
flood plain mapping	conventional	
development	conventional	e.g. Act of 1890s required all new dwellings in
managed retreat	conventional	widely used on coast, some inland uses at least by
dikes/walls	conventional	common
super dikes	not used	
design of dikes as	not used	
discontinuous dikes	not used	not known to have been used, may be historical
designed weak	trialling	not known to have been used, may be historical
secondary defences	conventional	in practice, widespread but not necessarily intended;

demountable	trialling	mass mobilisation of volunteers abandoned after
civil defence	not used	mass mobilisation of volunteers abandoned after
resilience forums	conventional	response to threat of terrorism threat
permanent flood	conventional	included in building regulations
robust construction	conventional	included in building regulations
contingent flood	being adopted	
flood gates on roads	being adopted	legal problems in obstructing/closing a Public
property elevation	traditional	
floating buildings	traditional	“house boats”, but not currently considered
refuge areas	not used	no known equivalent of 'Terps'
planned evacuation	being adopted	
provision for rescue	being adopted	
flood insurance	conventional	current approach is not sustainable; current search
land acquisition and	trialling	recently small scale trials under the Pathfinder
social service	conventional	yes
soft loans for	conventional	local initiatives
compensation for	not used	UK governments have never provided

Legend

traditional used prior to C20th	established options included as policy with widespread use on the ground but now often seen as bad practice	trialling limited usage on experimental basis	being adopted emerging policy/currently preferred practice	not used no or rare examples

A2.2 Flood risk management debates in Scotland

Broadly speaking flood management in Scotland has followed a similar pattern of evolution to that in England, with an initial focus on land drainage. Most of the Land Drainage Acts implemented in England also have a Scottish equivalent. This has also now moved towards the broader consideration of water management and towards aiming for more holistic flood management. However, Scotland might be considered to have a much smaller flooding issue with only around 125 000 (SEPA 2011) considered to be at risk.

Similar to the Environment Agency in England, the Scottish Environmental Protection Agency (SEPA) has powers under the Environment Act 1995 to both assess and advise on the risk of flooding and have an overall responsibility for all flooding issues in Scotland. The organisation was established under the Environment Act 1995 when SEPA took over the responsibilities of the River Purification Boards. The Flood Protection and Land Drainage Act (Scotland) 1997 implemented one key feature which was different to that in England. In Scotland local authorities were legally required to maintain and report the state of local watercourses and culverts, whereas in England there was no statutory duty for them to do so.

Scotland implemented National Planning Policy Guidance 7: Planning and Flooding in 1995 which provided SEPA with a greater say on planning decisions a few years before similar powers were granted to the EA in England (The Scottish Office 1995). It was argued therefore that, at this time, planning was more effective at preventing inappropriate development in flood risk areas. This guidance was replaced and improved in 2004 (Scottish executive 2004) with a significant revision being the inclusion of a risk framework, similar to the sequential test of the English Planning Policy. This guidance has now been replaced by the Scottish Planning Policy (Scottish Government 2010) with the direction of planning towards a more general approach similar to that also being adopted in England.

Understanding flood risk, flood warning and awareness-raising is one area where SEPA might be considered to have lagged behind the Environment Agency. It was not until 1999 that SEPA developed a Flood Warning Strategy and at that time they reported that the police were the best organisation to disseminate flood warnings and were reluctant to take on this role due to resource constraints. However, this has altered more recently with SEPA offering a flood warning service (SEPA 2012a) (via a range of mechanisms) and providing flood maps to the public online (http://www.sepa.org.uk/flooding/flood_extent_maps/view_the_map.aspx, accessed 28 April 2013). An overall picture of flood risk was also not produced until 2011 (SEPA 2011), a few years behind that in England. Government in Scotland passed new civil response legislation in 2005 (Scottish Statutory Instrument 2005) with similar responsibilities to the equivalent English Act.

The key development in flood risk management in Scotland in recent years has been the passing of the Flood Risk Management (Scotland) Act 2009 and subsequent strategies adopting the key components of this legislation (SEPA 2012b). The Act reinforces the movement towards managing risk sustainably. It includes the introduction of flood risk management plans which will consider flood risk from all sources and supports the need for increased community engagement. In particular, flood managers in Scotland have showed an increased attention to managing floods through better land use and practices and managing catchments (SEPA 2012c). Although this is something which is also considered in England, the upland nature of Scotland widens the options for the adoption of these types of measures. It might be argued that in general the central tenets of the Act and strategy are broadly similar to those adopted post-Pitt in England. However, in both countries it is too early to say how many of these broad ideas will manifest in practice and whether they are able to be as holistic and sustainable as they claim.

Main characteristics of the debate on the implementation of the FD in England

The Floods Directive for England and Wales is transposed by the Flood Risk Regulations 2009 (Statutory Instrument 2009/3042, FRR, 2009). Originally, the FD was going to be transposed solely through the Floods and Water Management Bill; however this was not going to be passed into legislation in time to satisfy FD implementation guidelines. The resulting legislation, the Flood and Water Management act of 2010, is consistent with the FRR 2009 and calls for the development of "risk management strategies" (RMS) of varying scopes at different levels. In many instances England and Wales were relatively far advanced in the sense of already having in place many of the elements required by the FD. The FRR (2009) makes a clearer specification about the scenarios providing specific probabilities for high, medium and low flooding. The FRR (2009) also provides additional definition about the list of institutions which need to be consulted (reg. 36 (3)) as well as the public (reg. 27 (7)).

Preliminary flood risk assessment (PFRA) – The Environment Agency did not produce a specific PFRA for those sources of flooding for which they are the Lead Flood Authority in England and Wales (e.g. main river, the sea and reservoirs). The transitional arrangements permit them to continue to use and adapt existing processes. However, local flooding was treated differently.

The Environment Agency provided guidance (Environment Agency 2010) on how to prepare a PFRA and the core information that needed to be included. Within England and Wales there are a total of 174 Lead Local Flood Authorities (LLFAs), however a few LLFAs worked together to produce the assessments. Therefore only 169 have been produced in accordance with the December 2011 deadline. The LLFAs were responsible for producing a PFRA for local sources of flood risk, primarily from surface runoff, groundwater and ordinary watercourses. The EA guidance is that the PFRAs should include: summary information about significant historic floods, summary information about future flood risks based primarily on the EA's national datasets and reporting information for the European Union. If the LLFA is located within the designated Flood Risk Areas then the PFRA was required to also consider information about those aspects**.**

Flood maps – It is expected that the Environment Agency will mainly utilise existing risk mapping approaches to fulfil the mapping requirements of the Floods Directive for main river flooding, coastal flooding and flooding from reservoirs. The National Flood Risk Assessment (NaFRA) which currently forms part of the existing flood hazard maps provided, will continue to form the basis of the maps, with additional information (such as numbers of people affected, flood depths and velocities) added to fulfil the risk requirements of the FRR. It is not yet clear whether there will be a number of mapped products available (i.e. FD compliant maps and separate public awareness-raising maps) or whether all aspects will be combined into one mapping product or platform.

LLFAs are responsible for producing the maps for local flood risk (e.g. surface water etc.) in the 18 designated Flood Risk Areas. In some situations Local Authorities that have already undertaken some local mapping will use (and improve these). In other cases Local Authorities have suggested that they will use the nationally-available Surface Water Flood maps produced by the Environment Agency and use these as a basis for the FD compliant maps.

Flood risk management plans – Similar to the other elements, the Environment Agency are responsible for developing flood risk management plans for flooding from rivers, the sea and reservoirs, with the LLFAs responsible for producing them in the 10 Flood Risk Areas identified in England and the further 8 in Wales. The preferred approach to developing these plans is that they will be principally based upon data and information in existing plans including: catchment flood management plans, shoreline management plans, local flood risk management strategies and surface water management plans. A consultation was held in 2012 (closing for response in December 2012) asking for views on possible approaches to delivering FRMPs. The consultation received 80 responses from a range of national and local organisations, private companies and other interested parties. These responses are currently being analysed and will feed into the Flood Risk Management Planning process.

A3 France

A3.1 Flood risk management debates

In France, flood risk takes many forms. Slow floods are found for example in the Loire valley. Rapid floods (less than 12h) are found mainly in the mountains and the Mediterranean regions. Flooding by urban runoff is present in large cities, and flash floods occur in mountainous areas. Finally, groundwater flooding is on the rise (events most notably being those of the Somme).

The evolution of flood management policy in France ¬ From a local issue to a national one

Local societies in France, very early, adapted themselves, in one way or another, to natural phenomena. The first devices to fight against the floods were mainly sought to control and slow fast waves, which were particularly destructive to crops and cultivated soil. At that time, there was no intention to limit their expansion, as the first dikes formed of branches that protected Angevin lands

along the Loire. The fight against the floods then passed through the implementation of often individual strategies and management practices related to proximity. They were the responsibility of local populations and later their councillors. Indeed, some authors note the very early establishment (sometimes even before the sixteenth century) of warning and emergency systems executed by local authorities, but also systems of commemorative inscriptions in order to report exceptional events.
The nineteenth century constitutes a turning point, marked by the assertion of State intervention. This period marks a transition from a culturally embedded and a local risk management to the implementation of a more scientific understanding of flood events that were by then understood more as natural phenomena). This scientification of the problem is related to the development of scientific knowledge able to better understand the phenomena. In the eighteenth and nineteenth century, this scientification of flood problems is supported by the political power. The scientification of the problem has been said to provide the state with the legitimacy to act, while local people were divested of the object.

After the French revolution, the legitimacy of the State to take action against floods has been reinforced, based on various grounds: security, economic, consolidation of national identity. From the mid-eighteenth century, the State relies on “corps” (established and formalized technical specialists) to lead action on behalf of the state: the Corps of Engineers of Civil Engineering, of Water and Forests and to a lesser extent that of Mines. The engineer became the figurehead of this movement of trying to anticipate and control natural hazards.

At the beginning, when facing floods, the State was above all "compassionate", voting credits for flood victims (like after the floods of 1846). During the second half of the nineteenth century it became more "protective". After the floods of 1856, the Second Empire (1852-1970) is a high time of investment in flooding by the State. The law of 28 May 1858 on the protection of cities plans further strengthening of dikes and structures to protect the country's major urban centres. Furthermore, regulatory constraints were issued, aiming at controlling or prohibiting any new dikes. The law established the principle of maintaining the natural alluvial flood plain and created new rules to control the building of new dikes. State engineers in charge of rivers not only wanted to strengthen or develop protection systems along the major rivers, but, together with the construction of works, take actions in the field of forecasting and even prevention. By a decree of February 3, 1854, a first hydrometric service was established for the basin of the Seine in Paris. This hydrometric service was in charge of the transmission of forecasts to all local engineers. After the catastrophic flood of June 1875, such flood warning services were implemented for all major watersheds. Due to the extensive buildings of protection structures, as well as the release of first recommendations in the field of prediction or prevention, the 1860s and 1870s were important in the history of the fight against the floods in France. For local communities, however, they can also be seen as a radical break with the past as well as a period of divestiture.

The involvement of the government in flood risk issues is the result of a historical process within which political, scientific and technical capacity were interwoven and produced new administrative skills.

From State involvement to a renaissance of the role of local authorities
With a State being progressively "protective", the control of the flooding issue continued to be refined. This movement was also linked to the rise, since the late nineteenth century, of the welfare state model. Throughout the twentieth century and until the 1980s, several trends can be observed.
On the one hand, the fight against the floods brought by the government asserted a logic of eradication and defence against a threat that must be neutralized or cancelled: a "logic of the structures". Following the First World War, the construction of dams and reservoirs in the upstream of the major French rivers was undertaken. With these storage and flow control strategies in the

upstream basins, alluvial plains were coming out of the river basin. The issue of flood risk was managed in areas located far from major issues and did not reach them anymore. The affirmation of this "logic of the structures" tended to make the problem disappear behind the technique.

In parallel, the “deterritorialization” of the flood problem was confirmed. Earlier, State flood policies were based on the setting of regulatory mapping for the control of urbanization in flood zones. The twentieth century was punctuated by successive reforms in this area, often in response to new events. This regulatory mapping reveals the wiliness of the State to control and impose its own vision of the flood problem, where the focus is on the events of rare occurrence: major floods.
Enacted by the decree of October 1935, devoted specifically to flooding, the Plans of Submersible Surface (PSS) were the first regulatory mapping exercise. They were intended to ensure the free flow of water and the preservation of flood plain areas. These regulatory rules were then reinforced by the 1955 change of the Town Planning Code and the introduction of Article R. 111-3. This article established a procedure to be prescribed by the Prefect of the department in order to define a perimeter of risk where buildings could be controlled or prohibited. As the map must present the extension of the strongest known events, the evaluation of potential phenomena was established. Furthermore the law of land orientation of 1967 introduced the ability to define so-called “Nd” areas (unconstructible areas) related to exposure to hazards of natural origin. Exposure Risk Plans (PER) were created in the framework of the law n ° 82-600 of 13 July 1982 devoted to the compensation of victims of natural disasters. They included a map of historical phenomena, a hazard map, but also a vulnerability map and a zoning plan. In the spirit of the law, the implementation of the measures defined in the PER would condition the right to compensation. It was not until the 1990s with the creation of Predictable Natural Risks Prevention plans (including "Flood” PPR), that the development of regulatory mapping changed in its approach.

The main rules that have structured national flood risk policies (since 1990)
The principle of solidarity facing disaster issues was written in the Preamble to the Constitution of the Fourth Republic, in 1946, as the principle of "equality and solidarity of all French as regards charges resulting from national calamities." In 1982, when the CAT-NAT device was introduced, parliamentarians had the perspective of the welfare State: in their minds, the nation "must [...] show its concern for the victims of disasters of any kind, but also as far as possible implement redistributive mechanisms able to institutionalize solidarity " (Decrop 1997). Since Law N°. 82-600 of 13 July 1982 devoted to the compensation of victims of natural disasters, it has been a sharing and pooling regime that prevailed in France. All persons who purchased damage insurance must contribute to the CAT-NAT fund through a surcharge. And, in case of natural disaster, all the property of people or legal entities other than the State were covered by a damage insurance funded by the CAT-NAT fund. The implementation of this pooling system, guaranteed by the State, therefore participated in the disempowerment of local populations as far as the problem of flooding is concerned. 80% of buildings located in French floodplains were built after 1950 (Dacharry 1950) The flood plains urbanization was most often allowed by an omission of the flooding character of these areas; the protection structures appeared to be a definitive answer: "These measures offered the promise of reducing the damage caused by past development of risk areas, while also allowing for a more intensive use of floodplains, not yet urbanized" (Pottier 2003: 193).

Since 1990, however, there has been a shift from a "conquest of security" logic to a "risk management" one. The "logic of structures" was seen as outdated, while a systemic approach of the problem of flooding appeared, trying to overcome the uncertainties related to civil engineering protection structures and at the same time trying to make flood areas more resilient.

Since the 1993 and 1994 flood in the Rhone valley, the question of dikes and their safety was asked more and more forcefully. The identification, assessment and restoration of protection dikes were part of the objectives of state policy. In 1997, a first report of the General Council for Roads and

Bridges already warned the government and recalled that the state is certainly not responsible for the protection of structures whose it is not the owner. Nevertheless, the state should not divert from their future and must ensure their maintenance when they involve public safety (Ledoux 2006).

For over a decade, "traditional" systems of protection (dams, dikes) were then criticized and challenged in their abilities to protect against flooding. This debate came to the point that the flooding problem was no longer seen as a problem of flood, the natural element to master, but of protection dikes and structures and their whether they are able to control all events, even exceptional ones. The risk of flooding was thus transformed from a natural hazard risk to a technological one.

For us, it seems that by highlighting these uncertainties, risk managers were also part of a process of empowerment of local governments (if they were not themselves owning their protection structures) and local inhabitants or local users of the areas behind these structures.
Highlighting the continued uncertainty vis-à-vis protection structures (or even increased risk with the presence of these items), risk managers rediscovered floodplains as a support of socio-economic activities. The risk (re)became a question of confrontation between hazards and stakes; our societies appear increasingly vulnerable, while events cause more and more damages.

As the ambition of an "eradication" of risk seemed no more achievable, the solutions proposed for the management of hazards and stakes have been deeply renewed. For instance, in the field of protection, they tend to offer palliative to the weaknesses of the dykes: the "vertical" answers were substituted to a "flattening" protection strategy (Warner et al. 2008), which should precisely allow to overcome the uncertainties related to the dikes.

However, these "flattening" strategies enhance the issue of development and adaptation ("live with"). The circular of 24 January 1994 devoted to the prevention of floods and floodplain management laid the new principles of management of flood risk in France. Among them, the preservation of "flow capacity and flood plain expansion, in order not to increase the risk for areas upstream and downstream" was a priority. The principle of flow control was first experimented in the 1990s, and has been applied to a multitude of rivers since the early 2000s.

The principle of the conservation of natural flood plain areas was again emphasized under the law n ° 2003-699 of 30 July 2003 on the prevention of technological and natural risks and the repair of damage called "Risks law". This Law promotes the establishment or restoration of such areas. It provides in particular the creation of a flooding easement for instance for loss of flooded crops.
Finally, this type of development has been strongly encouraged from 2002 through the funding by the Ministry of the Environment of local Action Plans for Flood Prevention (PAPI). PAPI, are action programmes designed at watershed scale, and developed in coordination between local and State agencies. They aim to combine improved protection devices, improvement of the provision of information to the public and approaches to reducing vulnerability.

In recent years, with the risk of breaking dams, some dams have been provided with water overflow devices. These punctual cuts-off of the structures lets predict the point of introduction of water in the floodplain before the dike does break. Unlike dynamic slowdown areas settled in areas with limited stakes, weirs are supposed to be built on any type of dam potentially vulnerable. There is however no obligation, presently, to develop weirs on existing dikes.

Ultimately, beyond their technical ambitions, such preservation or restoration projects of "flood plain" fall mostly in a broader logic of "integrated risk management" (Hubert 2001: 19). Risk

managers try more and more to reconcile security and development issues related to the concerned area.

Development or preservation of natural flood plain and the introduction of weirs security are two forms of protection belonging to a "horizontal" mode of hazard control, even if they respond to different logics. Finally, they are responses to the uncertainties that exist vis-à-vis traditional flood barriers: the preservation of natural flood plain involve the lowering of the water level (and therefore the pressure on dikes) within the bed of the river, whereas the weirs are a solution to a "time bomb" that would be a dyke not equipped with a weir.

In relation to uncertainties regarding the protection structures, public policy has also targeted the prevention issue and the reduction of flood areas vulnerability.
Risk Prevention Plans for flooding (or “flooding PPR") can be seen to belong to prevention strategies. This new regulatory risk mapping has been created following the 1995 law Barnier: PPR are intended to reduce or stop urbanization in flood plain areas (depending on the level of hazard) and to impose measures to reduce the vulnerability of already built properties. They also respond to the logic of preserving flood plain areas, as pointed out above. The circular of 24 April 1996 on the provisions applicable to existing buildings and structures in flood areas thus recalls that one of the objectives of the “Flood PPR" is "delimiting flood plain areas to preserve, i.e. areas that are non-urbanized and less urbanized or developed such as farmland, parks, sports fields, etc… and where a large volume of water can be stored".

Beyond this regulatory tool, prevention is based upon information to local populations and on approaches to reduce vulnerability. Reducing the vulnerability has, in fact, become an essential component of flood management policies in France: indeed the increase of vulnerability became more and more obvious because of the concentration of activities, urbanization in flood prone areas, and also because of an addiction of the population to greater security. On this last point, risk managers present the absence of a risk culture as a determinant of the vulnerability of populations living in flood prone areas. Thus an increased attention is given to the development of information tools and teaching towards this issue.

It is not easy to draw a portrait of all the steps of vulnerability reduction initiated in France in recent years. They have played an important role in the flood risk management policy in recent years. However, beyond a few requirements expected in the PPR, they do not fit into any particular regulatory framework and rely most often under the responsibility of local authorities, called to take responsibility vis-à-vis their local threats. In that respect, the more and more active role played by the EPTB (Etablissement Territorial de Bassin – water agency at the level of watershed) must be emphasized (methodological issue, financial plan for projects, technical assistance). From experimental initiatives and early attempts, these approaches have thus multiplied and enriched each other and have become institutionalized. They now exceed the problem of preservation of material stakes. They plan the management of flood areas in a more systemic way, addressing a variety of audiences: individuals, businesses, farms, municipal services. As part of these efforts, proponents also seek to establish a local "culture of risk". As such, any municipality covered by a “Flood PPR" must now establish a local information report on major risks (DICRIM). It is a document with communicative purpose, the formulation of which is very flexible. The idea is to educate residents on the hazards present their locality and disseminate first safety rules. The concerned local governments have the obligation to organize at least every two years a communication about the risks on their territory (e.g. public meetings, leaflets). Finally, municipalities should install or maintain flood marks on their territory.

The uncertainty vis-à-vis dikes and structures also explain the development of tools for the preparation and crisis management at the departmental and communal levels. Since the law 2004-

811 of August 13, 2004 called Law for the modernization of civil security, the mayor of a "locality covered by a" Flood PPR "is identified as responsible for the management of the crisis and post-crisis on its territory. As such, it is the "Director of Emergency Operations" in case of "major event". This mission returns back to the Prefect as soon as the flooding exceeds the limits of the municipality. To accomplish this mission, each municipality covered by a "Flood PPR" must make a local Conservation Plan (PCS).

Current division of responsibilities between actors

Since the late nineteenth century, the powers and responsibilities in the field of floods have been divided between three actors: the State and its decentralized services, local authorities and the riparian, especially when he owns a property located in a flood prone area. The late nineteenth century was marked by the takeover by the state administration of a number of new issues (forecast regulatory mapping). In the early 1980s, despite the decentralization, risk management remained a bastion of sovereign powers of the State; laws 82-600 of 13 July 1982 on the compensation of natural disasters and 87-565 of 22 July 1987 organizing civil security and prevention of major risks and entrusted the State with new fields of competencies, both in the development of regulatory risk mapping and vis-à-vis the established compensation system (system CATNAT).

However, in recent years, local governments (communes) have also become key actors for flood policy. Traditionally responsible for the security of dikes and structures or for forecasting floods on small streams, they are now investing prevention approaches devoted to vulnerability reduction on their territories. In addition, they are also responsible for informing the public.

Flood risk policies are more and more rooted in local areas, and orientated to their adaptation their ability to "absorb" the potential hazards. This situation calls for better coordination between actors, and for a co-construction of public flood policy, which might no longer be supported only by the State but also thought and formalized at the local level. Local governments have therefore become essential key players. They are mobilized to carry prominent approaches to reduce vulnerability; they also invest more in improving localized protection devices and become owners of dikes and structures and have even bought State dikes and structures.

The third pillar of flood risk management is the riparian owner. Since the law of 1808, the riparian is responsible for his own safety. Since then, his obligations have increased. The Act of 30 July 2003 on the prevention of technological and natural risks and the repair of damage has empowered private owners, lessors or sellers of goods located in a flood prone area. Those have now an obligation to inform potential buyers or tenants of the flood character of their property.

Similarly, approaches to reducing vulnerability related to socio-economic interests have multiplied. Inhabitants are potentially actors in the management of flood crises. This principle has been enacted under the law of 13 August 2004 on the modernization of civil security, which states in Article 4 that "Everyone contributes by its behaviour to civil security". The creation of Communal Reserves for Civil Security allows residents to volunteer to participate in rescue operations under the authority of the mayor.

Finally, we can state that if flood risk management is grasped in a more comprehensive or systemic way, the accumulation of texts and the deepening of the issue led to a significant scattering of responsibilities.

A3.2 Implementation of the floods directive in France

The Directive 2007/60/EC of 23 October 2007 has been transposed in France by the Law on National Commitment to the Environment called "ENE Act" of July 12, 2010 (s. 221). It has been transposed with a delay of 7 months.

France had already a flood risk policy and a policy based on solidarity for the repair of flood damages, but the 2007 Directive introduced the concept of integrated risk prevention, which imposes a modification of existing regulations.

First of all, a new organization has been set up to ensure the governance of this new policy of flood risk management. A joint flood committee (CMI) has been created at the national level, stemming from the steering committee for the prevention of major natural hazards (COPRNM) and the National Water Committee (CNE), bringing together representatives of government services, local authorities and of civil society. It met six times. These meetings led to the development of the first guidelines for the future national strategy focused on reducing the negative effects of floods and the labeling of 34 action plans for flood prevention (PAPI) and plans for flash submersion (PSR). In addition, a working group “flood directive " (GTDI) was formed to participate in the implementation of the Directive. This group is part of the existing basin authorities, namely the basin committee and the planning commission, extended to different categories of actors involved in the flood issue.

Secondly, the spatial level used for the application of the new provisions is that of the district or watershed. The district identified by the Act of 16 December 1964 on the regime and the distribution of water and the fight against pollution, is from the Water Act of 3 January 1992 the territorial reference essential for water management. It was taken by the EU Framework Directive on Water No 2000/60 of 23 October 2000, but was not used for flood risk prevention until now.
In addition, Directive 2007/60/EC introduced the distinction between the evaluation phase and the risk management one, the first being a precondition for the second, which forced France to conduct studies to carry out the first step imposed by the European Union, namely the preliminary risk assessment prior to the establishment of a flood and flood risk mapping and the development of flood risk management plans. The French law of July 12, 2010, specified by Decree No. 2011-227 of 2 March 2011, added an additional Plan not listed in the Directive: the development by the State of a national strategy for flood risk management, under the responsibility of the Minister for the prevention of major risks (Article R. 566-3 C. envir.).

Preliminary flood risk assessment - Decree n ° 2011-227 of 2 March 2011 on the assessment and management of flood risks incorporates verbatim the list of items to take into account established by the directive: 'topography, location of watercourses and their general hydrological and geomorphological characteristics, including floodplains as natural retention areas, the effectiveness of existing man protection against flooding, the location of populated areas, areas of economic activity as well as long-term developments including impacts of climate change on the occurrence of floods "(art. 5 d of the Directive, Art. R. 566-1 I 4 ° C. envir).

This evaluation was carried out by the state administrative authority (basin coordinator prefect under Article R. 566-2) and was conducted specifically for each watershed by DREAL (regional service for environment) with the help of the Ministry of sustainable development (including the Service “Monitoring and Statistics” and the “General Council for Sustainable Development”).

The preliminary flood risk assessment (EPRI) has necessitated the demarcation of areas potentially exposed creating the EAIP (potential area of flooding), which is the area concerned with extreme floods. Two areas have been identified: the EAIP "watercourse" for all overflow of rivers phenomena and EAIP "coastal flooding" which integrates the effects of climate change. EPRI includes in particular

a description of the risks and challenges for human health, the environment and economic activity in the concerned basin. EPRI has allowed us to characterize the importance of flood risk on human health, economic activity, cultural heritage and the environment with the production of several impact indicators, calculated at the level of the municipalities and watersheds.

The results for the 14 districts are available on the website of the Ministry of Sustainable Development (http://www.developpement-durable.gouv.fr/L-evaluation-preliminaire-des,25689.html, accessed 28 April 2013). Based on EPRI conducted at district level, a national EPRI was conducted to highlight events beyond the district level. It is also available from March 2012 on the website of the Ministry of Sustainable Development (http://www.developpement-durable.gouv.fr/L-evaluation-preliminaire-des,25689.html, accessed 28 April 2013).

Flood maps –. Based on the results of EPRI and national synthesis, the Ministry for the environment identified the high flooding risk areas (TRI) using national criteria determined by Ministerial Decree of 27 April 2012 for characterizing the importance of flood risk (potential impacts on human health and economic activity, assessed as regards to the permanent population and the number of jobs located in potential flood area (as defined in the EPRI). The list of TRI - "territories that have a significant risk of flooding with the consequences of national significance" (art. L. 566-5 C. I envir.) - was adopted by the Minister in charge of major risks. It is intended to develop, by the basin Coordinator Prefect for these TRI a mapping of floodplains and flood risk before 22 December 2013, as required by the 2007 Directive. It is expected that these maps are made available to the public and professional representatives, to local water committees, to economic, social and environmental regional committees, and where applicable, to the management bodies of national parks, regional parks and regional natural areas and to the Conservatory of coastal areas and lake shores (art. L. 566-12 C. I envir.).

Flood risk management plans – For the TRI, it is expected that the basin coordinator Prefect enacts a PGRI before 22 December 2015. This document will set objectives for managing flood risk, in accordance with the objectives of the national strategy. To meet the priorities identified by the Directive, the relationship between assessment and preliminary planning is ensured by inserting the PGRI findings of EPRI in the form of a preliminary map delineating areas at significant risk (as specified in Annex A of the Directive). The content of this plan also reflects the diversity of data integration. Under Article R. 566-10, "These plans take into account relevant aspects such as costs and benefits of their implementation, the extent of flooding, the water flows, the areas with the capacity to hold water, as the Plains flood or natural wetlands, management of soil and water, land use, nature conservation, navigation and port infrastructure". The PGRI seems to be a tool for integrated flood risk management. It also includes "the basic guidelines and provisions contained in the water management plan as regards flood prevention in terms of balanced and sustainable management of water resources" (art. L. 566-7 C. envir.). It will thus identify measures for prevention, protection and safeguard measures for concerned areas (art. L. 566-8 C. envir.). These plans will be completed by Local Policies developed and translated into programs of measures for each TRI. The PAPI prefigures these local strategies.

On issues related to land use, the Grenelle II law articulates PGRI with planning documents: the territorial coherence schemes (SCOT), the local urban planning (PLU) and local maps must be compatible with the objectives of flood risk management as well as with basic guidelines and provisions of PGRI.

As regards the participation of citizens, the law of 12 July 2010 states that public comments on the draft PGRI are collected by the basin Coordinator Prefect, and may impact them. The draft plans are then submitted to "stakeholders" by the basin coordinator Prefect (art. L. 566-12 II C. envir.). The

procedures of public consultation on the draft plan are also detailed, particularly regarding the applicable relatively long time limits (public consultation at least one year before the date scheduled for the commencement of the plan, for a period of six months, announcement of the consultation at least fifteen days before the beginning), places and means to collect comments from the public (including a website). The views of stakeholders, solicited during the period of public consultation are deemed favorable in the absence of response after four months. Changes to update the plan come after the basin committee information and a procedure for informing and consulting the public only performed electronically, for a period of two months.

Provision is also made in accordance with the directive that all these steps should be revised every 6 years following a schedule synchronized with that of the Water Framework Directive (WFD).
The Floods Directive is presented by the government as "an opportunity to improve and adapt risk management at the national level and identify priorities for action in order to better allocate resources throughout the country." It seems that future PGRI are both more accurate and more "encompassing" than the current risk-prevention plans. The question of how to implement them, however, is still pending.

Moreover, for governance issues, even if it appears that, following the 2007 Directive, Article L. 566-2 II of the Environmental Code states a principle of collaboration of all local authorities and will involve all the "stakeholders" and make effective public consultation, in reality those texts give a leading role to the State, as it is usually the case for risk management in France.

A4.4 The Netherlands

A4.4.1 Flood risk management debates in The Netherlands

Traditional approach: prevention through fighting against water (until 1980s)

With regard to its physical circumstances, of all consortium countries, The Netherlands can be considered the country in which the potential significance of flooding is highest. More than 30% of the country is located below sea level. Also, 60% of The Netherlands can potentially be flooded, either by rivers or by the sea (Delta Committee 2011). The majority of the population lives in the lower parts and most investments are also made there. The lowlands are exposed to all kinds of flooding (fluvial, pluvial, tidal and surge flooding). The Netherlands have a long tradition of fighting against the water as many devastating floods from rivers and from the sea have occurred (Rooijendijk 2009). Gradually, a dominant approach has developed which can be labelled a "civil engineering approach" (Wiering & Arts 2006; Van Den Brink et al. 2011). This approach was aptly summarized by Saeijs (1991) with the statement: "God created man, but the Dutch created The Netherlands". However, the government is only responsible for the habitability and safety of areas *behind* the primary defence structures and *within* dike-protected areas. In most cases, people live and work in areas outside these primary defences and dike-protected areas at their own risk. However, in some cases the “Wet tegemoetkoming bij schade en zware ongevallen” (Disaster and serious accidents Compensation Act) can be called upon, as happened in the Province of Limburg in 2011. Insurance for flood risk does virtually not exist in The Netherlands although recently the Catatasthrope insurance of “De Nederlandse” has been established (Van Rijswick & Havekes 2012).

The "fighting against the water" approach to flood risks formed the basis of the advice of the first Delta Committee (1953-1960). This committee was established after the major flood disaster of 1953 (with over 1,800 casualties) (Correljé et al. 2010). Based on the Committee's advice, the Delta Works were executed, roughly between 1958 and 1970. Several iconic parts of the Delta Works are, however, of a more recent date. The storm surge barrier in the Eastern Scheldt has been finished in 1986 and the last barrier, the Maeslant barrier, has been completed in 1997. Compared to other countries, at the time of the Delta Works, The Netherlands focused very much on reducing the

probability of flooding, while other countries put more emphasis on reducing the *consequences* thereof (Rijke & Ashley 2013). Despite this focus on flood probability, still in 2006, it was shown that many dikes, dams and embankments in The Netherlands did not comply with the safety norm that were set for these barriers (Derde toets primaire keringen 2011).

1980s/1990s: Ecological shift in Dutch water management

At the end of the 1970s, a first shift away from the dominant civil engineering paradigm became apparent (Van Der Brugge 2009). By then, Rijkswaterstaat, the Agency of the Ministry of Transport, Public Works and Water Management, had started to take into account ecological concerns next to water safety issues. This can be shown, amongst other things, by the fact that the Eastern Scheldt storm surge barrier, which was originally planned to entirely close off the Eastern Scheldt, became an open barrier that is only closed if necessary (ibid) in order not to disturb the Eastern Scheldt ecosystem.

Another noteworthy development of the 1980s was the "Plan Ooievaar". People were invited to come up with ideas about future water management, which could be submitted anonymously. In this plan, economic functions of rivers such as agriculture and fresh water supply were connected to nature development in a spatial vision. Many ideas from this plan were operationalized in the Living Rivers Plan developed by the World Wildlife Fund for Nature (Correljé et al. 2010). The main focus on the plan was on creating space for nature. At the same time, the plan refers to its beneficial effects from a 'water safety' point of view. For instance, by deepening flood plains, they will be flooded more often. This is said to be more nature friendly, but also to increase the buffering capacity of these floodplains.

Besides this integration between water management and nature concerns, there were other societal developments that challenged the dominant "probability-based" approach for dealing with flood risks (ibid). More and more societal protests against ever higher and broader dikes arose since they did not provide space for nature, there were cultural and historical concerns related to landschape, houses and buildings, and they were considered to be aesthetically unpleasant. At the same time, dike maintenance turned out to be lagging behind, amongst other things because flood protection often got a relatively low priority in political and societal discussions. In this period, we can also witness the first societal concerns for the consequences of climate change when it became clear that climate change can lead to sea level rise as well as higher peak discharges of the Dutch rivers.

The 1993/1995 floods – renewed concerns for safety in combination with concerns for climate change consequences (1993-2008)

The (near) floods in 1993 and 1995 accelerated policy developments in the water domain (Correljé et al. 2010; Driessen & De Gier 1999). On 31 January 1995 and the days after, 250,000 people were evacuated from some areas between the large Dutch main rivers (Rhine, Waal and Meuse). Amongst others, the Culemborger and Bommelerwaard were mandatorily evacuated due to the high water levels in the rivers (one of the largest evacuation operations in recent Dutch history). This has acted as a shock event. In 1995 the Dutch government developed the Major Rivers Delta Act, catering for amongst other things, a speeding up of dike reinforcements (Wiering & Driessen 2001). The name of the plan can be seen as "a blatant referral to the famous first Delta works" and thereby a powerful historical metaphor (Wiering & Arts 2006). At the same time, flood mitigation options became reality after the 1993 and 1995 near floods in the Rhine and Meuse catchments.

An increased focus on flood mitigation measures is visible in several policy documents, including a publication by the Ministries of Transport, Public Works and Water Management as well as Housing, Spatial Planning and the Environment entitled "Space for Water" (1995) as well as the new governmental vision on flood protection "Space for the River" (1996). The third Policy Memorandum

on Water Management (1998) stressed the need for an integrated approach to water management. The latter has as its main implication that the government expects water managers to collaborate with other policy domains (e.g. spatial planning) (Correljé et al. 2010). For the regional levels in The Netherlands, the results of the governmental committee "Water Policy for the 21st Century" are of importance. This committee made a plea for new approaches in which water is not discharged as quickly as possible (leading to undesirable downstream effects) but to first retain and store water.

Other recommendations of the committee include:

to make space for rivers;

to make a Water Impact Assessment (Watertoets in Dutch) obligatory in spatial planning procedures. This instrument enables water policy makers to specify and politicize their interests;

to start a campaign to inform the public about the need to (as the committee put it) "live with the water".

The committee's recommendations resulted in several policy developments and amendments of the Spatial Planning regulation. A discussion about the need to designate emergency retention areas was started, but in the end no such areas were denominated (Winnubst 2011). A public campaign entitled "The Netherlands live with Water" started in 2003. Also in 2003, an agreement was reached between the national government, the provinces as well as the umbrella organizations of the provinces, water boards and municipalities entitled "Nationaal Bestuursakkoord Water" (National Water Governance Agreement).

The Room for the River programme (2006-2015) based on the Spatial Planning Act aims to accommodate a discharge capacity of the Dutch major rivers of 16,000 m3/s combined with improvement of the spatial quality of the riverine area (Rijke & Ashley 2013). Within the programme, 39 example projects are being executed. These example projects include flood by-passes, excavation of floodplains, and dike relocation. Now most projects are in their realisation phase. Rijke & Ashley (2013) argue that Room For The River has contributed to a transition in Dutch water management towards more integrated water management establishing multiple objectives and integrating multiple scales. They have also shown that several measures (e.g. river widening) developed within Room for the River are being taken up in the Delta Programme (see below).

All the above-mentioned policy developments have led to important institutional changes in Dutch water legislation and management in which "water safety" has been integrated in other fields of water management (quality, quantity and flood protection) and connected to other policy domains, "water" has received a more prominent place on the agendas of policy makers and politicians and more discussion has started to take place on "how to weight different interests, including what is often termed 'water interests'" (Correljé et al. 2010). However, fundamental changes in the policy making actors and their power bases haven't occurred. The Public Work Department and the (after several mergers resulting) 25 water boards as well as the associated knowledge institutes (Delft University, Deltares, STOWA) did and do play a key role in flood defence (Wiering & Arts 2006). Other research and policy actors have started to participate, but their place in the network is in the periphery and not in the core.

From 2008 onwards: multi-layered safety and discussion on protection levels

The shift towards "accommodating water" and integrated water management has further been taken up in the second Delta Plan (Delta Committee 2008) as well as the Delta Programme that was based on this advice (Delta Committee 2012). However, the main driver behind the realisation of a second Delta Plan was the intention to make The Netherlands "Climate Proof" for the long term (until the year 2100 and beyond). The main issues that are addressed in the Delta Programme are,

first of all, the wish to protect the Netherlands to floods and second, fresh water supply. The Delta Committee has advised the Dutch government to make huge investments in the Delta Programme of at least 1.2 billion Euros per year until the year 2050 (and slightly lower investments thereafter). These investments are collected through the so-called Delta Fund in addition to the taxes that are raised by the regional water authorities (water boards). The legal basis of the Delta Programme, Delta Fund and the Delta Commissioner (director of the Delta Programme) is set out in the Delta Act, part of the Water Act.

Parallel to the discussions on what in The Netherlands is called “Climate Proofing” (Kabat et al. 2005) the discussion about risks has started (Correljé et al. 2010). In 2004 The Netherlands Environmental Assessment Agency issued a report “Risico’s in bedijkte termen” stating that the individual probability of dying because of a flood was lower than ever before. However, the *group risk* (the risk that a large number of people dies because of a flood) has increased. At the same time, potential economic damage has increased tremendously. All this is mainly due to urbanisation and economic development in vulnerable areas (Ten Brinke & Bannink 2004). In this respect, some even talk about a “control paradox” in which the perceived safety behind the dikes triggers further economic development, paradoxically leading to higher risks because of an increase of the potential consequences of a flood (Wiering & Immink 2006). The issue that 100% protection to flood risks is impossible and that we have to live with a “residual risk” came on the agenda of the former Ministry of Transport, Public Works and Water Management. This has led, at the same time, to discussions on the “efficiency principle”. It was argued that the costs and benefits of reducing flood probability and flood consequences should be considered in relation to one another and that society should choose: which residual risk is acceptable for whom? Currently, discussions about safety norms are on-going.

The report of the Delta Committee pleads for a tremendous increase of the Dutch safety norms with a factor 10. Currently, four different norms are used (1/10,000 for the Randstad, the prime west coast urban agglomeration; and lower forms for other areas, varying from 1/4000; 1/2000 to 1/1250). The standard norms for water safety are based on “the average annual probability that the highest high-water level that the primary flood defence structures erected as a direct defence against external water must be designed to withstand is exceeded” (Dutch water act, cited in Van Rijswick & Havekes 2012) and are combined with manuals on how dikes have to be built. These safety norms are already far higher than in any other country. According to the latest Delta Programme (Delta Committee 2012) and contrary to the advice of the Delta Committee, it is not deemed necessary to increase all safety norms with a factor 10. But still, stricter safety norms for some areas are being discussed (e.g. for the Main River areas, the Rijnmond-Drechtsteden area and the city of Almere). At the same time, discussions are taking place about the systematic for determining safety levels (from probability of exceeding a certain water level to probability of flooding). With ‘probability of flooding’ is meant the probability that a water barrier fails to such an extent that the area it should protect is flooded. The Dutch Water Act provides for the possibility to supplement the former probability with the latter, which is also said to better tie in with the Floods Directive (Van Rijswick & Havekes 2012). However, experts differ in their opinion on the need to shift from ‘probability of exceeding a certain water level’ to ‘probability of flooding’. There are also plans to base Flood Risk Management on a general safety norm equal for all individuals, comparable with safety norms for other external risks. The report of the Delta Committee also discusses new concepts for water safety such as robust enhancement of barriers as well as a search for innovative combinations of functions such as water safety, nature, recreation, working and living.

The report of the Delta Committee also mentioned the need for a further broadening of Flood Risk Management Strategies through the “multi-layered safety” concept. This concept is based on the various elements of a chain of responses to risks called “layers”: flood prevention; sustainable spatial planning, civil protection and crisis management. Apart from Flood Defence more emphasis has to be

put on flood mitigation and preparedness measures. The phase of flood recovery is hardly discussed in The Netherlands (Van Rijswick & Havekes 2012). The concept of multi-layered-safety had also been discussed before the Delta Committee issued its advice under the flag of "Water Safety in the 21st century" (Correljé et al. 2010). The outcome of these discussions was that flood prevention should remain the main pillar of Dutch water safety policy. Floods are considered unacceptable and it is argued that prevention should remain the cornerstone of Dutch flood policies because of the fact that it is based on clear responsibilities, accountability and low costs. It is remarkable that that elements that have to be taken into account due to the Floods Directive – hazardous industry, nature and cultural heritage – do not play a role in the new safety approaches. The latest version of the Delta Programme states (p11): "In general, prevention is the most cost-effective approach to reduce flood risks. The Delta Programme will also pay attention to the concept of Multi Layered Safety and thus pay attention not only to prevention but also to reducing the consequences of floods through better spatial planning and adequate disaster management". The Delta Programme is currently developing proposals for so-called "Delta-decisions" to be taken in 2014 (Delta Committee 2012). These should provide input to new measures that have to be implemented from 2015 onwards, after running programmes (including "Tweede Hoogwater Beschermingsprogramma" (Second protection programme for protection against high water levels); "Room for the River" and "Maaswerken" (Meuse Works)) have been finalised. It is argued that these measures should be based on notions of robustness (being able to cope with extreme events) as well as adaptiveness (in this respect, the Delta plans of 2012 and 2013 mention the notions of "adaptive delta management" and "tipping points") (Delta Committee 2011/2012).

Currently, the roles and responsibilities of the main actors in Dutch water management are based on the Water Act (2009) and the Water Authorities Act (1991). The dominant actors in developing and implementing Flood Risk Management strategies are still the national agency for Public Works, Transport and Water Management (Rijkswaterstaat), as well as the democratically chosen governmental authorities called regional water-boards. The latter are called "functional authorities" that have regulatory and tax raising powers (Van Rijswick & Havekes 2012). The taxes are based on the economic interests of citizens (e.g. taxes of property owners depend on the estimated value of their properties) and may be used only for water management issues. The provinces have the responsibility to oversee the state of the primary flood defences (article 3.9 of the Water Act). They are also responsible for making and managing the flood hazard and flood risk maps.

A4.2 Main characteristics of the debate on the implementation of the FD in The Netherlands

In 2003 The Netherlands, together with France, put the issue of floods on the political agenda in Brussels (Ministry of Public Works and Water Management 2008). This was done to foster international cooperation regarding floods and to be able to deal with flood risks in the long term. The Floods Directive is a tangible result of these political activities.

In The Netherlands, water safety is highly institutionalised in law, policies and policy programmes. For that reason, the Dutch national government has decided to implement the Floods directive in a "sober and expedient" way (http://deltaproof.stowa.nl/pdf/Floods_Directive?rId=28, accessed 29 April 2013). It is argued that very few new legislation, policies and programmes are needed to implement the floods directive. Instead, the Dutch approach is to inventory existing information and existing policy plans (on flood prevention, flood protection and preparedness) and to try to coordinate these. Another guiding principle used by policy makers at the national level is to try to avoid extra bureaucracy. It is explicitly stated that new participatory processes or consultation forums are not necessary (http://deltaproof.stowa.nl/pdf/Floods_Directive?rId=28, accessed 29 April 2013).

In line with its initial motivation for pleading for European policies, the national government sees the Floods Directive as a juridical instrument to coordinate goals of flood risks with the other river basin partners (of the Rhine, Meuse, Scheldt and Eems rivers) and neighbouring countries (http://www.helpdeskwater.nl/onderwerpen/wetgeving-beleid/eu-richtlijn/, accessed 29 April 2013). In 2009, The Netherlands anchored the Floods Directive in national law through the new Water Law and more specific the Water Decree. The actual implementation of the Directive started in 2010 (http://www.helpdeskwater.nl/onderwerpen/wetgeving-beleid/eu-richtlijn/implementatie-ror/, accessed 29 April 2013). Regarding the three main obligations of the Floods Directive, the state of affairs concerning the implementation in The Netherlands is as follows:

Preliminary flood risk assessment – The Netherlands did not carry out preliminary flood risk assessments. This was done on the basis of the exception clause stipulated in article 13, sub b of the Floods Directive. This clause states that Member States that decided before 22 December 2010 that flood risk maps need to be made for specific areas may decide not to carry out a preliminary flood risk assessment.

Flood maps – maps will be produced for areas that can be flooded by main and regional water courses and have a significant flood risk. These maps will be made for unprotected as well as protected areas. A special working group on the implementation of the flood risk maps has advised which information should be included in the flood maps. It was decided that the *flood hazard maps* should include information on the extent of floods, maximum water depths, the velocity of the water (if applicable), the time that passes before the first water floods the area, the duration of the flood, the time the water needs to rise, the sources of floods and the areas that are threatened at the same time. *Flood risk maps* should provide information on the potential consequences of floods. These include, amongst other things, the potential number of people affected, the type of economic activity of an area, the potential damage as well as the presence of potentially vulnerable institutions (Ministry of Public Works and Water Management 2010). The Water Boards and the provinces are the main parties responsible for making the maps or supplying the data on which the maps will be based. The process of producing flood maps is currently on going and for many areas flood maps are already available. It is planned to integrate the flood maps with an existing website for communicating risks to citizens and governing people (http://www.risicokaart.nl/, accessed 29 April 2013).

Flood risk management plans – two temporary national coordination teams have been set up to support the implementation of the Floods Directive in The Netherlands. One of these teams (IMPRO, Implementatie Richtlijn Overstromingsrisico's (Implementation of the Floods Directive in English)) focuses on the administrative aspects of the Directive, while the other (simply titled "coordination team") is responsible for the content-wise elaboration and implementation of the Directive. The coordination team includes four *production teams*: one on "maps", one on "flood risk management plans", one on "coordination" and one on "processes". Preliminary Flood risk management plans have been produced (2012). After consultation they will be revised in 2013. The plans will be scrutinized for the extent to which the goals and means of various Flood Risk Management Strategies (prevention, protection and preparedness) are linked. The plans are expected to be finalised in 2015 and to be operational from 2016 onwards.

The Floods Directive in itself is not expected to lead to fundamental change in Dutch water safety policy. Its implementation is mainly seen as a coordination issue. No changes in the existing competences and responsibilities of the main actors in Dutch water management are foreseen. It also seems that the Directive is seen as supportive of running policies including the strategy of "Multi Layered Safety". It is argued that the five Flood Risk Management Strategies of the Floods Directive correspond with the three strategies of the Multi-Layered Safety approach. "Prevention" (NL) is said

to correspond with “protection” (FD); “Spatial Planning” (NL) with “Prevention” (FD); and “Crisis Management” (NL) with “Calamity Planning”, “Preparedness” and “Recovery” (but some doubt that recovery is really addressed in The Netherlands) (Van Rijswick & Havekes 2012).

The main innovative features of the Floods Directive are said to be the flood maps, which can be used for making evacuation plans and spatial plans and to be useful for the Delta Programme of the Dutch government (Rijkswaterstaat, the provinces, municipalities and Water Boards). Also, the Floods Directive is said to contribute to the goal of integrating existing policies (e.g. those of flood protection, spatial planning and evacuation) by providing a discussion platform for actors involved in these policy domains.

A5 Poland

A4.5.1 Flood risk management debates in Poland

Floods remain the main natural disaster in Poland, raising considerable concern. In recent years, the material losses in severe floods have been very high, up to the level of billions (dollars or Euro) in the most dramatic floods of 1997 and 2010. Flood damages reached, or exceeded, the order of 1% of Polish GDP in 1980 and 1997 (Ostrowski & Dobrowolski 2000) and probably also in 2010. There have been direct and indirect material damages and fatalities. Moreover, floods have also led to serious social damage – ill health, stress, social disruption, and losses in natural and cultural environment.

Rainfall floods occur on all rivers of the country. The highest flood risk is in the headwaters of the Vistula and the Odra rivers and their mountainous and piedmont tributaries. Sometimes combination of intense and or long-lasting rainfall and snowmelt occur simultaneously, producing a mixed-mechanism flood, as has happened on large lowland rivers (Narew, Bug, Warta, Noteć).

There were several large floods in Polish lands in the 20th century. A destructive Odra (Oder) flood occurred in July 1903 and triggered intensive work on construction of the flood protection system of the city of Wrocław (then: Breslau). A large snowmelt flood occurred in March 1924. The largest flood in the 20-year existence of the 2nd Republic of Poland (between regaining independence in November 1918 and losing it again in September 1939) occurred in the basin of the Vistula in July 1934. The flood was caused by intense rainfall, with two-day total exceeding 300 mm in several places. Inundations covered record-large areas in Poland, starting in mountain valleys of the Dunajec catchment and propagating downstream, along the Vistula. During the dramatic July 1934 flood, the peak discharge of the Vistula upstream of the mouth of Dunajec was 3100 m^3/s, while the Dunajec added 4500 m^3/s. The flood inundated 1260 km^2 of land and caused 55 fatalities. It destroyed 78 bridges and 22 thousand buildings. The damage reached the level of 60 million zlotys (12 million US$, 1934 value).

During the times of the Polish People's Republic (1944-1989), large floods occurred in the summers of 1958, 1960, and 1962, in spring of 1970 and in summer of 1970 and 1977. After record-high snow cover in most of Poland during the winter of 1978/1979, a large snowmelt flood evolved in March and April 1979, called the "flood of small rivers", which inundated 1 thousand km^2 of agricultural areas and destroyed 1250 bridges. Wet summer of 1980 resulted in a large-scale flood all over the country, destroying 3300 bridges. In January 1982, an ice-jam flood on the Vistula upstream of the Włocławek reservoir inundated 100 km^2 of land. The two largest floods in the 3rd Republic of Poland (since 1989) occurred in 1997 and 2010.

A5.2 Flood defences in Poland

The flood defences in Poland are mostly structural. Those in the Vistula basin include embankments of approx. 4700 km in length, protecting the area of about 5300 km^2. There are several storage

reservoirs playing an important role in the flood protection system on the upland tributaries of the Vistula, including Porąbka and Tresna on the Soła, Czorsztyn and Rożnów on the Dunajec and, the largest, Solina (460 million m^3) and Myczkowce on the San and Sulejów on the Pilica, Dębe on the Narew. There are also reservoirs on the Vistula itself, such as Goczałkowice on the Mała Wisła (Small Vistula) and Włocławek on the lower Vistula. The disastrous 1934 flood prompted intensive work on the flood control system on the mountainous tributaries to the Vistula. To reduce flood risk, flood protection reservoirs in Porąbka on the Soła (terminated in 1936) and in Rożnów on the Dunajec (1941) were constructed, and – half a century later – despite considerable opposition of environmentalists and part of the general public, another reservoir, in Czorsztyn on Dunajec, was built. However, water storage reservoirs in Poland do not play a very important role in flood protection because their total capacity can only store 6% of the mean annual runoff (Dobrowolski & Słota 2005).

The flood protection system in the Odra basin consists of embankments, weirs, reservoirs (including dry flood protection reservoirs) and relief channels for the Odra and its tributaries, and a system of polders. In the nineteenth century, the reach of the River Odra from Ratibor (Racibórz) to Schwedt was shortened by 26.4% by digging channels. Regulation has continued since then. There are 23 weirs at the Odra itself (19 built before the end of the World War Two), serving principally navigation and hydropower. There are also several reservoirs in Czech tributaries to the Odra.

Most severe floods, in terms of flood fatalities and material damage have occurred in large river valleys, especially urban agglomerations and industrial areas protected by embankments. Since levees are designed based on probability theory, they do not give a complete guarantee. When a very large flood comes, levees may fail to withstand water masses and break. Several towns were devastated by the 1997 flood (Racibórz, Opole, Wrocław) and the 2010 floods (Sandomierz). Damage clearly depends on the duration of the flood wave.

In July 1997, some of the reservoirs in the Odra Basin have contributed to lowering of the flood stage downstream but, in general, the existing flood reserve in reservoirs was by far too little in the context of the summer 1997 flood.
There are at least two different interpretations of the notion of early warning, in the flood context (Kundzewicz 2013). One notion refers to a short-term flood preparedness system, where “flood warning” is a commonly used technical term denoting a means for reducing flood impact to vulnerable areas in terms of lives and material damages. Flood warning is timely information based on a reliable forecast that high water level (or high river discharge) is expected to occur in a cross-section of interest at some defined future time point, so that emergency actions, such as strengthening dikes or evacuation, can be undertaken. A flood alert, usually issued before flood warming, is less specific and aims at raising vigilance. A warning should be issued sufficiently early (this depends on catchment size relative to vulnerable zones in terms of possible lead times) before the potential inundation, in order to allow adequate human preparations. It should persuade people to take appropriate action in order to reduce damages and costs of the forthcoming flood. Flood forecasting and warning system has been operating in Poland, now including radars.

Great flood of 1997 and its consequences for flood defence (largely based on Kundzewicz et al 1999)
The most destructive flood in Poland was the July 1997 inundation (Kundzewicz et al. 1999). After intense precipitation over large areas, in the second half of June, heavy and long-lasting rains came from 4 to 10 July, caused by quasi-stationary atmospheric conditions with a front dividing humid air masses that significantly differed in temperature: hot and very water-rich air to the east, and humid and cooler polar sea air to the west. The two weather systems met over the Czech Republic and the southwest of Poland and stayed there for a long time, releasing large volumes of intensive

precipitation, culminating between 6 and 8 July. The highest 5-day precipitation between 5 and 9 July was recorded in Lysa Hora, Czech Republic (585 mm), while in the Polish drainage basin of the Odra, the highest precipitation amounts were recorded in Kamienica (484 mm) and Międzygórze (455 mm). This abundant precipitation caused destructive flooding. Yet, a few days later, from 15 to 23 July, another series of intense rains occurred, and then a third wet spell in July 1997 basically in the drainage basin of the River Vistula.

The flood started on the Czech stretch of the Odra, where the severity of the event exceeded all inundations in the 20th century. The water level on the upper Odra rose by 4 m in 12 h. Flood rise in highland tributaries was even faster and, due to the absence of adequate water storage capacity, there was no way to avoid catastrophic losses.

The flood ruined Kłodzko (31,000 inhabitants) located on the River Nysa Kłodzka (tributary to the Odra), causing several casualties. Over 500 families lost virtually everything they owned. The historic stage record at Kłodzko, on the Nysa Kłodzka, was exceeded by 70 cm.

In Racibórz-Miedonia, a stage of 838 cm and flow rate of 1630 m^3s^{-1} were observed during the 1985 flood, but these records were overtaken by much greater values of 1045 cm and 3260 m^3s^{-1}, respectively, in 1997. The flow rate of the exceedence probability of 1% (100-year flood) estimated in this cross-section, based on seven decades of records, was 1680 m^3s^{-1}. Having inundated the town of Racibórz (65,000 inhabitants), the Odra devastated further large towns located downstream, such as Opole (131,000) and Wrocław (700,000). The flood protection system of Wrocław, designed for a flow rate of 2400 m^3 s^{-1}, failed when the peak flow rate was nearly 50% greater. In result, about one third of the area of the city of Wrocław was inundated.
The nationwide toll for both Odra and Vistula floods of summer 1997 was an all-time high in Poland as far as economic losses are concerned. The estimates of material losses range from 2 to 4 billion US$, indicating that the costs were of much significance to the national economy. The number of fatalities reached 54. The number of flooded towns and villages was 2592 (1362 totally and 1230 partially inundated). The flood caused damage to 46,000 houses and apartments and the number of evacuees was 162,000. Around 6,650 km^2 of land were flooded, of which over 4,500 km^2 consisted of agricultural fields. The flood destroyed about 480 bridges and damaged 245. The serious damage to roads and railways occurred at 3,000 km and 2,000 km, respectively. Loss of 1,900 cattle, 5,900 pigs, 360 sheep and around 1 million poultry was recorded. Embankments were damaged or seriously weakened at a distance of about 1,100 km.

There have been a lot of politics around the 1997 flood striking a dynamically developing country-in-transition. In the beginning of the flood, on 7 July, the then Prime Minister of Poland, Mr Cimoszewicz, flew into the flood area and issued a rather unfortunate statement to TV journalists that „a far-sighted man should have insured himself". He also said that there were no significant reserves in the central budget to be used for providing assistance to flood victims.

However, already a few hours after the quoted declaration, the flood attacked furiously, becoming really destructive. It devastated the town of Klodzko. The Prime Minister regretted the non-diplomatic statement and apologized in public in two weeks' time for his words of 7 July 1997, largely inadequate to the grimness of the situation that developed later. In his address to the Parliament he said: „When I visited endangered terrains on 7 July in order to assess the situation, it seemed that the flood had dimensions known from earlier experience and one could combat it with conventional means. What started to happen to the Upper Odra a few hours later exceeded not only alarm stages, but also the scale of existing imagination about the force of the element". However, the original statement of the PM and the efficiency of performance of authorities in combating flood was violently criticized by the opposition. Political opponents of the ruling coalition requested the PM to step down and emergency status to be introduced. The government managed to prove that the

benefits of emergency status would not add any essential instrument of use in combating the flood, but would considerably increase the inconvenience to the concerned population. A side effect of the emergency status would be delaying parliamentary elections.

Testing public opinion in polls demonstrated that the nation was critical to the central government and this criticism may have contributed to the defeat of the ruling coalition in the parliamentary elections, as stipulated by many an international observer. Also some provincial authorities, who underestimated the danger and did not make a proper use of the forecasts, have been strongly criticized. The flood proved a considerable capacity of local authorities, who were seen to perform better. In several locations, they managed to combat the hazard. It was an argument in a nation-wide discussion about the territorial structure of Poland, as to whether or not to replace the existing division into 49 provinces (Polish – *województwa*) by a smaller number of larger units and whether or not to introduce an intermediate level of counties (Polish – powiaty) between provinces and municipalities (Polish – *gminy*). The flood demonstrated inefficiency of the existing structure of flood protection system, and of division of responsibilities.

The flood has taught humility to arrogant politicians and militant environmentalists alike. The new reservoir in Czorsztyn, subject to violent and long-lasting dispute that had lasted for decades, proved to be very much needed during the flood, saving settlements from inundation.
The flood was extensively covered by Polish media. For several weeks, it was the dominating topic in the press and the principal theme of cover stories of weekly magazines.

Flood is a relatively a simple phenomenon. Therefore, a great many journalists, politicians, social activists and other public personalities considered it appropriate to share their, typically negative, opinions on the flood defence action via the media.

Flood theme was intimately interwoven into the election campaign in the media; politicking around flood became quite common. As a result, a large part of the public during the flood could have a feeling that it was possible to avoid flood losses and only the inefficiency of authorities led to disaster. Yet, in the light of objective hydrological data, it is clear that the disaster could not have been avoided.

Destruction, panic and chaos in the concerned areas of Poland in the beginning of the flood was set against the „*Ordnung*" of the preparatory action on the German side of the boundary reach and of the Lower Odra. Yet, this was in the time when the flood peak was still far away upstreams of the Lower Odra. When high water arrived to Slubice/Frankfurt area, it turned out that the levees on the Polish side, subject to massive strengthening efforts, withstood the stress while the dikes on the German side broke in several places resulting in massive inundations and high flood losses in Germany.

After decades of censorship, the freedom of press has been an essential human right in Poland. Yet, during the flood, the absolute freedom of press has not always rhymed with responsibility. Chasing sensations did not serve well the flood defence. In the country where so many individuals shared their regarded opinions on the flood through the media, questioning individual decisions pertinent to flood management (e.g. moving amphibias from the centre of Poland into the flooded zone) was not uncommon. Furthermore, the press presented „alternative" forecasts; some of which largely underestimated precipitation during the second flood wave that was rightly foreseen in the official forecast.

Mr Szamalek, Deputy Environment Minister and Deputy Head of the ad-hoc high level emergency committee for coordination of flood mitigation (Anti-Crisis Committee), stated that „such a flood

could neither have been foreseen, nor remedied" and rightly heralded it as „the largest natural disaster in the 1000-year history of Poland". Indeed, if a flood record is doubled, as in the case of flow rate in Raciborz-Miedonia, and the flood recurrence interval gets into the range of thousands of years, there is no way to avoid material losses. The flood magnitude was really unexpectedly high. For decades, people have got used to floods of the Odra and its tributaries. They knew where safe places were, where to find shelter for animals, cars. This time, water entered usual save places.
The event made broad public aware of how dangerous and destructive a flood can be. It also demonstrated where the weaker and stronger points of the flood defence were and helped identify the burning needs.

As demonstrated by the catastrophic flood in July 1997, there was a lack of an adequate flood protection system for larger towns, such as Wroclaw, Legnica, Opole, Lwówek Slaski. Also vast areas of agricultural land at the stretch of the Upper Odra to Krzepkowice, and in valleys of tributaries to the Upper Odra were not adequately protected.

The system of anti-flood committees was found inefficient, having played the role of the hot reserve, but not actually involved in action of this scale before 1997. Even the maps possessed by the committees were dated. Units involved in action, such as the Anti-flood Committee and the Army had dated instructions and directives (e.g. delegating military units that do not exist anymore to combat flood). Activity of disseminating information on floods in provinces, towns and villages was very weak to non-existent. No virtual civil defence was available; the one existing was oriented on war rather than natural disaster.

Box (largely based on Kundzewicz 2013)
The dramatic Odra flood in July 1997, occurring after a long flood-free period, unveiled the weak sides of the flood preparedness system in Poland. The flood unveiled the many weak points of the existing flood protection system where improvements were badly needed. Indeed, every link in the chain of operational flood management (observation – forecast – response – relief) was found in the need of strengthening. The nation has learnt the lesson and improved the flood preparedness system since.

During the 1997 flood, legislation was found deficient, being in the state of transition: previous regime's laws were essentially abandoned and new ones were being enacted – many new legal acts had to be passed during a short time. The distribution of responsibilities was ambiguous and conflicting and there were complicated links between different participants in flood defence activities. According to the legislation existing during the 1997 flood, the low-level authorities were not entitled to announce the flood alert or the alarm status. Such decisions should be issued by the provincial anti-flood committees and, in result, they came delayed; often after the passage of the crest of a flash flood in a mountain tributary of the Odra. Hence local authorities typically took common-sense decisions, without waiting for the instructions from above. Also the information flow was deficient; hydro meteorological stations reported to the regional branches of the hydro meteorological service (albeit making information available, on request, also to local authorities). Some of the forecasts proved to be of low accuracy.

The conditions of participation in flood actions, and financial consequences, were not clearly defined for the Army, Police, and Fire Brigades. Polish Civil Defence was geared to act in case of war rather than emergency at peace.

Among the downsides of the forecasting and warning system was the telecommunication support. Classical telecommunication links were disconnected. Even if mobile phones provided more reliable communication, system limitations were also unveiled.

Advance warning on the Odra was available for the medium and lower course when the flood occurred in headwaters in Czech Republic and Poland. The State of Brandenburg in Germany had ten days before the arrival of the floodwater. Yet, detailed forecasts were difficult to obtain due to interruption of observations in several gauges, flooding of the flood information office in Wrocław, and other problems.

The needs were recognised of modernisation of the network of weather radars, stage and rain gauges, automation of data transmission, technical upgrading of flood warning centres, including telecommunication facilities (phone, radio, fax, working also without mains supply), upgrading and modernisation of the warning system, enhancing regional, inter-regional and inter-national flow of flood-related information, and building more suitable forecast models.

After the flood of 1997, there have been considerable investments in Poland, aimed at the improvement of the flood preparedness systems, including strengthening the flood forecasting and warning systems (e.g. broader use of modern technology, radar, models, GIS). Efforts have been made to upgrade the monitoring systems, to render stream gauges, communication and data transmission systems, more robust and more reliable than during the 1997 flood.

A4.5.3 Main characteristics of the debate on the implementation of the FD in Poland

The EU Floods Directive No. 2007/60/WE was published in Polish legislative periodical *Dziennik Ustaw* (Dz.U. UE L 288/27). The implementation of the Directive to the Polish legal system is regulated by the updated Water Law of 5 January 2011 (Dz.U. Nr 32, poz. 159), that entered into power on 18 March 2011.

Having entered the European Union on 1 May 2004, Polish experts have contributed to collaborative, pan-European work on preparation of the Directive, aimed at a holistic and interdisciplinary approach to flood risk management. The National Board of Water Management prepared the road map of implementation of the Directive, following the schedule foreseen in the Floods Directive. This road map was approved by the Environment Ministry in 2008.

The road map has been produced in order to coordinate the works and activities undertaken within Poland, towards carrying out the preliminary assessment of flood hazard and risk maps and plans for flood risk management. The road map also plays an important role in the process of establishing the costs of implementation of the Directive.

Since the Floods Directive is closely related to implementation of the Water Framework Directive, road maps for implementations of these both directives have to be fully synchronized. Hence, close coordination of processes of social consultation is strived at. Coordination of implementation of directives should enhance realization of complementary objectives.

Article 17 of the Floods Directive states that “Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive before 26 November 2009.” This deadline was not met by Poland. This objective was achieved later, on 5 January 2011, by passing the regulation changing the regulation *Water Law* and some other regulations (Dz. U. 2011 No. 32 item. 159) [in Polish: *ustawa z dnia 5 stycznia 2011 r. o zmianie ustawy - Prawo wodne oraz niektórych innych ustaw (Dz. U. 2011 Nr 32 poz. 159)*].

In the light of the dramatic floods in Poland in May and June of 2010, there was a broader concern as to whether implementation of the Floods Directive is on schedule. This was encapsulated in a formal interpellation of the Member of Parliament, Michal Jaros, dated 14 July 2010 (sign. SPS-024-7411/10), answered by the Deputy Minister of Environment, Bernard Błaszczyk (representing the

Minister), on 30 July 2010. Since the interpellation of the Member of Parliament and the response by the Deputy Minister, listing the essential activities undertaken, are very instructive for understanding the legislative process related to implementation of the Floods Directive in Poland, these documents are introduced in the text box below:

Box: Interpellation of a Member of Parliament and the response by the Deputy Minister

Michal Jaros, Member of Parliament:
How advanced are works on the first stage of implementation of the Directive, i.e. adaptation of Polish law? What are the reasons for delay in implementation of the Directive?

Bernard Błaszczyk, Deputy Minister of Environment (shortened):
In 2007, the National Board of Water Management (NBWM) started work on the implementation of the Directive 2007/60/WE. To this effect, a project of regulation changing the regulation *Water Law* and some other regulations has been prepared. However, the project of novelization transposing the so called Floods Directive has not been agreed upon yet, due to its interdisciplinary nature and the long-lasting process of inter-sectoral negotiations. The chronology of works on the implementation of the Directive is presented below.

The first stage of work – preparation of the road map of the implementation of the Floods Directive started already in 2007 and was approved by the leadership of the sector in February of 2008. Next, the National Board of Water Management undertook work on making necessary revisions to the regulation *Water Law* and some other regulations, reflecting the letter of the Directive. These have been subject to working consultations with regional boards of water management. Then, in July 2008, they were subject to Inter-Ministry discussions and approved by the leadership of the Ministry.

In the beginning of August of 2008, the project was forwarded to the Environment Ministry for arranging social consultations. In the framework of social consultations, some 400 remarks and opinions were presented by interested social partners, organs of public administration, research and development units, and even individual citizens. Working meetings were organized devoted to the controversial issues. All remarks and opinions submitted at the stage of social consultations (sometimes being conflicting with each other) were analysed and partly included in the project of regulations.

On 24 September 2008, the project of regulation was agreed by the Joint Commission of The Government and the Territorial Self-government. In December 2008, the project of regulation, with revisions following the social consultations was directed in December 2008 to the Ministry of Environment, with request to initiate inter-sector consultations.

Nevertheless, in result of additional consultations and remarks conveyed e.g. by a non-governmental organization, WWF, referring to the need to mention environmental objectives resulting from the Water Framework Directive, it was found necessary to extend the project of the regulation, so that it embraces the suggested matters. Earlier, the works on complementing the transposition of Water Framework Directive were carried out separately, in order not to jeopardize the deadlines for transposition of the Floods Directive.

A revised project, extended by detailed transposition of the Water Framework Directive was re-submitted to the Ministry of Environment in February 2009, in order to be conveyed to inter-sectoral consultations. Next, in April 2009, a working meeting was held to discuss the comments made by the Ministry of Infrastructure and maritime offices. After having agreed on controversial issues, on 30 April 2009, a conference was held to agree on the project of novelization with sectors that submitted

comments. The revised, verified project was submitted to the Ministry of Environment in the beginning of June of 2009, in order to be conveyed to further legislative process.

On 26.08.2009, the project novelization of the regulation *Water Law* became accepted again by the Joint Commission of the Government and the Territorial Self-government.

On 9.10.2009, the project was agreed by the Economic Committee of the Council of Ministers, and on 21.12.2009 by the Permanent Committee of the Council of Ministers. From 4 January 2010 on, the Project of novelization was a subject of work of the Law Commission of the Governmental Legislation Centre. Positively recommended by this Commission, it was conveyed for re-consideration by the Joint Commission of The Government and the Territorial Self-government and the Permanent Committee of the Council of Ministers.

Following the suggestion from the Prime Minister Office, on 24 February 2010, the project of Water Law was extended by inclusion of implementation of Directive 2008/105/WE on environmental quality standards in the water policy area. The revised project was accepted by the leadership of the sector on 10 March 2010 and immediately conveyed to inter-sectoral discussions.

On 1 April 2010, the Minister of Environment forwarded the agreed (extended) project of the regulation for consideration by the Committee of European Affairs of the Council of Ministers. In about the same time, on 26 March 2010, Mr Maciej Berek, Secretary of the Council of Ministers, forwarded the project for consideration by the Permanent Committee of the Council of Ministers. The Ministry of Environment was informed about this development post factum. Under these circumstances, the project of regulation was withdrawn from the agenda of the Social-Economic Committee meeting on 16 April 2010, with recommendation of reaching agreement. The project was re-submitted to the agenda of the Social-Economic Committee meeting on 13 May 2010. Since, shortly before the Social-Economic Committee meeting, further comments were submitted, the Committee decided to recommend further agreements. To this effect, the NBWM organized a conference on 21 May 2010, aimed at reaching agreements with representatives of interested sectors.

The project was accepted by the Committee of European Affairs of the Council of Ministers on 8 June 2010. Next, the Permanent Committee of the Council of Ministers, at a meeting on 24 June 2010 accepted and conditionally recommended to the Council of Ministers a project of regulation changing the regulation *Water Law* and some other regulations. Simultaneously, it was indicated that the remark of the Ministry of Infrastructure related to the possibility of issuing of the local law with reference to flood risk areas would be considered by the Law Commission of the Prime Minister Office. In addition, it was indicated that the novelization of the regulation *Water Law* should be processed jointly with the project, being prepared by the infrastructure sector, concerning regulation changing the regulation on particular principles of reconstructing or pulling down of structures destroyed or damaged by floods.

I would like to inform that no resources are earmarked in the state budget for preparation of planning-related documents, required by the Floods Directive. The Government undertook attempts to obtain funds necessary for realizations of obligations imposed by the Directive from funds received from the EU.

Michal Jaros, Member of Parliament:
What regulations, besides the Water Law, are in need of change in view of adjustment to the Floods Directive?

Bernard Błaszczyk, Deputy Minister of Environment (shortened):
Besides the Water Law, the project of novelization foresees also changes in:
- regulation of 21 March 1991 on maritime territory of the Republic of Poland and the maritime administration (Dz. U. of 2003, No. 153, item 1502, with later changes) [in Polish: *ustawa z dnia 21 marca 1991 r. o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej (Dz. U. z 2003 r. Nr 153, poz. 1502, z późn. zm.*)];
- regulation of 27 April 2001 Law of Environment Protection (Dz. U. of 2008. No. 25, item 150, with later changes) [in Polish: *ustawa z dnia 27 kwietnia 2001 r. Prawo ochrony środowiska (Dz. U. z 2008 r. Nr 25, poz. 150, z późn. zm.)*];
- regulation of 27 March 2003 on spatial planning and management (Dz. U. No. 80, item 717, with later changes) [in Polish: *ustawa z dnia 27 marca 2003 r. o planowaniu i zagospodarowaniu przestrzennym (Dz. U. Nr 80, poz. 717, z późn. zm.)*].

Changes in the above-mentioned legislation are principally dictated by the necessity of adjustment to the new terminology in planning-related documents, that are intended to be created, following the requirements of the Floods Directive.

Michal Jaros, Member of Parliament:
When will the necessary changes in legislation be introduced?

Bernard Błaszczyk, Deputy Minister of Environment (summary):
On 8 June [2010], the project was accepted by the Committee of European Affairs of the Council of Ministers and then it was directed to the Permanent Committee of the Council of Ministers. Unfortunately, due to the lack of agreements with sectors related to the way of introduction of zones indicated on risk maps to spatial planning and immense financial consequences of the proposal submitted by the infrastructure sector, the project of novelization still waits for making final decisions on the matter. Immediately after the project is accepted by the Permanent Committee of the Council of Ministers and the Council of Ministers it will be conveyed to the Parliament, for deliberation.

Road map for the implementation of Floods Directive in Poland, 2011-2013
Important deadlines in the implementation of the Floods Directive are foreseen in 2011 and 2013. Chapter II, item 4 of the Floods Directive requires that Member States shall complete the preliminary flood risk assessment by 22 December 2011. The chairperson of the National Board of Water Management approved the preliminary flood risk assessment on 21 December 2011, thus meeting the deadline of 22 December 2011, as obliged by force of the Floods Directive. The document was prepared by the Institute of Meteorology and Water Management – State Research Institute via its Centres of Flood Modelling in Gdynia, Poznan, Cracow and Wroclaw, in consultation with the National Board of Water Management. The preliminary flood risk assessment was carried out in the framework of the Information System of National Protection against Extraordinary Hazard (Polish abbreviation – ISOK), financed from the European Fund of Regional Development – Operational Program: Innovative Economy.

The assumptions made for preparation of the preliminary flood risk assessment, resulting from the Project of updating of the Water Law were as follows:

The preliminary flood risk assessment for river basin areas was prepared by the Chairperson of the National Board of Water Management (who delegated this responsibility to the Institute of Meteorology and Water Management – State Research Institute).

Chairperson of the National Board of Water Management conveyed the Project of the preliminary flood risk assessment, for opinion, to voivods and voivodship marshalls (45 days for providing comments).

Chairperson of the National Board of Water Management had 45 days for informing how the review comments were considered and passed the preliminary flood risk assessment to the Director of Government Centre for Security.

Chapter III, item 8 of the Floods Directive requires that Member States shall ensure that the flood hazard maps and flood risk maps are completed by 22 December 2013. Methodology of developing such maps in Poland has been specified by the Decree of the Minister of the Environment, the Minister for Infrastructure and Minister of the Interior and Administration. The methodology defines content range of maps, the quality of source data, and the timetable for their implementation and publication, etc. Such maps, based on current geodetic and cartographic data, including the precise digital terrain model developed from airborne laser scanning data, are being prepared within the ISOK project (Kurczynski, 2012), by the consortium led by the Institute of Meteorology and Water Management, embracing the National Board of Water Management, Main Office of Geodesy and Cartography, the National Institute of Telecommunications, and the Government Centre for Security, as a supporting entity.

Directors of regional boards of water management are responsible for preparation of flood hazard maps and flood risk maps in a water region. Upon decision of the Chairperson of the National Board of Water Management these maps are to be prepared by Centres of Flood Modelling affiliated at the Institute of Meteorology and Water Management – State Research Institute.
The maps will be forwarded to nine groups of addressees (Chairperson of the National Board of Water Management, Main Geodesist of the Nation, Main Inspector of Environment Protection, Director of the Government Centre for Security, relevant voivods, relevant marshalls of voivodships, district authorities – starostas, and local authorities – mayors, and commune leaders, and relevant commanders of voivodship, district or urban fire brigades).

The limits of flood-endangered areas presented in maps will be considered in the concepts of spatial management of the country and the voivodships, studies of conditions and spatial management of communes, and local plans of spatial management.

Within 18 months since receipt of the maps, organs of public administration listed above will take account of these areas in plans and studies of spatial management, while covering the costs of introducing these changes by budgets of relevant communes or voivodships.

A6 Sweden

A6.1 Flood risk management debates in Sweden

Overview

In Sweden, the negative impact of flooding has historically been relatively limited (Swedish Civil Contingencies Agency 2012). Only small proportions of the total surface of the country are densely built and populated which makes the physical circumstances quite favourable. The extensive development of hydropower establishments in Sweden has had a significant impact on water flows in the country, and has reduced the occurrence of river floods. The construction of large dams located in the mountainous areas makes it possible to affect the amount of water passed through into the rivers. Likewise, water from heavy and/or persistent rain can, to some extent, be kept in reservoirs for future power generation. The most disastrous flood risks in Sweden are however also related to hydropower generation, if one of the larger hydropower dams would collapse the impact on

developed areas along the downstream river would be severe (Swedish Hydrological And Meteorological Institute 2004).

Both fluvial and pluvial flooding occurs in Sweden although the former are more common (Swedish Civil Contingencies Agency 2012). Even coastal flooding caused by high sea water levels as a result of a combination of low pressure and strong winds or of tidal cycles can affect the country (http://www.krisinformation.se/web/Pages/Page____11206.aspx, accessed 29 April 2013). Recurring high water levels and floods have traditionally been considered local and regional issues. For instance, recurring floods caused by melting snow during the spring time in the north of the country generally receives substantial attention in the local media and among the general public. In a similar way, high water levels in the large lake Vänern are discussed and debated on local arenas such as in the southwest Gothenburg area and in the city of Karlstad. Unlike what happens in The Netherlands, the concept of floods and its consequences have in general not constituted a part of a national discussion or debate, probably due to the relatively limited experiences of the consequences of flooding. Rather, the general discussion in the national media has tended to perceive heavy and/or persistent rains as something partially good, contributing to future hydropower capacity, and potentially also keeping electricity prices down during the winter (when demand for electricity generally peaks).

However, a series of considerably damaging events in the last few years have caused the issue of floods to get more national attention, with a number of public agencies investigating not only these events, but also in general how consequences can be prevented and mitigated (Regeringens proposition - Ett första steg för en enklare plan- och bygglag, Prop. 2006/07:122). Another reason for the increased national attention is the matter of climate change. Sweden is expected to be severely affected by climate change (Sveriges offentliga utredningar 2007). Increased precipitation is expected to increase the risk for floods and landslides in the future, in particular in the southwest part of the country. Therefore, in a report commissioned by the Swedish Government early adaptation is recommended, inducing increased responsibility for municipalities and county administrative boards together with government support for large-scale cost initiatives (ibid).

Main actors and rules

Currently, competences regarding floods are divided among authorities at local, regional and central level. Since many of the larger Swedish rivers are regulated for the production of electrical power, dam owners/power companies or water regulation companies as well as insurance companies are also important actors.

The large dams constructed in Swedish rivers have in general come about for the production of electrical power and not as a measure for flood protection (Räddningsverket 2000). Something similar can be said regarding dikes, which during the past century were mainly used to drain wetlands in order to gain productive arable land. Today drainage is primarily used to improve building grounds for new residential areas and roads. Other examples of water control include deepening and enlarging of watercourses, lakes, and embankments. The Swedish Environmental Code (SFS 1998:808) requires permit for all water operations. Because of the importance of wetlands, as buffering systems for water flow both during flooding events and drought, drainage is now prohibited in large parts of southern and mid Sweden (Swedish Environmental Protection Agency 2009:5).

The municipalities have, in accordance with the Planning and Building Act (SFS 2010:900) responsibility for spatial planning and regulate the use of land and water areas within their borders. The Act includes explicit requirements to consider the risk of accidents, floods and erosion when determining the suitability of the land where buildings and structures are to be located. In some cases, municipalities must also consult with the county administrative boards, which represent the

national Swedish Government in each of the country's twenty-one counties. These county administrative boards coordinate national and inter-municipal interests, provide the municipalities with relevant data and advice, and have a specific responsibility to control that flood and other risks are sufficiently taken into account in planning processes.

Municipalities are also primarily responsible for emergency planning and preparedness. The Civil Protection Act (SFS 2003:787) requires that municipalities have a Plan of Action for prevention, in which they identify risks for emergencies and indicate how preventive activities are organized and planned. An Action Plan for emergency services, indicating municipal operational capabilities, is also required. The county administrative boards support these municipal activities by providing advice and information.

Another piece of legislation, the Act on Extraordinary Incidents (Act on Measures to be taken by Municipalities and County Councils in Preparedness for and during Extraordinary Incidents during Peacetime and Periods of Heightened Alert - SFS (2006:544), regulates the municipalities' and the county councils' (regional governments) obligations in relation to complex, extraordinary incidents that disrupt or can severely disrupt vital societal functions. In particular, municipalities and county councils are required to perform a risk and vulnerability analysis accounting for the extraordinary incidents at peacetime that can occur within their borders and, on the basis of that, establish a plan for how such incidents will be managed.

The Swedish Civil Contingencies Agency (MSB) works at a central level to prevent and mitigate the effects of natural disasters such as floods. This Agency has the overall responsibility for the implementation of the Floods Directive and, in this function, cooperates closely with the county administrative boards. Special responsibilities lie with the five county administrative boards that were designated Water Authorities as a result of the implementation of the Water Framework Directive (Swedish Civil Contingencies Agency 2012).

The MSB also compiles and maintains general flood maps illustrating the areas than can be flooded when the water rises to certain levels. These maps are provided to the municipalities and county administrative boards to serve as a basis for spatial and emergency planning. Finally, The MSB promotes the establishment of local river groups which function as forums for cooperation and coordination for relevant stakeholders in a river basin (https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Alvgrupper/, accessed 29 April 2013). International tendencies and debates regarding flood risk management are known to MSB (Nyberg 2008). The extent to which they are considered at the implementation stage is however undetermined.

Another national government agency with functions related to flood risk management is the Swedish Meteorological and Hydrological Institute (SMHI), which is responsible for producing forecasts of weather, wind, water, climate and environment. SMHI has a three level warning system for extreme weather forecasts (http://www.smhi.se/vadret/vadret-i-sverige/Varningar, accessed 29 April 2013).

As for flood recovery strategies, it is important to mention that, for example, a home insurance will always cover damages that are caused by flooding. However there have been major disasters, where the central government has given assistance to farmers and forest owners. There has been criticism regarding these grants as it is seen as lowering the incentives to take on insurance by the private actors. The municipality is responsible for restoring community facilities such as building, roads and railroads. There have been motions to try to develop a national natural damage fund, but these have been unsuccessful (Sveriges offentliga utredningar 2007).

Resources

Municipalities in Sweden are self-governed and have independent powers of taxation to finance their operations. However, for certain measures regarding floods and flood risk management, municipalities can also receive support from the national government. For example, municipalities can apply for grants up to 60% of costs for flood prevention measures (https://www.msb.se/sv/Forebyggande/Naturolyckor/Statsbidrag/, accessed 29 April 2013). Also, if a flooding event of such proportions that municipal and regional resources are insufficient occurs, the central authorities can contribute with extra resources (Swedish Civil Contingencies Agency 2010). Even after a flooding event, if the affected municipality has incurred in considerable costs to perform the rescue services, they may also be entitle to certain compensation (ibid).

In Sweden, insurance of private property, economic activities, agricultural activities and forestry has been left to the private insurance market.

A6.2 Main characteristics of the debate on the implementation of the Floods Directive in Sweden

The Floods Directive is implemented in Sweden principally through Government Ordinance (SFS 2009:956) on flood risks. Implementation will be completed in three steps within the period 2009-2015. While the main responsibilities lie with national public agencies at central and regional level, the Ordinance states that affected municipalities and other particularly affected stakeholders must be given the possibility to participate by submitting material or considerations.

Step one consisted of undertaking the preliminary risk assessment. The MSB, with the cooperation of the corresponding agencies in Finland and Norway, conducted this assessment and identified 18 areas where significant flood risks exist https://www.msb.se/sv/Start1/Nyheter-fran-MSB/Nyheter-Naturolyckor--klimat/18-omraden-med-betydande-oversvamningsrisk/, accessed 29 April 2013).

Under Step two, flood hazard maps and flood risks maps will be prepared for each of the identified areas. The MSB will prepare the flood hazard maps. These maps will cover the geographical areas that can be affected by: 1. floods with low probability are expected to occur or that are expected to occur in extreme situations; 2. floods that with medium probability are expected to occur; and, if appropriate, 3. floods that with high probability are expected to occur. The flood risk maps, which must show the potential adverse consequences associated to such floods, will be drawn up by the Council Administrative Boards that constitute Water Authorities for the five water districts in which the country is divided. Step two is expected to be finalized in 2013 ([1] https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Oversvamningsdirektivet/Kartor-/, accessed 29 April 2013).

Step three entails the establishment of flood risk management plans by the County Administrative Boards with jurisdiction over the areas with significant flood risk. These plans must be based on the objectives that the Boards establish and on the flood hazard maps and flood risk maps developed under Step two (Swedish Civil Contingencies Agency 2012a). The MSB has specified the contents of the plans through Regulations (MSBFS 2013:1) on the County Administrative Boards' flood risk management plans.