



**HAL**  
open science

## **Analysing and evaluating Flood Risk Governance in France: from State Policy to Local Strategies**

Corinne Larrue, Silvia Bruzzone, Lisa Lévy, Mathilde Gralepois, M Schellenberger, Jean-Baptiste Trémorin, Marie Fournier, Corinne Manson, Thomas Thuillier

► **To cite this version:**

Corinne Larrue, Silvia Bruzzone, Lisa Lévy, Mathilde Gralepois, M Schellenberger, et al.. Analysing and evaluating Flood Risk Governance in France: from State Policy to Local Strategies. 2016. halshs-01981420

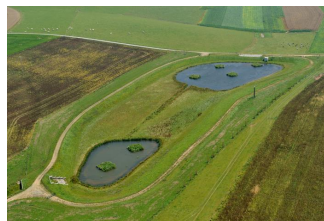
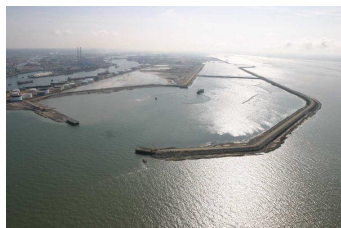
**HAL Id: halshs-01981420**

**<https://shs.hal.science/halshs-01981420>**

Submitted on 15 Jan 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



# Analysing and evaluating flood risk governance in France

## From state policy to local strategies

Larrue, C., Bruzzone, S., Lévy, L., Gralepois, M., Schellenberger, T.,  
Trémorin, J.B., Fournier, M., Manson, C. and Thuilier, T.

Date: 31 March 2016  
Report Number: D3.7  
Milestone Number: MS3  
Due date for deliverable: 30 September 2015  
Actual submission date: 28 September 2015

STAR-FLOOD receives funding from the EU 7<sup>th</sup> Framework programme (FP7/2007-2013) under grant agreement 308364

Document Dissemination Level  
PU Public

Co-ordinator: Utrecht University  
Project Contract No: 308364  
Project website: [www.starflood.eu](http://www.starflood.eu)  
ISBN



---

Left photo: The marine wall, protection for both the harbour and the city of Le Havre. Source: Le Havre Patrimonial, Port 2000, <https://imagesduhavre.wordpress.com>

Right Rural photo: basins in the upstream section for mitigation strategy. Source: The on-site rural retention basin, CODAH

## Document information

Work Package	3
Main partner responsible	Université François Rabellais de Tours
Year	2016
Document type	Draft Deliverable
Status	Final Draft
Date	10.09.2015
Author(s)	C. Larrue (scientific resp.) S. Bruzzone, L. Lévy, M. Gralepois, T. Schellenberger, J. B. Trémorin, , M. Fournier, C. Manson, Thuilier, T.

## Acknowledgement

The work described in this publication was supported by the European Union's Seventh Framework Programme through the grant to the budget of the Integrated Project STAR-FLOOD, Contract 308364.

## Disclaimer

This document reflects only the authors' views and not those of the European Union. This work may rely on data from sources external to the STAR-FLOOD project Consortium. Members of the Consortium do not accept liability for loss or damage suffered by any third party as a result of errors or inaccuracies in such data. The information in this document is provided 'as is' and no guarantee or warranty is given that the information is fit for any particular purpose. The user thereof uses the information at its sole risk and neither the European Union nor any member of the STAR-FLOOD Consortium is liable for any use that may be made of the information.

© STAR-FLOOD Consortium. This report should be referred to as follows:

C. Larrue, S. Bruzzone, L. Lévy, M. Gralepois, T. Schellenberger, J. B. Trémorin, M. Fournier, C. Manson, Thuilier, T (2016). *Analysing and evaluating Flood Risk Governance in France: from State Policy to Local Strategies* , STAR-FLOOD Consortium, Tours, France. ISBN: 978-94-91933-08-0.

---

## Key words

Flood risk governance;  
Governance arrangements;  
Administrative structure;  
Contextual background;  
Legal framework;  
Discourse;  
Resources;  
Actors;  
Evaluation;  
France;  
Recommendations;  
Resilience.

## Author Details

**Corinne Larrue** is Director and Professor at the Paris School of Planning (University of Paris Est), and was previously a Professor at the University of Tours. She is the scientific coordinator of the French team.

**Silvia Bruzzone** is a researcher in sociology at the CITERES Research Centre, University of Tours.

**Lisa Lévy** is a post-doctoral research fellow at the CITERES Research Centre, University of Tours.

**Mathilde Gralepois** is Assistant Professor in Urban Planning at the Planning and Environment Department, University of Tours.

**Thomas Schellenberger** is a post-doctoral research fellow at the CITERES Research Centre, University of Tours. He is also working as a Teaching Assistant in Public Law at the University of Aix-Marseille.

**Jean Baptiste Tremorin** is a research fellow associated with the CITERES Research Centre, University of Tours.

**Marie Fournier** is Associate Professor in Geography at the Ecole Supérieure des Géomètres et Topographes, an engineering school for land surveyors, and the Centre National des Arts et Métiers (CNAM).

**Corinne Manson** is Associate Professor in Public Law at the University of Tours.

**Thomas Thuillier** is PhD in Law at University of Tours.

## Preface

This report is one of the deliverables of the EU 7<sup>th</sup> Framework project STAR-FLOOD (see [www.starflood.eu](http://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 eighteen vulnerable urban regions in six European countries: Belgium, the U.K., France, the Netherlands, Poland and Sweden. The project assesses the institutional embedding of these strategies from a combined public administration and legal perspective, with the aim of making European regions more resilient to flood risks.

This report constitutes deliverable D3.7, a country report on France. Work Package 1 provides an extended problem analysis related to Flood Risk Governance in Europe, Work Package 2 focuses on how Flood Risk Governance in Europe can be researched and Work Package 3 forms the empirical core of the project, in which analyses, explanations and evaluations of each country, including three case studies, have been carried out.

France represents an interesting country, as it is the most southern country in the STAR-FLOOD consortium. It suffers from different types of flooding, including those typical of the Mediterranean area, and our selection of case studies reflects this variety. As we will show, the flood issue is increasingly defined as an “urban issue” within the framework of the decentralisation process. *Agglomérations*, which are fairly new institutional actors, appropriate the flood issue according to their development projects and perspectives. In this context, the role of the State is reconfigured from a monolithic-centralised approach – mainly as a supplier of rules and controller – to a diversification of interventions according to local situations. Indeed, cities provide an enhanced integrated approach among the various FRMs when compared with the national level. Nonetheless, resilience still requires further work for the development of interconnections among different scales – European, national, basin, urban, and project.

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

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

Yours sincerely,

Dr Ann Crabbé  
Leader of WP3

Prof. Corinne Larrue  
Lead author

Prof. Peter Driessen  
STAR-FLOOD Project  
coordinator

## Table of contents

Chapter 1. Introduction.....	1
1.1 Introducing flood risk governance in France.....	1
1.2 Research aims and questions.....	1
1.3 Research approach and methods.....	3
1.3.1 The STAR-FLOOD Project framework .....	3
1.3.2 Reasons behind the choice of case studies .....	5
1.3.3 Working methods and approach .....	7
1.4 Outline of the report .....	8
Chapter 2. Analysis of national flood risk governance .....	9
2.1 Introduction.....	9
2.2 The context level .....	9
2.2.1 Physical circumstances .....	9
2.2.2 A brief history: evolution of the French flood policy.....	11
2.2.3 General characteristics .....	12
2.2.4 The French administrative structure and legal system .....	13
2.3 Flood risk governance at the national scale.....	19
2.3.1 An overview of the French Flood Risk Governance Arrangement .....	19
2.3.2 Defence and preparation: two historical sub-arrangements .....	21
2.3.3 Prevention and recovery: complementary sub-arrangements .....	26
2.3.4 Bridging processes linking sub-arrangements.....	31
2.4 Explanations of stability and/or changes in Flood Risk Governance in France.....	33
2.4.1 The extent of governance dynamics in French FRGA.....	33
2.4.2 Explanatory factors in French FRGA .....	36
2.5 Evaluating flood risk governance on a national scale .....	40
2.5.1 Resilience.....	40
2.5.2 Legitimacy.....	42
2.5.3 Efficiency.....	44
2.6 Conclusion .....	44
Chapter 3. Nevers: when a local strategy fits into the national policy .....	49
3.1 Introduction and scope of the analysis .....	49
3.2 Main characteristics of the case study .....	49
3.2.1 A city with few development issues .....	49
3.2.2 Flood risk characteristics: slow floods on the largest French river .....	51
3.2.3 Characteristics of flood management strategies.....	53
3.3 Analysis of flood risk governance in Nevers.....	57
3.3.1 An expert-based and centralised vision of the risk .....	59
3.3.2 A lack of articulation between risk and development issues .....	62
3.3.3 Recovery .....	64
3.4 Explaining dynamics in flood risk governance at the case study level.....	64
3.4.1 Explaining stability in Nevers.....	65
3.4.2 Explaining changes in Nevers .....	67
3.5 Evaluating flood risk governance in Nevers .....	68

3.5.1	Resilience.....	69
3.5.2	Legitimacy.....	70
3.5.3	Efficiency.....	70
3.6	Conclusion.....	70
Chapter 4.	Le Havre, diversification through technical responses (Case study 2).....	73
4.1	Introduction and scope of the analysis.....	73
4.2	Main characteristics of the case study: a shrinking industrial city facing floods.....	73
4.2.1	Introduction.....	73
4.2.2	A preserved natural geomorphological area.....	76
4.2.3	Multiple flood risks in Le Havre.....	77
4.2.4	A densely-populated city centre in a shrinking demographic context.....	78
4.2.5	The industrial and working-class economic context.....	78
4.2.6	The local flood policy: active involvement in risk management.....	78
4.3	Analysis of flood risk governance in Le Havre.....	80
4.3.1	Runoff flood sub-arrangement:.....	80
4.3.2	The defence versus the prevention sub-arrangement.....	83
4.3.3	Preparation sub-arrangements, replications from the national scale.....	86
4.3.4	Recovery.....	86
4.4	Explaining the dynamics of flood governance in Le Havre.....	88
4.4.1	Explaining changes in Le Havre: Towards more local flood policies.....	88
4.4.2	Explaining stability in Le Havre: existing institutional and expert frame.....	91
4.5	Evaluating flood risk governance in Le Havre.....	92
4.5.1	Resilience.....	93
4.5.2	Legitimacy.....	94
4.5.3	Efficiency.....	95
4.6	Conclusion.....	95
Chapter 5.	Nice: a national-local coalition to integrate the risk in development projects.....	97
5.1	Introduction and scope of the analysis.....	97
5.2	Contextual background of the case study.....	99
5.3	Analysis of flood risk governance in Nice.....	106
5.3.1	The prevention-defence sub-arrangement on the River Var.....	106
5.3.2	Mitigation-defence sub-arrangement on the Paillon River.....	109
5.3.3	Preparation sub-arrangement.....	110
5.3.4	Recovery.....	112
5.4	Explaining change and stability in flood risk governance in Nice.....	113
5.4.1	Explaining changes in Nice: The rising role of the <i>Métropole</i> and its new coalition.....	114
5.4.2	Explaining stability in Nice.....	115
5.5	Evaluating flood risk governance at the case study level.....	116
5.5.1	Resilience.....	117
5.5.2	Legitimacy.....	117
5.5.3	Efficiency.....	118
5.6	Conclusion.....	119
Chapter 6.	Explanations for stability and change in French flood risk governance.....	121
6.1	Introduction.....	121
6.2	Explanations for stability in flood risk governance.....	122



---

6.2.1	Stability traits.....	122
6.2.2	Stability factors.....	122
6.3	Explanations for changes in flood risk governance.....	124
6.3.1	Main trends.....	124
6.3.2	Main factors for change.....	124
6.4	Conclusions.....	127
Chapter 7.	Evaluation of flood risk governance.....	129
7.1	Introduction.....	129
7.2	Resilience.....	131
7.3	Legitimacy.....	132
7.4	Efficiency.....	133
7.5	Conclusions.....	134
Chapter 8.	Moving forward.....	135
8.1	Introduction.....	135
8.2	Identifying the strengths and limitations.....	137
8.2.1	Strengths.....	137
8.2.2	Limitations.....	138
8.3	Opportunities for progress, and the barriers that hinder it.....	140
8.3.1	The Action Programmes for Flood Prevention (PAPI).....	140
8.3.2	Decentralisation and the assertiveness of agglomerations.....	141
8.3.3	Mitigation as an opportunity.....	143
8.3.4	Other potential barriers and opportunities.....	143
8.4	Recommendations for strengthening and redesigning flood risk governance in France.....	143
8.4.1	Going further with decentralisation.....	143
8.4.2	Improvements in private citizen participation and agency.....	145
8.4.3	Using the local strategies introduced by the Floods Directive as a first step.....	145
8.4.4	A number of further elements have emerged from our analysis.....	145
Annex 1 - Interviewees.....		153
Annex 2 - Historical development.....		159
References.....		147

## Figures

Figure 1.1 Overview of the set-up of the research, including all research steps.....	4
Figure 1.2 Overview of the five Flood Risk Management Strategies identified within STAR-FLOOD .....	4
Figure 1.3 Map of the selected French case studies .....	5
Figure 2.1 Number of declarations of Natural Disaster (CAT-NAT) due to floods .....	9
Figure 2.2 Distribution of State credits among different types of risk .....	13
Figure 2.3 The main actors involved in flood risk management strategies at various levels.....	15
Figure 2.4 Map of the French Regional and <i>Départemental</i> Councils / River Basin Water Boards .....	16
Figure 2.5 Overview of strategies present in France.....	20
Figure 2.6 Flood risk management instruments in France.....	20
Figure 2.7 Number of approved and prescribed PPRNs since 1959 .....	28
Figure 2.8 French flood risk management system .....	33
Figure 2.9 Distribution of PAPI funding per action (%) .....	35
Figure 2.10 Distribution of PAPI funding among actors .....	35
Figure 3.1 Location of Nevers.....	50
Figure 3.2 Location of Nevers in the Loire Basin .....	50
Figure 3.3 Flood-prone areas and the exposed population in Nevers .....	52
Figure 3.4 Overview of strategies present in the case study Nevers. ....	53
Figure 3.5 Nevers flood policy milestones .....	53
Figure 3.6 Map of the defence system .....	54
Figure 3.7 Main actors and their territorial scale of action .....	58
Figure 3.8 Three Flood Risk Governance Sub-Arrangements of Nevers .....	59
Figure 3.9 Risk of dike failure .....	66
Figure 4.1 Location of Le Havre in the northern part of France.....	74
Figure 4.2 Le Havre, a balance between development and flood prevention?	75
Figure 4.3 Actor system in Le Havre .....	76
Figure 4.4 The Lézarde river basin.....	77
Figure 4.5 A constant decrease since the 1970s .....	78
Figure 4.6 Overview of strategies present in the case study Le Havre..	79
Figure 4.7 Three sub-arrangements in Le Havre .....	80
Figure 4.8 Transformation of flood issues in Le Havre ).....	81
Figure 4.9 The urban retention basin in the city of Le Havre.....	81
Figure 4.10 Rural basins in the upstream section for mitigation strategy .....	82
Figure 4.11 The marine wall, protection for both the harbour and the city.....	83
Figure 4.12 New urban development in the harbour area of the city .....	84
Figure 4.13 Negotiations for definition of risk: a battle for scientific legitimacy.....	85
Figure 4.14 The diversification of strategies in flood management: the result of consensus? .....	90
Figure 5.1. Location of Nice.....	98
Figure 5.2 The city of Nice and its water courses.....	98
Figure 5.3 The range of the great flood of 5 November 1994 .....	101
Figure 5.4 The "Paillons" catchment area .....	102
Figure 5.5 The Nice actor system .....	104
Figure 5.6 Overview of strategies present in the case study Nice.. .....	105
Figure 5.7 Flood risk governance sub-arrangements in Nice .....	106

## Tables

Table 1.1 Key characteristics of selected case studies and research motivations.....	6
Table 2.1 The main geographical and demographic characteristics of France .....	10
Table 2.2 Historical approach to flood management strategy in France .....	11
Table 2.3 Major demographic characteristics of France .....	12
Table 2.4 Evolution of French GDP between 1990 and 2013.....	12
Table 2.5 Major socio-economic developments .....	12
Table 2.6 The main characteristics of the French political and juridical environment .....	19
Table 2.7 Flood risk management strategies in France.....	21
Table 2.8 Summary of defence sub-FRGA.....	21
Table 2.9 Summary of sub-FRGA preparation.....	24
Table 2.10 Summary of sub-FRGA prevention .....	26
Table 2.11 Summary of recovery sub-FRGA.....	34
Table 2.12 Evolution of risk prevention plans.....	34
Table 2.13 Stability and change factors of the French FRGA .....	41
Table 2.14 Evaluation of flood resilience at a national level.....	41
Table 2.15 Evaluation of FRGA legitimacy at a national level .....	46
Table 3.1 Key characteristics of Nevers (2013) .....	51
Table 3.2 Flood risk management strategies in Nevers .....	57
Table 3.3 Funding sources for the EGRIAN action plan.....	61
Table 3.4 List of floods covered as “natural disasters” by the CAT-NAT system .....	64
Table 3.5 Change and stability factors in Nevers .....	64
Table 3.6 Summary of evaluation criteria in the case of Nevers.....	68
Table 4.1 Key characteristics of the city of Le Havre .....	75
Table 4.2 Flood risk management strategies in Le Havre .....	79
Table 4.3 List of floods covered as “natural disasters” by the CAT-NAT system in Le Havre .....	86
Table 4.4 Stability and change factors of in Le Havre .....	88
Table 4.5 Evaluation criteria in Le Havre.....	92
Table 5.1 Key characteristics of Nice.....	99
Table 5.2 The Var: the main river of the <i>département</i> .....	100
Table 5.3 Characteristics of the Paillon .....	102
Table 5.4 Flood risk management strategies in Nice .....	105
Table 5.5 Development perspectives in the Var Valley.....	108
Table 5.6 Current Action Programme for Flood Protection (PAPI II Var) .....	108
Table 5.7 Current Action Programme for Flood Prevention (PAPI). .....	110
Table 5.8 Differences between the Paillon and the Var river systems .....	111
Table 5.9 List of floods covered as “natural disasters” by the CAT-NAT system in Le Havre .....	112
Table 5.10 Stability and change factors in Nice.....	113
Table 5.11 FRGA Evaluation in Nice .....	116
Table 6.1 Summary of stability and change drivers .....	121
Table 7.1 Overview of Evaluation of Flood Risk Governance Arrangement in France.....	130

---

## Boxes

Box 1.1 Research questions of this report .....	2
Box 2.1 Climate change projections in France (Preliminary Evaluation of Flood Risk (EPRI)) .....	10
Box 2.2 evaluation of cost of the policy and risks .....	12
Box 2.3 The new “GEMAPI competence” .....	14
Box 2.4 The main characteristics of the French political and juridical environment .....	16
Box 2.5 Dikes: length in kilometers, owners, condition and related costs .....	22
Box 2.6 Protecting development: a mission for the modern <i>élite</i> .....	38
Box 3.1 The Plan Loire Grandeur Nature.....	55
Box 3.2 The OREALM policy.....	60
Box 5.1 The Operation of National interest (OIN): a specific framework .....	107

## Abbreviations

Abbreviation	English	French
<b>AFPCN</b>	French Association for Natural Disasters Reduction	Association Française pour la Prévention des Catastrophes Naturelles
<b>CAT-NAT</b>	Natural Disaster Scheme	Système Catastrophes Naturelles
<b>CCR</b>	National Reinsurance Company	Caisse centrale de réassurance
<b>CDRNM</b>	<i>Départementale</i> Commission for Natural Risks	Commission départementale des risques naturels majeurs
<b>CEPRI</b>	European Centre for Flood Prevention	Centre Européen de Prévention du Risque d'inondation
<b>CGDD</b>	General Commission for Sustainable Development	Commissariat général au développement durable
<b>CLE</b>	Local Water Committee	Commission Locale de l'Eau
<b>CODAH</b>	Le Havre inter-municipal Body	Communauté d'Agglomération Havraise
<b>COGIC</b>	Inter-Departmental Ministerial Centre for Crisis Management	Centre Opérationnel de Gestion Interministérielle des Crises
<b>CMI</b>	Flood Committee	Commission Mixte Inondation
<b>COPRNM</b>	Advisory Board on the Prevention of Major Natural Hazards	Conseil d'Orientation et de Prévention des Risques Naturels Majeurs
<b>DDT</b>	<i>Départementale</i> Directorate for Territories	Direction Départementale des Territoires
<b>DDTM</b>	Départemental Directorate for Territories and the Sea	Direction Départementale des Territoires et de la Mer
<b>DDRM</b>	<i>Départementale</i> Document on Major Hazards	Dossier Départemental des Risques Majeurs
<b>DGPR</b>	Ministerial Directorate for Risk Prevention	Direction Générale de la Prévention des Risques
<b>DICRIM</b>	Municipal Information Document on Major Hazards	Dossier d'Information Communal des Risques Majeurs
<b>DREAL</b>	Regional Directorate for Environment, Land Planning and Housing	Direction Régionale de l'Environnement, de l'Aménagement et du Logement
<b>EGRIAN</b>	Nevers Flood Risk Assessment Study	Etude Globale du Risque d'Inondation sur l'Agglomération de Nevers
<b>EPA</b>	Public Organisation of Development	Etablissement Public d'Aménagement
<b>EPAGE</b>	Local Water Management Organisation	Etablissement Public d'Aménagement et de Gestion des Eaux
<b>EPCI</b>	Inter-Municipal Cooperation Body	Etablissement Public de coopération Intermunicipale
<b>EPL</b>	Loire Basin Water Board	Etablissement Public Loire
<b>EPTB</b>	River Basin Water Board	Etablissement Public Territorial de Basin
<b>EPRI</b>	Preliminary Flood Risk Assessment	Evaluation Préliminaire du Risque d'Inondation
<b>FRMP</b>	Flood Risk Management Plan	Plan de Gestion du Risque Inondation (PGRI)
<b>GEMAPI</b>	Management of the aquatic environment and flood prevention	Gestion des milieux aquatiques et prévention des inondations
<b>GIR Maralpin</b>	Maralpin Interdisciplinary Research Group	Groupe Interdisciplinaire de Réflexion Maralpin
<b>Abbreviation</b>	<b>English</b>	<b>French</b>

<b>MAPAM (Law)</b>	Modernisation of Territorial Public Action and the Affirmation of the Metropolis	(Loi de) Modernisation de l'action publique territoriale et d'affirmation des métropoles
<b>MEEDE</b>	Ministry of the Environment	Ministère de l'Écologie, du Développement Durable et de l'Énergie
<b>MRN</b>	National Mission for Natural Hazards	Mission Nationale sur les Risques Naturels
<b>OIN</b>	Operation of National Interest	Opération d'Intérêt National
<b>ORMES</b>	Seine Estuary Major Risk Office	Office des Risques Majeurs de l'Estuaire de la Seine
<b>ORSEC</b>	Civil security response organisation	Organisation de la Réponse de Sécurité Civile
<b>PACA (Region)</b>	Provence-Alpes-Côte d'Azur	Région Provence-Alpes-Côte d'Azur
<b>PAPI</b>	Action Programme for Flood Prevention	Programme d'Action et de Prévention des Inondations
<b>PCS</b>	Municipal Crisis Management Plan	Plan Communal de Sauvegarde
<b>PER</b>	Natural Hazard Exposure Plan	Plan d'exposition aux Risques Naturels
<b>PGRI</b>	Flood Risk Management Plan (FRMP)	Plan de Gestion du Risque Inondation
<b>PLU</b>	Land-Use Plan / Local plan	Plan Local d'Urbanisme
<b>PSR</b>	Rapid Submersion Plan	Plan Submersion Rapide
<b>PPR</b>	Risk Prevention Plan	Plan de Prévention des Risques
<b>PPRI</b>	Flood Risk Prevention Plan	Plan de Prévention du Risque Inondation
<b>PSS</b>	Submersible Surface Plan	Plan de Surfaces Submersibles
<b>SAC</b>	Flood Warning Service	Service d'Annnonce des Crues
<b>SAGE</b>	Local Water Management Plan	Schéma d'Aménagement et de Gestion des Eaux
<b>SCHAPI</b>	National Flood Forecasting Service	Service Central d'Hydrométéorologie et d'Appui à la Prévision des Inondations
<b>SCHAE</b>	Hydraulic Consistency and Global Development Scheme	Schéma de cohérence hydraulique et d'aménagement d'ensemble
<b>SCOT</b>	Master Development Plan	Schéma de Cohérence Territoriale
<b>SDAGE</b>	Water Management Master Plan	Schéma Directeur d'Aménagement et de Gestion des Eaux
<b>SDIS</b>	<i>Départementale</i> Fire and Rescue Service	Service Départemental d'Incendie et de Secours
<b>SIDPC</b>	Defence and Civil Security Service	Service Interministériel de Défense et de Sécurité Civile (de la Préfecture)
<b>SIP</b>	Paillons Inter-municipal Syndicate	Syndicat Intercommunal des Paillons (SIP).
<b>SLGRI</b>	Local Strategy for Flood Risk Management	Stratégie Locale de Gestion du Risque Inondation
<b>SMBV</b>	The River Basin Syndicate	Syndicat Mixte des Bassins Versants
<b>SPC</b>	Regional Flood Forecasting Service	Service Régional de Prévision des Crues
<b>TRI</b>	High Flood Risk Areas	Territoires à Risque important d'Inondation

---

## Overview of key findings

Floods policy in France has evolved since the beginning of the 1980s: it relies increasingly upon integrated and diversified strategies, aiming at protecting population and goods against fluvial floods and marine submersions due to climate change. Although it remains mainly a public issue involving State authorities with a quite stable arrangement over the years, FRM in France is becoming more and more based on local policies due to the decentralisation process.

### 1. Main characteristics of flood risk in France

**Flooding remains France's most important natural risk** (60% of natural disasters and 60% of damage). About 17 million people (26% of the population) and 9 million jobs are located in flood-prone areas. The frequency of flood events in France is high compared to the other countries of the STAR-FLOOD consortium. However, major episodes were rare during the 20<sup>th</sup> and 21<sup>e</sup> centuries, which led to a low level of risk awareness among the population. Four types of flooding can be distinguished:

- Tidal floods and storm surges in the west and the north;
- Pluvial and flash floods in the south;
- Fluvial floods along the main rivers;
- Urban run-off in most cities

Since the 1980s, France has had a general risk policy that takes into account natural and industrial risks through a specific instrument, the Risk Prevention Plan (PPR). In 2001, the adoption of the Action Programmes for Flood Prevention (PAPI) introduced the principle of integrated flood risk management at local level. Even before the adoption of the European Floods Directive<sup>1</sup>, floods were considered to be the principal natural risk, thus justifying the development of a specific policy in this domain.

Notwithstanding the available scientific evidence, the impact of climate change on flood risk in France has not been clearly identified at this time. Nonetheless, at a political level, the link between climate change and flood risks has been stated through the National Adaptation Plan for Climate Change (2011). Specific adaptation measures adopted since 2011 have aimed at reinforcing the current flood prevention provisions: in particular, more knowledge needs to be developed on the connections between flooding and climate change at the level of hydrographical basins, the development of tools to better map floodable areas and the development of technical and economic tools to aid decision-making.

### 2. Main characteristics of the Flood Risk Governance Arrangement

**All the strategies identified in the STAR-FLOOD Project are present:** defence, prevention, mitigation, preparation and recovery. The main actors are central and local public authorities. Although civil society and the private sector are much less involved (mostly as ultimate funders), their involvement is growing.

---

<sup>1</sup> Directive n°2007/60/EC of 23 October 2007 on the assessment and management of flood risks, OJEU L288/27 of 6 November 2007.

Today, **prevention** is the main strategy in terms of social and political legitimacy: the State plays a central role in defining the non buildable areas. The principal resources come from the National Fund for Major Natural Hazards (NFMNH, also known as the “Barnier Fund”), which is funded by taxes on home insurance contracts. **Defence** represents the most dominant strategy in terms of public investment. The State<sup>2</sup> maintains a central position through the legislative initiative and the control of procedures, while responsibility for infrastructures is devolved to the municipal level. The main resources for maintenance are River Plans, Water Management Plans, the Action Programme for Flood Prevention (PAPI) and local plans. **Mitigation** does not represent a strategy in and of itself; rather, it is a set of measures to support other strategies that are mainly associated with the water sector. Nonetheless, the discourse on mitigation is powerful. Local authorities are the main actors for reducing the vulnerability of buildings and flood retention techniques (bottom-up approach). **Preparation** is a fairly stable strategy, and traditionally a State domain. Operationally, State services (at a *département* level) and municipalities manage civil security procedures. This is a multi-risk, and not simply flood-oriented, strategy. **Recovery** is a characteristic pillar of the French welfare system. It is a State domain through the Natural Disasters Fund (CAT-NAT), which relies operationally on insurance companies and insured clients as the main (compulsory) contributors.

We conclude that all the strategies are present, but do not appear to be aligned (that is, coordinated or articulated), and yet the reconfiguration of all the strategies under the banner of “prevention” is remarkable: a typical example of this is provided by the Action Programme for Flood Prevention (PAPI). In reality, this instrument, which – as its name indicates – is intended as an instrument for prevention measures, has a holistic approach, integrating all the strategies.

**Each FRMS represents a distinct sub-FRGA, except for mitigation.** Four sub-FRGAs have therefore been identified. Defence and preparation are the core of the historical flood policy. Defence is an informally centralised sub-arrangement, while preparation mainly means civil security: it is an intrinsically centralised and multi-risk mission. Prevention is part of a broader planning culture that is dominated by the principle of rigorous restrictions on construction in risk areas. Tensions between centralisation and decentralisation lie at the heart of dynamics in the prevention sub-arrangement. Recovery is based on the constitutional principle of national solidarity. The Natural Disaster Compensation Scheme (also called “CAT-NAT” system) embodies the solidarity principle. It can be considered to be one of the main features of the French flood policy. This arrangement results from a mix of centralised and private-public governance.

Although each sub-arrangement may be presented as isolated system, there are also **bridging processes**, characterised by a varying degree of formalisation and stability. The bridging process between prevention and recovery is the main one: the balance between these strategies is the core element of flood risk policy in France. Other emerging bridging processes are the result of an overlapping of instruments, rules, funding and/or actor responsibility. This is the case with defence and prevention as well as defence and preparation, which are progressively growing closer to each other as regards their operational functions. In the French FRM system, mitigation does not represent a clearly-identified sub-arrangement. Being an element of other policies, mitigation has a bridging role among all the sub-arrangements.

---

<sup>2</sup> We use the term “State” (with a capital S) to identify the central and deconcentrated public administration.



The **production of knowledge** on flood risk policy is noteworthy for the central role of the State. Nonetheless, local authorities now support the development of alternative and locally-specific knowledge resources.

Public partnership financing tools represent the main resources allocated to flood prevention. Today, local authorities (€240 million per year) and leaders of the Local Actions Programmes against Flooding (Action Programme for Flood Prevention – PAPI) are the main contributors. The State participates mainly through its budget line (€60 million per year) and the “Barnier Fund” completes these credits in an amount of €150 million per year through a levy raised from insurance contracts. The State also finances mitigation work, research activities and large emergency systems. The recovery strategy is the only one based on private resources (insurance premiums) but it is still framed and regulated by a public decision-making process.

Distributional effects are identified with regard to the “territorial” distribution existing through the CAT-NAT scheme: the more heavily-damaged regions can receive three to four times the amount of their contributions. The distributional effects of protection and prevention strategies are very hard to assess. At a basin scale, the most heavily-populated downstream areas are more protected than are the upstream ones. At a more local level, disengagement by the State is creating inequalities, as municipalities will have to find their own resources to maintain their system of protection.

### 3. Explanations for stability and change

**The prevention and preparation sub-FRGAs are significant for their stability.** This is characterised as follows: few private actors, lack of public participation and little involvement of local authorities. The case studies confirm the explanatory factors for stability, which are mainly linked to national factors: path dependency, centralisation and technocratic approaches, which are confirmed and strengthened by shock events.

**Two main dynamics are noticeable that characterise the evolution of the FRGA.** On the one hand, there is a diversification of strategies, giving a prevailing role to prevention (associated with mitigation) rather than defence and preparation. On the other hand, there is a redistribution of powers, leading to a broadening of the set of actors (especially through the rise of the importance of the governmental level of the urban agglomeration). Overall, flood risk management appears to be in transition, but the process is still in mid-stream.

These dynamics can be explained by two main factors. First, the European Floods Directive (FD) reconfigures the existing national tools. It provides the State with a way of rationalising its policy at a national level, and reinforces the role of local actors. Second, and more broadly, the decentralisation process is associated with the rising role of local authorities – especially inter-municipal cooperation bodies – in the implementation of strategies, and a progressive disengagement on the part of the State. This goes together with a discourse that is increasingly focused on empowerment of the population in flood prevention and on the need to rely on limited public resources. However, while decentralisation may represent a key factor for change, the process is not yet very advanced. The State still maintains control over the main policies.

There is no real coordination of actors and tools among the water, land use, building permits and civil protection sectors. The two principal difficulties are (1) the diversity of the laws, which divide urban, environmental and risk-planning tools; and (2) the fact that responsibilities are shared among multiple actors acting at different levels. Despite the connexions provided by law, horizontal fragmentation hinders effective coordination. The 2014 MAPAM Act<sup>3</sup> which creates a new competence for the management of the aquatic environment and flood prevention (GEMAPI) under the responsibility of municipalities, may have a positive effect on the coordination of these different domains.

A further change is represented by the new role of private citizens in the flood domain. New rules have led to increasing involvement in flood prevention and emergency management on the part of the public. At a local level, the involvement of private citizens is rarely sought and comparatively ineffective. Moreover, in large and economically strategic projects, the opportunity available to the general public to make an impact on decision-making processes is extremely limited.

The 2007 FD is being transposed in France since the "ENE Act" of July 12, 2010. Significantly, France added an additional Plan not listed in the Directive: the national strategy for flood risk management. The spatial level used for the application of the new provisions is that of the basin. In addition, the FD introduced the distinction between the evaluation phase and the risk management phase, which forced France to conduct studies to carry out preliminary flood risk assessments, flood risk mapping and Flood Risk Management Plans (PGRI). PGRI will be set up by the 22th December 2015. Consultation of stakeholders and the public took place during six months (2014-2015), following minimum legal requirements (website consultation). Regarding governance, even though the FD requires the involvement of all the "stakeholders" and requires formal public consultation, the State keeps its traditional leading role in FRM.

#### 4. Evaluation of resilience, efficiency and legitimacy

**Overall, FRGA can be deemed rather resilient and appropriate.** Nonetheless some important bottlenecks remain: the lack of legal flexibility, the lack of coordination between strategies and the low level of awareness among and involvement of the population.

It could be said that even though FRM may be seen as forward-thinking – especially as far as the diversification of strategies is concerned – the fragmentation of actions and a persisting level of centralisation and rigidity of the legal and institutional system represent the main obstacles to a resilient system. Concerning the **buffer capacity**, one may say that the current FRGA provides a good capacity of response especially at local level. Both national and local levels contribute to the **adaptive capacity**. The tendency of the national government is to provide tools which should enable local authorities to put in place appropriate local flood risk policies. At the same time the local level is increasingly able to produce its own expertise and to propose locally tailored solutions.

---

<sup>3</sup> Act on Modernization of Territorial Public Action and Affirmation of the Metropolis (MAPAM) of 27 January 2014.

---

Considering **legitimacy**, the participation of the main stakeholders in decision-making at both a national and local level is acknowledged, but it is often limited to actors from the public sector. France has developed specific tools of public participation such as public debate. However, whenever the economic impact of a project is high, the possibility that the public may have an impact on the decision-making process is particularly small. Besides, judges assume a political role as *arbitrators* among conflicting interests because these interests cannot identify an opportunity for confrontation or resolution through the traditional channels for political disputes.

National and local level analysis confirm the difficulty of evaluating the FRGA according to **efficiency** and this represents the peculiarity of the French context compared to other countries of the consortium.

## 5. Good practices, options for improvement and recommendations

**To strengthen French FRM, it is sensible to go further with decentralisation:** strengthening integration of spatial planning and FRM by making risk planning a local competence. Improvements in private citizen participation and agency should also be made. In fact, citizens are already considered to be primary actors with reference to their own safety. Nonetheless, they can only be key actors if political participation is sought more effectively than it is today. Besides, local strategies present an exceptional opportunity for overcoming the traditional opposition between the State and local authorities. Through circular approach, the Local Strategy for Flood Risk Management (SLGRI) can be an important element for driving forward improvements in terms of planning and creating real collaboration between the State and local levels in order to ensure consistent and equal implementation. The Action Programmes for Flood Prevention (PAPI) can also be cited as good practices because they are designed to integrate all FRMS into a single funding scheme. Potentially, the CAT-NAT system represents both good and bad practice: it is a very good and efficient recovery measure, but it does not encourage prevention.

---

## 1. Introduction

### 1.1 Introducing flood risk governance in France

Flooding is the most threatening natural risk in France, which faces multiple types of flooding with high frequency. France did not experience such extensive flooding episodes in the 20<sup>th</sup> and 21<sup>st</sup> centuries, except for the 1910 floods in the Paris region.

France faces a wide variety of situations throughout the country, with multiple types of flooding:

- tidal floods and storm surges in the west and the north;
- pluvial and flash floods in the South;
- fluvial floods along the main rivers;
- urban flooding in most cities.

Consequently, the French do not seem to be especially sensitive to the flood risk, however (Roy, 2008). They consider themselves to be very poorly informed about natural risks, and do not know what risks their *Commune* is exposed to. By the same token, they do not treat flood risk as a high priority domain for public policies, even in relation to water management. They are not concerned about the problem, and are not willing to take measures or adapt their behaviour (IFOP, 2013; IRSN, 2013).

This report will demonstrate that flood risk management has traditionally (and constitutionally) been a matter for the central State. Protection against flooding is not written into the French Constitution, but the interpretation provided by constituents and extensive case law has created a true compensation scheme in the event of natural disasters that has a constitutional value. This report will also point out the diversity of actors' organisations at a local level, due to certain specific territorial contexts and political constructions.

This report will also highlight a changing context in the progress of the decentralisation movement in favour of local governments, especially regional and inter-municipal bodies and will show how the rising role of local actors help to enhance the resilience of the floods policy. Moreover, policy recommendations and implications over flood risk management policy will be discussed.

### 1.2 Research aims and questions

This report is a deliverable of the EU 7<sup>th</sup> Framework STAR-FLOOD Project (see [www.starflood.eu](http://www.starflood.eu) for an outline of the project). STAR-FLOOD focuses on flood risk governance. The project investigates how current flood risk governance arrangements might be strengthened or redesigned to enhance society's resilience to flooding. To this end, it assesses to what extent governance arrangements support or constrain the diversification of Flood Risk Management Strategies, as well as the extent to which a diversification of strategies enhances society's resilience to flooding. Empirical research is carried out in six European countries – England in the UK, Belgium, France, the Netherlands, Poland and Sweden – and eighteen vulnerable regions in these countries. The Project assesses Flood Risk Governance from a combined public administration and legal perspective.

This report is Deliverable 3.7 of the third Work Package of STAR-FLOOD. The first Work Package provided an extended problem analysis related to Flood Risk Governance in Europe and the second Work Package focused on how Flood Risk Governance in Europe should be researched. Work Package 3 reports the main results of the empirical research through six country-specific reports, each of which identifies the architecture of flood risk governance, analyses flood risk governance and evaluates current arrangements for governance in terms of *resilience*, *effectiveness*, *legitimacy* and *efficiency*. These findings are supported by inter-disciplinary research conducted at a national and case-study level.

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

### Box 1.1 Research questions of this report

#### National level research questions

1. How is the National Flood Policy and Regulation System (NFPRD) structured? To what extent is there cohesion among sub-Flood Risk Governance arrangements?
2. To what extent are the five Flood Risk Management Strategies distinguished by STAR-FLOOD (see below) embedded in the NFPR? Is there evidence to suggest that efforts are being made to diversify Flood Risk Management Strategies and the measures employed within these strategies?
3. In what ways is the National Flood Policy and Regulation domain linked to other relevant policy domains? In what ways do they enable or constrain flood risk governance?
4. How has the NFPR changed over time? What explanatory factors account for periods of stability and/or change?
5. To what extent can the current NFPR be characterized as resilient, efficient and legitimate? How has this changed over time?

#### Case study research questions

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

In France, the so-called “flood policy” is a relatively recent domain that has mostly been taking shape through advances in technical and scientific knowledge (flood forecasting systems, climate change forecasts, sophisticated modelling of dike breaches, projections of flood impacts on national and local economies, *etc.*) on the one hand, and the progressive definition of a complex legal system of competences and responsibilities on the other. How do these factors combine to provide an answer to increasingly flooded communities?

When considering flood policy in France, one must take into account the more general reform processes of the administration since the 1980s towards progressive decentralisation of powers and responsibilities.

With this framework in mind, this report will pay attention to the relationship between the national and local levels in the development and implementation of FRM policy. The extent to which these

---

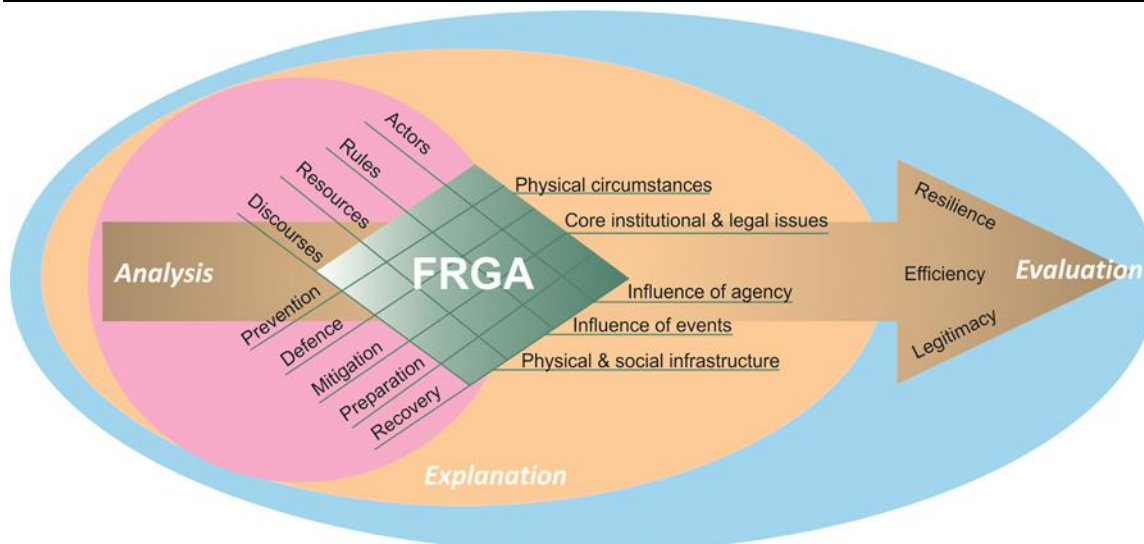
two levels match or diverge in their approach to FRM will also be assessed. The margin of action for the development of local policies will also be a matter of interest. This report will also focus on variables that contribute to define the flood issue. It will be important to understand the extent to which the flood domain informs the reconfiguration of public action more broadly?

Our three case studies have been selected because of the specific attention they pay to the flood issue *a priori*. Based on the case studies, this report will assess the extent to which it is possible to identify similar approaches or patterns in the FRMS and the reasons why it is not possible in some cases. A focus will also be made on the lessons learned and best practices from the case studies. Can a flood risk become an opportunity? Within the framework of the decentralisation process, this domain may provide local actors with the opportunity to assert themselves and reinforce their legitimacy. Last but not least, it is our intention to adopt a reflective posture vis-à-vis our theoretical and methodological architecture by asking what the potentials and limits of the STAR-FLOOD framework are in the case of France.

### **1.3 Research approach and methods**

#### **1.3.1 The STAR-FLOOD Project framework**

In order to analyse stability and change in Flood Risk Governance Arrangements, the STAR-FLOOD Project draws on the Policy Arrangements Approach (PAA). Policy arrangements have been defined as “a temporary stabilisation of the content and organisation of a policy domain” (Van Tatenhove *et al.* 2000). By studying the development of these policy arrangements over time, the degree of stability or dynamics therein can be analysed. The PAA is claimed to link up all the relevant dimensions of a policy domain (actors, discourses, rules and resources), and hence to enable a study of the policy arrangement as a whole. The approach has been applied in earlier studies of environmental policies, nature conservation and water management (Van Tatenhove *et al.* 2000; Arts *et al.* 2006; Wiering and Arts 2006). Two features make it particularly useful for analysing FRGA. First, it combines and integrates different concepts within frameworks of policy analysis (*e.g.* policy network models, discourse analysis, the advocacy coalition framework and regime theory in international relations) and includes both structure- and agency-related elements of institutional analysis, thus electing for a more sociological approach (Giddens, 1984). Other approaches are less comprehensive in terms of the dimensions they include. Second, as shown in figure 1.1 below, the four dimensions of the PAA allow for the inclusion and integration of legal factors in the analysis.



**Figure 1.1 Overview of the set-up of the research, including all research steps**

Flood Risk Governance Arrangements (FRGAs) can be defined as institutional constellations that result from an interplay between the actors and actor coalitions involved in all policy domains relevant to flood risk management, including water management, spatial planning and disaster management; their dominant discourses; the formal and informal rules of the process; and the power and resource bases of the actors involved (Hegger *et al.* 2014). FRGAs can be analysed on different levels, including local, regional, national and international.

To help us identify the FRGA, the STAR-FLOOD Project refers to the notion of Flood Risk Management Strategies (FRMS), which are categorised as prevention, defence, mitigation, preparation, response and recovery. A number of Flood Risk Management measures can be grouped into these strategies, and by examining them, we can test our starting assumptions that diversity is a necessary feature of resilient governance (figure 1.2).

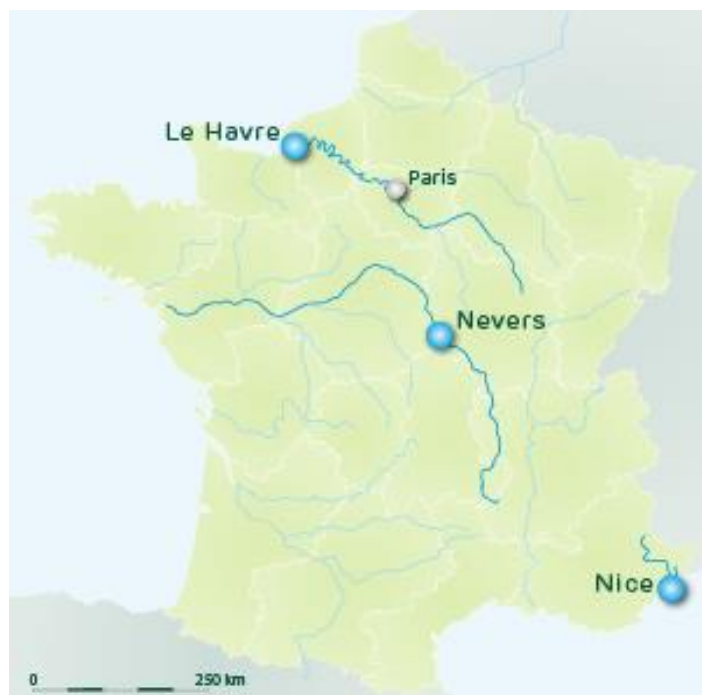


**Figure 1.2 Overview of the five Flood Risk Management Strategies identified within STAR-FLOOD**

While flood risk governance will be evaluated at each stage of the project (first at a national level and then at a case-study level), we consider evaluation to be the result of a process of comparison between national and local implementation. In other words, the ultimate goal of evaluation is to understand the extent to which local implementations differ or are in line with the national framework and how the national system works in practice. It is then built through different stages: first, in Chapter 2 we will provide an overview of the elements of strength and weakness at a national

level, and these elements will then be investigated at a case-study level. Finally, in Chapter 7 we will proceed to an overall evaluation of the flood risk governance system.

### 1.3.2 Reasons behind the choice of case studies



**Figure 1.3 Map of the selected French case studies.**

*Source: MarCom-Carto – Faculty of Geoscience – Utrecht Univeristy*

The three case studies, Nevers, Le Havre and Nice (cf. Figure 1.3 for localisation), have been selected according to their administrative, geographical and economic features in order to comprehend the diversity of local French configurations. Three of the main river basins were selected on the basis of their climatic and hydro-geographical specificities: flash floods, river floods, marine submersion and urban run-off.

We analysed the extent to which urban development takes into account the level of risk more specifically. Urban pressure represents an important variable to be taken into account in analysing the flood issue as it is often in the context of this binomial – risk and urban development – that the flood “problem” is developed in local contexts.

Lastly, we looked at the various governance frameworks that have integrated flood risk management as an important issue. In this regard, it is interesting to note that our three case studies present varying degrees of consistency compared with traditional national configurations in this domain: from the one that is most consistent with national policy (Nevers), to an affirmation of independent policy management (Le Havre), to the development of a new State-local configuration of governance (Nice).

In particular, we relate the history of:

- a local solution framed in the tradition of centralised, expert-based management (Nevers),



- a case study in which the local inter-municipal body develops its own position and expertise in the domain of flooding and issues a challenge to central government (Le Havre).
- the emergence of a flood risk governance coalition including the State and local authorities in order to implement a solution that combines risk and development (Nice).

Nevers lies on the river Loire, which is the longest river in France and flows through the centre of the country (see table 1.1 and figure 1.3). At the heart of the problem is the renovation of old protection infrastructures. This has triggered the development of a master plan by the inter-municipal body that combines defence and mitigation solutions. Nonetheless, the low level of urban pressure and financial stakes do not permit integration of the flood issue into urban planning, as a result of which the risk is framed purely as a “water problem”. Finally, Nevers exemplifies implementation of the national policy, with few adjustments for the local context.

Le Havre is located on the estuary of the River Seine, in the north-west of the country (see table 1.1 and figure 1.3). The core of our analysis is the role played by the inter-municipal body in identifying innovative solutions for combining risk management and agricultural development, on the one hand, and in challenging the State’s expertise and authority in the definition of the marine submersion problem on the other.

Nice is located on the Mediterranean coast, in the South of France (see table 1.1 and figure 1.3). The Operation of National Interest (OIN) on the River Var lies at the heart of our analysis. The local authorities and the State have jointly put into place a master plan for the future development of the city. After a lengthy, and not always transparent, process, the coalition has managed to adapt and integrate risk in development projects and to derogate from the national doctrine. Management of the Paillon provides a contrasting example: the reduced possibility of a further development of the valley has led the local authorities to adopt a low level of engagement in the river and in the flood question. The Table 1.1 below summarises these different criteria.

**Table 1.1 Key characteristics of selected case studies and research motivations**

	<b>Case study 1: Nevers</b>	<b>Case study 2: Le Havre</b>	<b>Case study 3: Nice</b>
Region and Department	Bourgogne/Nièvre	Haute-Normandie/Seine Maritime	Provence-Alpes-Côte d'Azur/Var
City population/ population density	~ 70,000 2,038 inhabitants per/km <sup>2</sup>	~ 300,000 3,688 inhabitants per/km <sup>2</sup>	~ 1,000 000 4,778 inhabitants per/km <sup>2</sup>
Basin	Loire-Bretagne	Seine-Normandie	Rhône-Méditerranée-Corse
Types of flooding	River overflow	Run-off/marine submersion	Run-off/river overflow
Properties at risk from flooding	5,700 houses 450 companies (EGRIAN, 2013)	76,500 inhabitants (Marine submersion: 54,000) 64,000 employees (marine submersion: 70,000 ) (DDTM 76, 2014)	76,600 inhabitants (45% of the basin’s population), more than 11,000 companies and 43,000 employees. (Insee, 2009)
Local development	Low land pressure and low economic development	Low land pressure but important economic development with the harbour of Le Havre	Very high land pressure and high economic development
Research motivation and	Low stakes at risk but huge infrastructure management	Separation of governance between two types of risk:	Very high stakes at risk along the Var riverbed

governance configuration	with the Loire dikes Involvement of inter-municipality in expertise and FRM	run-off and marine submersions Powerful local actor in the field of flood management with the inter-municipality (Inter-Municipality of Le Havre – CODAH)	Local configuration of actors very specific with State interference in local affairs (Operation of national interest - OIN)
--------------------------	--	--	---

### 1.3.3 Working methods and approach

Our analysis is based on a variety of methods.

#### *Document analysis*

Different types of resources were mobilised:

- Scientific literature in the social sciences dealing with environmental issues, risks, flood policies, case-specific literature on risk policies and local development, legal issues;
- Public reports to Parliament, the Senate and the Prime Minister;
- Policy programmes at a European, national and local level on flood-related issues;
- Case law;
- European and French legislation;
- Documents applicable at a local scale (local plans, Flood Risk Prevention Plan - PPRI, river contract *etc.*); and
- Web resources.

#### *Interviews*

64 interviews were conducted using a semi-structured approach. Most were face-to-face, and a small number were conducted by telephone. This report is substantially based on interviews, but the statements of the interviewees are not reproduced in full, they are synthesised.

We attempted to cover all the main institutions dealing directly or indirectly with the flood issue at a national and local level. In order to achieve this, we focused on the STAR-FLOOD flood strategy and policy sectors: prevention, defence, mitigation, preparation and recovery.

At a country level, we first interviewed civil servants at the Ministries involved in the definition and management of flood risk. We then turned to public experts and parliamentarians involved with the flood issue at a national and local level. We also met representatives from the insurance sector.

At a local level, we identified the public actors who were legally responsible for and/or voluntarily involved in flood risk management: State services at a regional and *départemental* levels, municipalities and inter-municipal bodies, *Départemental Councils*, River Basin Water Boards and syndicate and associations.

Overall, most of our interviewees (47) are representatives from the public sector. This is due to the fact that flood policy in France is mainly managed by public institutions, and the legitimacy of the policy is held entirely by this sector. All types of public actors were selected: elected, administrative, and operational.

Actors from the private sector (14) were included in our sample provided that they played a strategic role in our analysis: insurance companies (2), one company (Nice airport), a harbour authority (Le Havre) and associations from civil society (10), in particular environmental associations. Experts and academics were also part of our sample (3).

For each case study, the interviews were then supplemented with **fieldwork visits guided by local actors**. On different occasions, interviewees took us to significant sites involved in flood management projects in order to give us a better understanding of the specific problems associated with flooding in a certain area and the potential and limitations of the available solutions.

*Attendance at conferences* organised by public institutions on ongoing reforms in the flood sector allowed us to gather information and elements of the public debate on this topic, especially the “STAR-FLOOD Country and Case Study Workshop: presentation and discussion of case study and national analysis results with co-workers and co-thinkers, Paris, 2 April 2015”.

## 1.4 Outline of the report

The outline of this report is as follows. Chapter 2 focuses on an understanding of the National Flood Policies and Regulations System (NFPRS) in France, which are described in terms of an (overarching) flood risk governance arrangement (FRGA). This provides insights into the main features of the governance of flood risks at a country level. After elaborating on the relevant context-related variables, we provide a review of current flood risk governance arrangements and the extent to which Flood Risk Management Strategies (FRMS) are embedded in this arrangement. To understand how and why governance has developed in this way, Section 2.4 aims to provide explanations for the outlook of the current flood risk governance arrangements, including stability and change in the national arrangements and the relevant legal factors. In order to provide sufficient insight into these factors, a baseline date of 1982, which marked a turning point in French policy in general, was selected. This Chapter raises interesting questions to be taken up at the case-study level. Chapters 3 to 5 analyse, explain and evaluate developments in the case studies of Le Havre, Nevers and Nice respectively. Based on Chapters 2 to 5, Chapter 6 provides overarching explanations, and Chapter 7 provides a full evaluation of the developments studied. Both chapters combine insights from the national level and the case study level. Chapter 8 concludes this Report by offering suggestions for strengthening and redesigning flood risk governance in France.

## 2. Analysis of national flood risk governance

### 2.1. Introduction

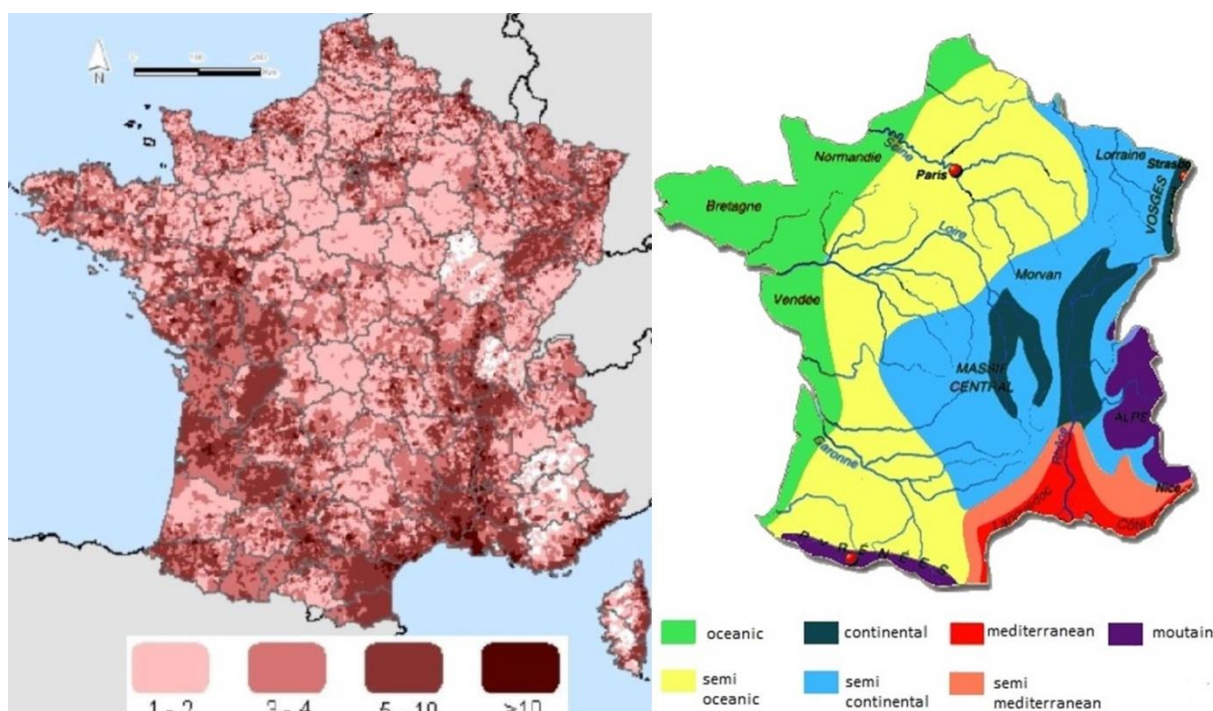
This chapter offers an account of national flood policies and regulations in France. It provides insights into the main features of the governance of flood risks at a country level. First, relevant context-related variables are presented (2.2), then an overview of national flood risk governance and the main features of stability and changes therein since 1982 is provided (2.3). Explanations for the national flood risk governance configuration are then developed (2.4), followed by a brief evaluation at a country level (2.5). Section 2.6 concludes this Chapter.

### 2.2 The context level

#### 2.2.1 Physical circumstances

France has six main water basins (river basin districts, as defined in the Water Directive) corresponding to the areas of jurisdiction of the six water agencies. The country's six water agencies play an important role in bringing together basin-level stakeholders into a "Water Parliament", in levying water abstraction and wastewater discharge fees, and in financing infrastructures with the revenues from these fees. Owing to heterogeneous climatic influences, France faces a wide variety of situations throughout the country, with multiple types of flooding (see Figure 1):

- Oceanic marine submersion (tidal floods and storm surges) on the west coast and in the North;
- Mediterranean flash floods;
- Slow floods along the four main rivers (Garonne, Loire, Rhône, Seine).
- Urban flooding in most cities.



**Figure 2.1** Number of declarations of Natural Disaster (CAT-NAT) due to floods between 1982 and 2010 by Commune, and climate in France

Source: Agence de l'Eau Rhône-Méditerranée and [www.cartesfrance.fr](http://www.cartesfrance.fr), translated by the authors

## Box 2.1 Climate change projections in France

(Preliminary Evaluation of Flood Risk (EPRI) -MEEDE, 2012)

In January 2011, researchers from Météo France published the results of various climate scenarios obtained from the application of two French models (report of the task assigned to “mission Jouzel (3)”, ONERC). Above all, these models illustrate the likely increases in average temperatures, while the results for precipitation are less clear. Based on a moderate scenario of increased greenhouse gases (B2) by the end of the 21<sup>st</sup> century, the average rainfall will increase slightly in winter and decrease substantially in summer. Following a scenario of sharply increased greenhouse gases (A2), climate change would be much more marked, including a sharp decline in summer rainfall (20% to 35%), and developments accentuating certain climate extremes. (...) In the course of a recent programme (PHRH CEMAGREF, Renard *et al.*, 2006), researchers identified no overall changes in operations at 195 French hydrometric stations, either during flooding or at low water levels or under normal conditions. At a more regional level, however, certain developments have been detected, but only three regions show significant changes. (...) Although extreme flows do not yet appear to have experienced any changes, the so-called general circulation models (numerical models of global atmosphere and ocean systems) forecast substantial future changes in temperature and, to a lesser extent, precipitation (Grésillon *et al.* 2007). A detailed description of the evolution of extremes from these models is considered by the scientific community to be premature, because coupling hydrological models and climate models is still difficult.

**Table 2.1 The main geographical and demographic characteristics of France**

Criteria	Main characteristics of France
Area	551,500 km <sup>2</sup> (675,417 km <sup>2</sup> with overseas territories)
Coast line	3,427 km
Elevation	Lowest: -4 metres Highest: 4,810 metres
Flood-prone areas	15% of the country (85,000 km <sup>2</sup> ) Floodplains (North and Rhône Delta); four main river basins: Rhone, Loire, Seine and Garonne
Stakes	17 million people and 9 million jobs are located in flood-prone areas 1.4 million people and 850,000 jobs are located in storm surge-prone areas
Urbanised Area	22%
Population	86% (2014)
Population	65,821,000 (2013) <ul style="list-style-type: none"> <li>– Probable increase by 15% by 2040 (INSEE, 2010)</li> <li>– The Atlantic coastal areas (10 <i>Départements</i>) may absorb over 20% of this growth between 2007 and 2040.</li> <li>– By 2040, therefore, the coastal <i>Départements</i> may include 40% of the French population (against 38% in 2007)</li> </ul>
Population density	117 per km <sup>2</sup>
Anticipation of climate change	<ul style="list-style-type: none"> <li>– the Ministry of the Environment has judged the rainfall and flood projections for 2050 or 2100 to be too heterogeneous and uncertain to include their impact on fluvial flooding</li> <li>– the hypothesis that the sea level will rise by one metre by 2100 has been adopted and integrated into the Preliminary Flood Risk Assessment (EPRI) (ONERC, 2009)</li> </ul>

### 2.2.2 A brief history: evolution of the French flood policy

Table 2.2 presents a historical approach to flood management strategy in France. Each period is defined according to key events in terms of societal, economic or catastrophic occurrences. The trends focus on long-term or structural factors. Since the 1980s, regular floods influenced the flood management policy, which is characterised by a global, multi-risk approach.

**Table 2.2 Historical approach to flood management strategy in France**

Event	Date	Flood policy development
	1982	Creation of "CAT-Nat" compensation system (the Natural Disasters Scheme)
1987: Grand-Bornand disaster (€107 million of damage and 27 victims) 1988: Flooding in the Gard <i>Département</i> (€500 million of damage and 10 victims)	1987 1990	Obligation for the local planning documents to take risk into account. Creation of the Municipal Information Document on Major Hazards (DICRIM) and the <i>Départemental</i> Document on Major Hazards (DDRM) to inform the population.
1992: Major flood events in the South of France, especially the Vaison-la-Romaine event (47 casualties and €500 million of damage)	1995	Creation of the Risk Prevention Plan ( <i>Plan de Prévention des Risques Naturels</i> , PPR) Creation of the «Barnier Fund» to finance expropriations and measures for vulnerability reduction
1999: flood events in the South (€533 million damage and 36 victims), major storm in December (€1 billion of damage and 10 victims) 2001: "AZF event". Explosion of a chemical plant in Toulouse. 2002: major flood in the Gard <i>Département</i> (€1.2 billion of damage and 23 victims) 2003: major flood event across the entire country: €1.5 billion of damage and 10 victims	2003	Creation of the Action Programme for Flood Prevention (PAPI), and integrated management plan co-financed by the State and local government. Creation of a new forecasting and alert service, cooperation between the Directorate for Risks and Meteo France (Flood Forecasting Service - SCHAPI) Creation of the Advisory Board on the Prevention of Major Natural Hazards ( <i>Conseil d'Orientation et de Prévention des Risques Naturels Majeurs</i> , COPRNM) and the Flood Committee ( <i>Commission Mixte Inondation</i> , CMI) which gathered all interested actors together to define the new policy lines and approve the Action Programme for Flood Prevention (PAPI)
	2004	Creation of a new plan for crisis management at a local level: local disaster plan. Citizens are defined as the main actors responsible for their own safety
	2006	Reorganization of the water system created by former laws taking into account climatic changes
	2007	Establishment of a classification of dikes in order of importance, and definition of assessment and maintenance obligations
	2009	Formalizing of the 268 Grenelle commitments. PAPI 2 <sup>nd</sup> generation
2010: Xynthia event (storm surge, Atlantic coast). 47 victims. Another flood event in the south: more than €1.5 billion of damage, 25 victims	2010	Creation of the Rapid Submersion Plan (PSR): 6-year-plan aimed primarily at the safety of individuals, including many measures on prevention, preparation and protection Enhancement of the PAPI. Modification of the ORSEC plan First transposition of the Flood Directive
	2011	Final transposition of the Flood Directive following an action brought by the European Commission before the EU Court of Justice
	2014	Automatic transfer of the management of aquatic environments and flood prevention (GEMAPI) to municipalities, possibility of transfer to inter-municipal communities Possibility of the creation of a tax by territorial communities Delimitation of the powers of River Basin Water Boards (EPTB) and the Local Water Management Organisation (EPAGE)

## 2.2.3 General characteristics of the demographic, socio-cultural and socio-economic context

### Demographic and socio-economic context

**Table 2.3 Major demographic characteristics of France**

Source: Insee, 2001-2015

Residents (France Metropole)	Households	Residents per household	Population density/km <sup>2</sup>	Average age	Average household income (€)
64,200,000 (2015)	28,000,000 (2011)	2.26 (2011)	117 (2013)	41 (2015)	20,603 (2012)

**Table 2.4 Evolution of French GDP between 1990 and 2013 in Million €**

Source: data.worldbank.org

1990	2000	2010	2013
1,275	1,368	2,646	2,806

**Table 2.5 Major socio-economic developments**

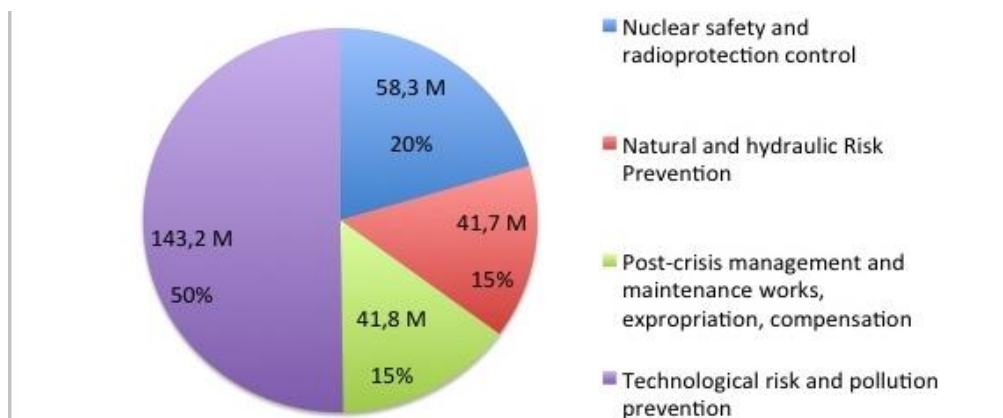
Date	Socio-economic development	Impact on flood risk management
1981	Socialist era commences	Development and implementation of the solidarity system
1992	European macroeconomic convergence criteria laid down in the Maastricht and Amsterdam treaties	The European objective impacts public spending by the State as well as local administrations, causing a reduction in human resources and the amount of investment
2007	Law on general revision of public policies	Budget streamlining ("rationalisation") entails the development of co-financing tools between State and territorial authorities ("contractualisation")
2008	Sub-prime crisis	Significant budget cuts accelerate the transfer of competences from the State to local authorities (through decentralisation) and the use of co-financing among public authorities, as well as funding from private sources, for instance by using the insurance system (see below)

### Box 2.2 evaluation of cost of the policy and risks

<p><b>A strong economy...</b> 6<sup>th</sup> among the world's economies Growth rate: on average 0.4% over the past 3 years (Insee)</p> <p><b>...Vulnerable to flooding</b> Estimated damages of a 100-years flood on the Seine: over €40 billion (OECD, 2014) (calculated on the reference flood of 1910) Estimated damages on the Loire: (Torterotot, 2009)</p> <p><b>Damages higher than investments in prevention</b> Investments in prevention: €350-400 million (more or less 1/1000 of global French expenditures per year). Annual insurance costs: €800 million Growing issue of climate change: impact on potential damages of flooding remains underestimated</p>
--

### *Global repartition of public resources allocated to flood risk management*

Risk management in France is characterised by a global, multi-risk approach influenced by the historical development of industrial risk management. The distribution of the State budget for all kind of risks reflects this approach (through a specific budget programme including all risks) and the respective weight of each type of risk (see Figure 2.2).



**Figure 2.2 Distribution of State credits among different types of risk (Programme 181)**

Source: MEEDE, 2013

On average, €350 to €400 million are allocated for flood risk prevention: €155 million from the State and “Barnier Fund” and €240 million from territorial authorities (CGDD, 2014). The allocated State budget (through Programme 181) has been steadily decreasing (nearly -30% between 2012 and 2013). This has led to a shift in the funding of a number of actions from the State’s programme to the “Barnier Fund” (and through it indirectly to private actors) (see 2.3).

## 2.2.4 The French administrative structure and legal system

### *The institutional and administrative structure*

France has a strong tradition of centralisation, which explains why the central State is comparatively powerful (see political culture and box 2.4), but from a constitutional point of view, its organisation is decentralised (Waline, 2014). Two main types of public authorities must be distinguished: State services and local authorities.

The State authorities (executive power) are composed of:

- central Ministries. As regards flood risk policy, the Ministry of the Environment is responsible for prevention and defence. The Ministry of the Environment and the Ministry of the Interior are the two principal Ministries that deal with preparation;
- deconcentrated services at a regional and *départemental* level (*Préfectures*) are responsible for the control of legality, implementation of the State budget and levying and redistribution among the various territories; and
- agencies (State public bodies) such as the six Water Agencies in charge of water management at a basin level.

The territorial authorities partly share the same geographical scales (cf. Figure 2.4):

- Regional Council (in 22 Regions, to be reduced to 13 in January 2016), which are responsible for strategic planning and economic development;



- *Départemental* Council (in 95 metropolitan and 5 overseas *départements*), which are in charge of social services and solidarity mechanisms between urban and rural areas;
- Municipalities (36,700), which are in charge of proximity services for the population, usually through inter-municipal bodies (by means of a transfer of competences organised according to their size). Some inter-municipal bodies (Syndicates) may also group *Communes* together with *Départemental* Councils and Regional Councils. It should be noted that Mayors are also State representatives through their police powers, and act in the name of the State when implementing the Civil security response organisation Plan (ORSEC).

Two powerful trends should be highlighted in relations among public authorities: decentralisation is accelerating, and cooperation among territorial communities is strengthening (box 2.3).

The decentralisation process, which was initiated in 1982, has incrementally transferred powers to the territorial levels. There is no hierarchy among the various levels of local government: according to the principle of “general competence”, each local authority has the power to make decisions beyond the areas of competence which are expressly attributed to it by law, if the decision is justified by a local public interest (Waline, 2014). This general competence operates as a guarantee of power and freedom for local authorities, but it can also lead to an overlapping of powers that complicates the decision-making system.

At the same time, political cooperation among municipalities is becoming closer. For instance, inter-municipal bodies have been elected by direct suffrage since 2014. Similarly, other forms of cooperation among territorial authorities are developing, although their development sometimes leads to competition. The main territorial cooperation bodies are:

- Inter-Municipal Cooperation Organisations (EPCI): municipalities unite to manage certain general and technical competences at an urban basin level. These competences, which include public transportation, land settlement and environmental issues, are transferred to the inter-municipal body;
- Inter-Territorial cooperation: these are dedicated to one specific task such as water management. They can bring together not only municipalities but also *Départemental Councils* and Regional Councils at a river basin level, as in the case of River Basin Water Boards (“EPTB”) (Pustelnik, 2008, Waline, 2014).
- The empowerment of local governments will be legally reinforced in a near future in the field of floods policy, by the creation of the GEMAPI competence in 2016 (cf. box 2.3).

### **Box 2.3 The new “GEMAPI competence”: the management of aquatic environments and flood prevention**

Constituting a major legislative reform (2014 MAPAM act), the GEMAPI competence is transferred to municipalities. Owing to a large number of floods that led to many victims and a great deal of damage, integrated management became a necessity. It consists of transferring this now mandatory competence – which obliges municipalities to maintain banks, rivers and lakes, to develop watersheds, to restore aquatic environments and to defend against floods and the sea – to municipalities. It can be transferred to an Inter-Municipal Cooperation Organisation (EPCI) if the *Commune* is a member of one.

The EPCI can also delegate to a group of communities such as a river syndicate, Local Water Management Organisation (EPAGE) or River Basin Water Board (EPTB). In this way, for instance, the community in charge of the GEMAPI can use Public Interest Declarations (DIG) and servitudes in order to carry out work on private properties.

The MAPAM act offers the possibility of establishing a tax of up to 40 Euro per inhabitant. Here, we can note a certain level of disengagement on the part of the State, which has transferred a competence to public communities without their having a real budget to take on this new management responsibility. This is why some conservative Deputies and Senators have not always agreed with this prospect during the parliamentary debates. There are two distinct cases to be considered here, however. On the one hand, large cities may benefit from the transfer, which might be compared to an increase of power, but on the other, smaller cities are obliged to take this new management responsibility upon themselves without having enough money to pay for it, as they already have to bear a large number of compulsory expenses.

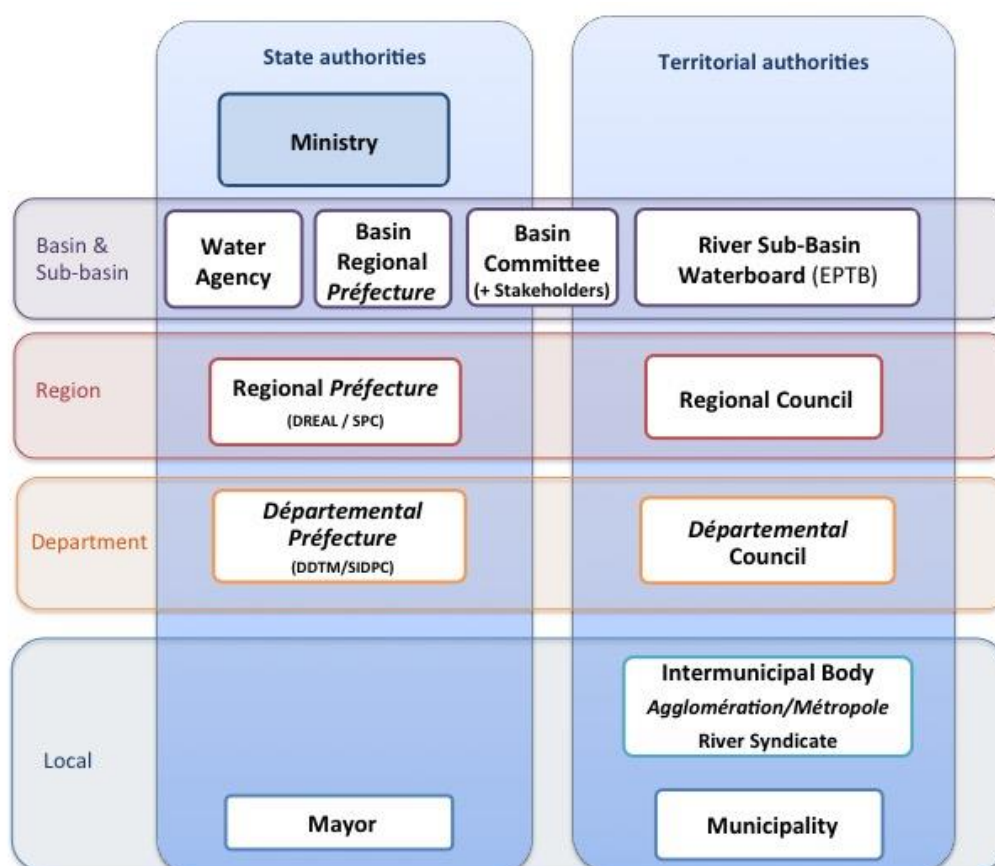
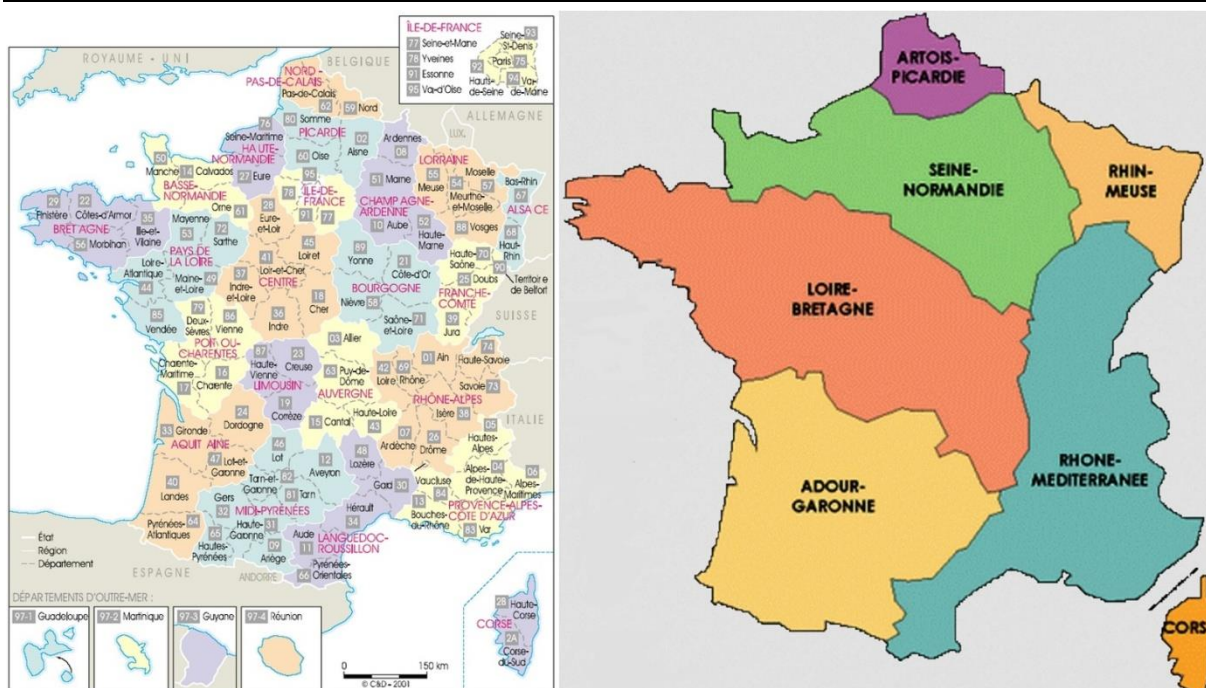


Figure 2.3 The main actors involved in flood risk management strategies at various levels, from national to local

**Legend**  
 DDTM: *Départementale* Directorate for the Territories and the Sea  
 DREAL: *Regional* Directorate for Environment, Land Planning and Housing  
 SIDPC: Defence and Civil Security Service  
 SPC: Regional Flood Forecasting Service  
 EPTB: River sub-basin Water Board



**Figure 2.4** Map of the French Regional and Départemental Councils / River Basin Water Boards  
 Source: [www.cartesfrance.fr](http://www.cartesfrance.fr)

**Box 2.4 The main characteristics of the French political and juridical environment**

**Administrative and Political Structure**

- Semi-Presidential Republic: in particular, the President of the Republic is elected by direct suffrage, which means a strong executive.
- Unitary State: the political power of the central State is strong; its geographical administrative organisation relies on the scale of the Regions (deconcentration).
- Sectorial Decentralisation: various areas of public action are transferred to public bodies that have a certain level of autonomy from the State (e.g. public basin organisation).
- Political Decentralisation: territorial communities (Regions, *Départements* and *Communes*) have increasing autonomy. Territorial communities may cooperate on certain issues (e.g. River Basin Water Boards)
- Inter-municipal Cooperation: municipalities join together in public bodies, which increases their power. Inter-municipal cooperation can be sectorial (e.g. River Syndicates) or general (inter-municipal public bodies).

---

### *The political and administrative culture*

One of the most important features of the French political culture is its high degree of centralisation, or “Jacobinism”. The French nation is based on the concept of an indivisible Republic<sup>4</sup>. This is a political doctrine that tends to organise State power based on a strong administrative structure relayed by highly centralised, hierarchical and technocratic decision-making. The French political culture is also characterised by the idea of national solidarity. Solidarity is a demonstration of a powerful vision of the unitary State, and goes together with the equality between individuals and territories that makes up the nation.

Over the past thirty years, successive decentralisation laws have given more power and competences to local authorities (such as economic development, environment policies and also – and more importantly – urban planning). As a result, the centralised culture is today counterbalanced by the increasing power of local authorities, in particular municipalities that join together in inter-municipal bodies (Auby *et al.*, 2009). This can lead to a certain amount of tension between local and central powers, although elected representatives can hold several mandates concurrently, thereby ensuring specific links between national and local offices. The balance between these tensions and links creates specific local contexts that influence the development of local flood risk policies.

“Jacobinism” also leads to a low level of public participation and a lack of consensus (Prieur, 2011). Policies have a strong top-down dimension, which is in part linked to the central role of the State in the configuration of the French welfare system; this situation is even more applicable in the case of risk management policies. Indeed, risk management falls within the wider sphere of civil protection and safety, which is considered to be one of the main prerogatives of the central State (Waline, 2014).

Although some effort has been made to incorporate more consultation of the general public into urban planning, risk management nevertheless seems to be fairly resistant to increased public participation, with the notable exception of various collaborative governance cases at a national level (Advisory Board on the Prevention of Major Natural Hazards - COPRNM, Flood Committee - CMI) and at regional and local levels (CDRNM, COMITER, COPIL Local Strategy for Flood Risk Management - SLGRI).

French political culture is also characterised by a strong public initiative. Private partners are not especially influential in the earlier stages of policy-making: it is usually local authorities or the State that drive new projects. With the notable exception of the Natural Disaster Insurance Scheme (CAT-NAT) (see §2.2.5.), the private sphere and civil society have very limited means of action for implementing their views. They act more as whistle-blowers, who bring up certain issues in the public agenda. Furthermore, owing to significant public budget shortages, public policies are now less based on coercion (such as incentives and flexible regulations) and more on soft laws (for example, contracts and partnerships between stakeholders).

### *The legal framework*

The French legal landscape can be characterised in the following four ways.

---

<sup>4</sup> French Constitution, article 1.

First, France has a civil law system that includes two notable features: independence of laws and jurisdictional duality. It is also crucial to mention the principle of the independence of laws: the laws relate to a specific area of action (such as town planning) and cannot, therefore, have a legal effect on another area (for example, the environment), even where the issues are combined (Waline, 2014, Frier *et al.*, 2014). Public authorities therefore tend to be restricted to specific and independent competences, which may lead to a fragmentation of public policy. As in most civil law systems, judges in France cannot create precedents with legislative force that apply in the future. The French court system is characterised by the existence of an autonomous administrative branch compared to the judiciary, and two distinct jurisdictional orders therefore exist side by side (Waline, 2014, Frier *et al.*, 2014). It is the administrative courts, and not the ordinary courts, that issue judgments on decisions made by a government administration. This may be challenged in terms of the separation of powers: to what extent are decisions made by public authorities reviewed by administrative judges?

Second, French environmental law has two special features in addition to the traditional principles: the national solidarity principle on the one hand, and varying degrees of legal effect on the other. Pursuant to the Constitution and the Environmental Code, French environmental law sets forth the following principles: prevention, precautions, polluter pays, free access to information and public participation in the decision-making process. As far as natural hazards are concerned, French law is based on the key constitutional principle of national solidarity, which is an important pillar of French policy on flood management (Pontier, 1983; Conseil d'Etat, 2005; Cans *et al.* 2014). Finally, it is of central importance to understand that the rules of law have three different degrees of legal effect: a legal provision may involve a requirement of compliance (strict), compatibility (intermediate) or consideration (flexible). These three levels are provided to adjust policies to local issues in the context of decentralisation (Lebreton, 1991).

Third, water and soil are subject to very different legal approaches. Water is treated as a *res communis*: it belongs to nobody in particular, and is part of a common heritage. Soil, on the other hand, is private property that its owner may dispose of freely (Prieur, 2011). From an environmental perspective, therefore, water is more easily made subject to interventions by public authorities and collective governance than is soil. In France, the most important rivers are classified in the public domain and therefore their beds are owned by the state. The beds of the other watercourses belong to the owners (public or private) of the banks (Cans *et al.*, 2014, Foulquier, 2013).

Fourth, **responsibilities in the field of flood management are mainly shared between the central authorities and municipalities.** Both *Prefects* (State) and Mayors (municipality) can be primarily liable because of their police powers (Cans *et al.*, 2014). At the same time, but secondarily, residents, experts and insurance companies may be held liable in some cases.

### ***Implementation of the 2007 Floods Directive***

In order to transpose the 2007 Floods Directive into French law, a new legal system for flood management is being implemented based on three new strategic plans applicable to three separate territorial levels: a national strategy (not required by the directive), flood management plans (basin) and local strategies. This is the first time that a flood management plan has been established at the watershed level in France (Allaire, 2012).

Overall, the European Directive is likely to have a limited impact in France: on the one hand, the new planning tools established by the European Directive do have limited legal force, and on the other, the Directive does not change the balance of power among public authorities. Indeed, French policy on floods remains controlled by the State, which traditionally uses its dominant tool for regulating land use: the Flood Risk Prevention Plan (PPRI). The question of local strategies raises an interesting perspective which might promote the development of bottom-up local initiatives, although it remains a hypothetical issue for now. If local authorities adopt strong flood management initiatives, the European Directive may increase decentralisation (but only marginally).

## 2.3 Flood risk governance at the national scale

At a national level, flood risk policy covers all the strategies defined in the STAR-FLOOD Project. Each represents a distinct governance sub-arrangement (each strategy can be related to a specific set of actors, rules, resources and discourses), except for mitigation. Two sub-arrangements – defence and preparation – lie at the heart of the historical centralised risk policy, and we will present them first. Prevention and recovery will then be introduced as a strategic pair, each of which is also characterised by a high degree of internal consistency.

At the same time, each separate sub-arrangement is not an isolated domain, and interconnections among them are well-developed. Finally, we analyse these connections and show how mitigation can be considered to be a bridging strategy.

### 2.3.1 An overview of the French Flood Risk Governance Arrangement

French flood risk policy includes a wide range of actions. As the tables and figures below show, legal tools frame some of them, and involve public and private actors at all levels.

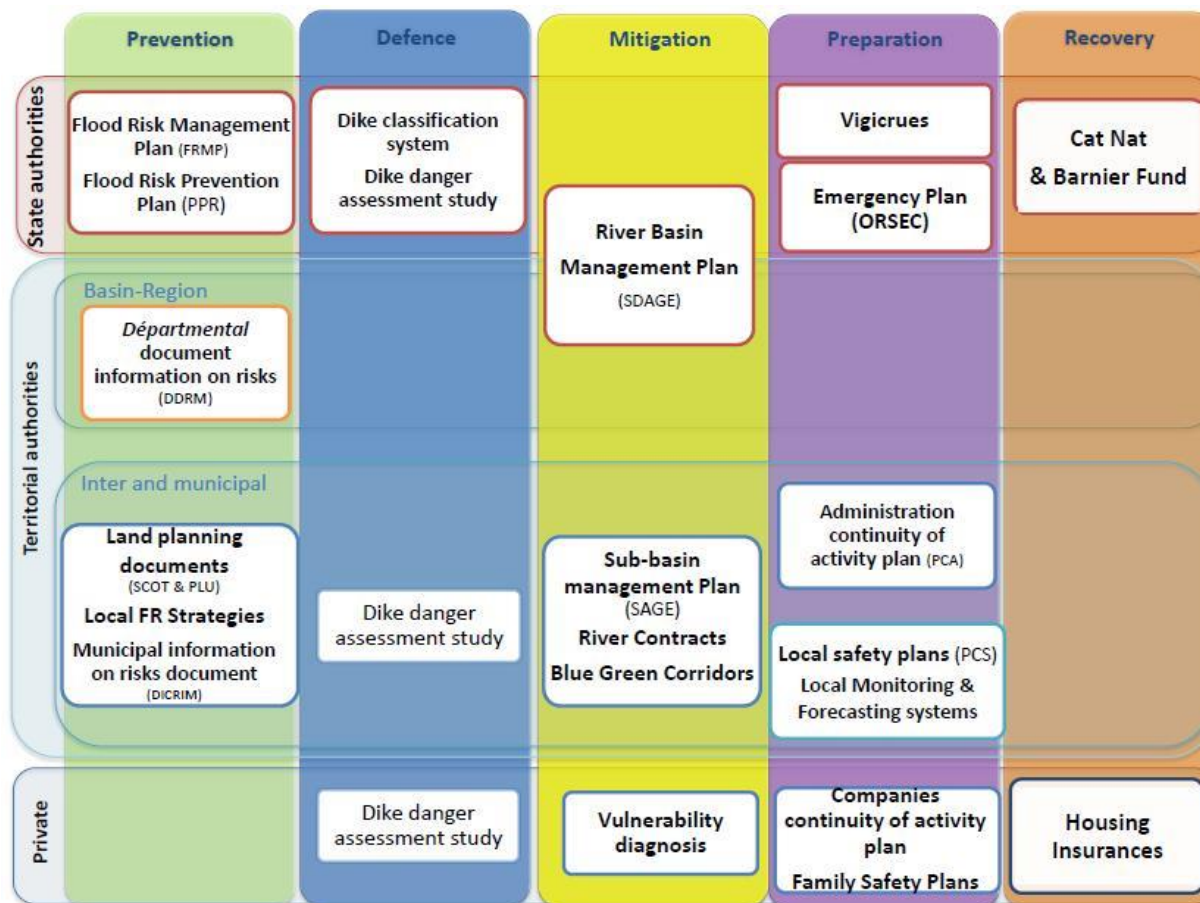
**Table 2.6 Flood risk management strategies in France**

Flood prevention	Flood defence	Flood mitigation	Flood preparation	Flood recovery
<ul style="list-style-type: none"> <li>• Spatial plans;</li> <li>• Prohibition and regulation of construction through planning;</li> <li>• Risk paragraph in purchase deed;</li> <li>• Expropriation and amicable acquisition policy;</li> <li>• General information on flooding (e.g. flood maps)</li> </ul>	<ul style="list-style-type: none"> <li>• Dikes;</li> <li>• Weirs and dams;</li> <li>• Retention basins outside area to be protected;</li> <li>• Water course maintenance;</li> <li>• Quay walls;</li> <li>• Compartment dikes.</li> </ul>	<ul style="list-style-type: none"> <li>• Retention basins inside area to be protected;</li> <li>• Human-controlled flood zones;</li> <li>• Rainwater reservoirs;</li> <li>• Flood-safe building;</li> <li>• Sustainable Urban Drainage Systems (SUDS), including green roofs, urban green spaces, and permeable pavements (Information, funding of diagnosis and works).</li> </ul>	<ul style="list-style-type: none"> <li>• Forecasting (24-hour monitoring and intervention teams);</li> <li>• Flood warning systems;</li> <li>• Intervention and evacuation plans;</li> <li>• Sandbags;</li> <li>• Pumps (if used to manage a flood when it occurs);</li> <li>• Repair works of flood protection measures;</li> <li>• Crisis communication;</li> <li>• Community awareness-raising activities;</li> </ul>	<ul style="list-style-type: none"> <li>• Insurance systems;</li> <li>• Solidarity fund;</li> <li>• Repair works.</li> </ul>

			<ul style="list-style-type: none"> <li>• General information on flooding (e.g. flood maps).</li> </ul>	
--	--	--	--	--



**Figure 2.5 Overview of strategies present in France.** Dark blue indicates the most dominant strategies, and medium blue establishing strategies, light blue minor strategies, grey-blue strategies do not play a role.



**Figure 2.6 Flood risk management instruments in France**

### 2.3.2 Defence and preparation: two historical sub-arrangements

Defence and preparation are the core of the historical flood policy. The laws of 1807 and 1858 defining the roles of private citizens and the State respective to ensure their protection (Cans *et al.*, 2014), together with the laws of 16 and 24 August 1790 on municipal police power (Waline, 2014), are the oldest and most important parliamentary laws in the flood risk domain. By these laws, the State affirmed its security-oriented concept of risk management, which still has a powerful influence on flood policies today.

At the same time, these two centralised sub-arrangements are also guided by a subsidiarity approach, which has acquired even more significance since 1982.

#### Defence: An informally centralised sub-arrangement in search of decentralisation

**Table 2.7 Summary of defence sub-FRGA**

Description	Key Actors	Key Rules and Legislation	Key Discourses	Resources
Distribution of liabilities and co-funding are the core of the sub-arrangement: - control of infrastructures provided by the State - maintenance work progressively falls to local authorities	<ul style="list-style-type: none"> <li>Ministry of the Environment;</li> <li>Water agencies;</li> <li>River Basin and Sub-basin Water Boards;</li> <li>Municipalities and inter-municipalities;</li> <li>Regions;</li> <li><i>Départements</i>;</li> <li>Academic: IRSTEA, CEREMA;</li> <li>Consultants: European Center for Flood Prevention- (CEPRI), France Digue;</li> <li>Private dike owners.</li> </ul>	<ul style="list-style-type: none"> <li>1807 Act: the owner of the land owns the defence structure;</li> <li>2006: the Water Act defines dikes as a potential danger;</li> <li>2007 Decree on defence structure safety: obligation of risk assessment, maintenance and monitoring;</li> <li>2014 MAPAM Act: legal definition of dikes; introduces classifications, norms and obligations for maintenance. Plans to make local authorities responsible for dike maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>Zero Risk does not exist: prevention has to prevail (building restrictions in flood-prone areas);</li> <li>From State intervention to regulation and control;</li> <li>Need to identify a single responsible subject: <i>Communes</i>.</li> </ul>	<p><b>Funding:</b></p> <ul style="list-style-type: none"> <li><i>Plans grands fleuves</i>, PAPI («Barnier Fund»);</li> <li>Marine submersion plan (PSR);</li> <li>Project Contracts, State-Region;</li> <li>European regional development fund (ERDF);</li> <li>Water sector resources: infrastructure management and expertise.</li> </ul> <p><b>Knowledge:</b></p> <p>SIOUH: Database on dike condition and ownership Research projects (Floodprobe, Digsure, etc.)</p>

As the construction of dikes is not a public safety obligation of the State, defence infrastructures are the responsibility of landowners (Cans *et al.*, 2014; Bécet, 2010). Consequently, in the case of private land, public action was traditionally limited to taking charge of voluntary building and maintenance of infrastructures in cases where public safety was deemed to be at stake (the Act of 1858 reinforces the principle of State intervention in cases of general interest following the floods of 1846 and 1856, which affected the entire country greatly). This legal framework has produced a complex constellation of actors: ownership of a dam or dike can be shared among several owners (both public and private) (Auby, 2012; Deliancourt, 2013) (cf. Box 2.5). In addition, the owner and manager of a dam may be different. Above all, one-third of all French dikes have no identified owner, which suggests a palliative intervention on the part of public authorities. All this creates uncertainty in



terms of legal responsibilities, and weakens defence strategy (Cans *et al.*, 2014; Deliancourt, 2013; Gonin, 2011).

Despite the absence of an obligation on the part of the State to take responsibility in this area, the defence sub-arrangement may be considered to be marked by a centralised governance mode. The State's interventionist approach and faith in the public sector profoundly influence actor relationships. In addition, the State owns the main rivers (public domain). About 1,000 km of dikes are managed by the State (CEPRI, 2015) in the name of public safety but also in order to ensure and protect development along the main rivers.

The main actors in this sub-arrangement are the State and local authorities, which take responsibility for action on smaller rivers. Recent reforms have sought to provide it with more consistency and an improved legal framework, and to redefine the role of the actors within the governance arrangement. The 2007 Decree reinforced the State's administrative policy, focusing its mission on dam and dike control policy (CEPRI, 2007). In an effort to clarify the distribution of liability, the decentralisation process has transferred responsibility for defence infrastructures to municipalities and inter-municipal bodies through the MAPAM Act of 2014 (Marcangelo-Leos, 2014). What is remarkable is the fact that these changes have led to a complete upset of the inherent logic of the traditional "French political model", and in particular faith in the public sector. The need to reduce public investments in the defence sector might have led to its being opened up to the private sector, but preference has been given to the delegation of competences to local authorities. This might be considered to be a way for the State to maintain a certain level of control over defence policy. The issue now is how to finance the protection system in the context of reductions in all public expenses.

There are proposals on the table, but each encounters opposition and presents uncertainties. The introduction of an additional flood premium to be collected by the Water Agencies raises the question of the difficulty with identifying the beneficiaries clearly and the exact type of service provided by these infrastructures. The option of increasing contributions to the "Barnier Fund" has met with opposition from insurers. The MAPAM Act seeks to bypass this problem by introducing a specific (but optional) tax that can be raised by *Communes* (which will be now responsible for dikes) in order to finance assessment studies and works on hydraulic infrastructures, but the political difficulties involved in politicians raising a new tax has proved problematic for its implementation (Madaoui, 2015).

**Box 2.5 Dikes: length in kilometers, owners, condition and related costs**  
(CEPRI, 2011)

<p>8,500 km total dikes (of which 510 km are for maritime protection)</p> <p>Owners:</p> <ul style="list-style-type: none"> <li>1,000 different administrators (public and private)</li> <li>3,000 km: owners unknown (some are "orphan dikes")</li> <li>1,600 km: administrators unknown</li> </ul> <p>Condition:</p> <ul style="list-style-type: none"> <li>3,000 km are in good condition</li> <li>3,000 km require intervention</li> <li>≥ 2,000 km (25%): information not provided</li> </ul> <p>Estimate of works and costs:</p>
--

Maintenance: between €2,000 and €5,000 per km Strengthening works: around €1 million per km Initial diagnostics: less than €10,000 per km Risk study between €20,000 and 30,000 per km
---

The intention of the 2007 Decree on dikes is to provide a consistent legal and technical framework: classification of dams and dikes, identification of owners, an obligation to undertake risk assessment studies, public monitoring and the reorganisation of technical services. Some actors think that this evolution represents an “over-technicalisation” of the domain, and requires a complex combination of engineering, administrative and legal competences (CEPRI, 2007).

Despite these evolutions, the costs involved and the lack of knowledge of the infrastructure on the part of the State are the main obstacles to the effectiveness of this policy (the identification of who will be liable also remains problematic). On the one hand, repeated catastrophic events (the latest of which was the Xynthia storm in 2011) associated with breaches of dikes (such as on the River Rhone in 2003) have increased the public authorities’ awareness of the potential for risk from defence infrastructures, and has led to criticisms of the protective approach (Vinet *et al.*, 2010, Léonard, 2010, Anziani, 2010). This gives a voice to the “zero risk” discourse by justifying limiting investments that would increase the risk in the long term. (Mercier, 2012). However, the acquired consciousness of the still poor level of (administrative and scientific) knowledge of national protection infrastructures has triggered an intense development of research programmes, diagnostic tools and norms and administrative requirements. We see a substantial change in the State discourse, which is reconfiguring the “defence issue” within the framework of flood risk policy, mostly in relation to prevention and mitigation. Although the State is still considering the need to prevent dike breaches, it also increases vulnerability measures behind dikes.

#### ***Preparation: the most isolated sub-arrangement***

Preparation represents a somewhat “isolated” strategy in the flood risk domain as a whole compared with other, more “interactive”, strategies (prevention-defence or prevention-recovery). Preparation mainly means civil security: it is an intrinsically centralised and multi-risk mission; in fact, the Ministry of the Interior leads the preparation policy, including industrial and natural risks of all kinds.

What really characterises preparation, however, is the sharing of powers and liabilities between the State and municipalities. The subsidiary principle applies in forecasting and alerts, as well as in crisis management. Private actors may be involved, but only as far as forecasting is concerned.

**Table 2.8 Summary of sub-FRGA preparation**

Description	Key Actors	Key Rules and Legislation	Key Discourses	Resources
<p>Sharing of liabilities, structure of the arrangement</p> <p>Forecasting and alerts: main rivers – Vigicrue; small rivers – local systems</p> <p>Police powers on civil security shared between: - <i>Prefects</i> (State) and <i>Mayors</i> (municipalities), following the subsidiarity principle.</p>	<ul style="list-style-type: none"> <li>• Ministry of the Interior (emergency management);</li> <li>• Ministry of the Environment: Flood Forecasting Service (SCHAPI);</li> <li>• State local authorities: <i>Prefects of Départements</i>, <i>Prefects of Defence Zones</i>;</li> <li>• State agency: <i>Meteo France</i>;</li> <li>• Municipalities and inter-municipalities;</li> <li>• Regions;</li> <li>• <i>Départements</i> (<i>Fire Brigades</i>);</li> <li>• Private citizens as part of <i>Municipal Civil Protection Reserve</i>;</li> <li>• Consultants: <i>Predict Service</i>.</li> </ul>	<ul style="list-style-type: none"> <li>• 1952: <i>ORSEC Plan</i>;</li> <li>• 2004: <i>Reform of civil security</i> (creation of <i>Municipal Crisis Management Plan, PCS</i>).</li> </ul>	<ul style="list-style-type: none"> <li>• Private citizens as "main actors of their own safety";</li> <li>• More subsidiarity: make local authorities responsible in the first instance.</li> </ul>	<p><b>Forecasting and alerts:</b></p> <ul style="list-style-type: none"> <li>• <i>Vigicrues National Alert System</i>, or the forecasting network for the "national" rivers;</li> <li>• Local alert system is the responsibility of local authorities for small rivers.</li> </ul> <p><b>Crisis management</b></p> <ul style="list-style-type: none"> <li>• State, meaning engines and operational tools;</li> <li>• <i>Départements</i> and <i>Communes</i> (<i>Fire Brigades</i>).</li> </ul>

***Civil security: a police power shared by Prefects (State) and Mayors (municipality)***

With regard to crisis management, this implementation of the subsidiary principle permits a stable balance to be established in relationships between the State and municipalities. Municipalities are responsible for floods that can best be handled at a local level, while the State manages floods of greater magnitude (Cans *et al.*, 2014). At the same time, however, the principle leads to a considerable need for coordination and cooperation (Waline, 2014; Vautrot-Schwarz *et al.*, 2014).

Crisis planning and management have been organised around a very traditional pair of actors since the Napoleon era: *Mayors* and the *Prefects of départements*. On the one hand, the State – through the *Préfecture* – plays a central role in emergency planning through the *ORSEC Plan* (which includes all types of risks) (Sousse, 2008). The *Prefect* is also in charge of organising specific emergency exercises and simulations involving a plurality of actors (public and private) at a level of the *département*. On the other hand, *Mayors* also have police powers that make them responsible for informing the population of a risk and for broadcasting alerts. The *Gendarmerie* and the police, under their command, can help spread the alert. The 2004 law on the reform of civil security strengthened the role of *Mayors* by creating the local *Municipal Crisis Management Plan (PCS)*, a document that is voluntarily developed by municipalities that implement the *ORSEC Plan* at a local level (this is an obligation for municipalities with a *Flood Risk Prevention Plan*). The law also calls for other actors to become involved in this field (for example, businesses must produce specific emergency plans (*Internal Emergency Plan -POI* and *Specific response Plan - PPI*), in particular for *Seveso Installations*). All these elements (plans, training and exercises) are integrated into the *ORSEC Plan* and make up its backbone. Finally, the *Départemental Council* is also involved through the *département's Fire and*

---

Rescue Service (SDIS), which is in charge of rescue operations. From the resource perspective, it is worth noting that local authorities are the main funders of crisis management, as the SDIS is 53% funded by the *Départemental Council* and 47% by municipalities and inter-municipal bodies (source: Ministry of the Interior, 2013).

### ***Evolution towards more decentralisation and self-governance***

Current evolutions reveal that a new actor has entered the picture. There is a trend for inter-municipal bodies to play an increasingly significant role in preparation strategy, as municipalities organise their strategies and pool their resources at this level. This leads to uncertainties, because inter-municipal bodies have no civil security police powers and are not liable for any type of damage. It is worth noting, therefore, that some inter-municipal bodies exceed their powers.

The innovations brought in by the new law on civil security (2004) also place private citizens at the heart of the preparation strategy by stating that they are “responsible for their own safety” (Romi, 2004). Preventive information provided to the public acquires specific importance: the more aware a population is of the risk, the more Courts may find they have been negligent. Empowerment of the population may therefore increase flood prevention effectiveness but also reduce the liability of public authorities by increasing the responsibility of residents (Calvet, 2014).

Finally, while civil security is considered to be mainly a Ministry of the Interior mission, the field requires major investments in research and development. This is why inter-ministerial collaborations (especially with the Ministry of the Environment) have been established at a local level for the development of forecasting and communication systems and to support local authorities on specific policy initiatives.

### ***Monitoring and forecasting: the subsidiary principle applied to large and small rivers***

**Flood Forecasting Service (SCHAPI).** The State is in charge of organising flood monitoring, and for forecasting and informing along those rivers that are in the public domain. At a local level, the service operates on twenty-two Regional Flood Forecasting Services (SPC). It provides a cartographic representation of forecasts according to the levels of danger, and is accessible to a wide public. SPCs can also help public authorities with decisions on alerts by providing advices.

**Private forecasting services.** Not all rivers are monitored by the State. Private companies have recently begun offering support to local authorities for risk management. These companies are then able to provide *ad hoc* and comparatively efficient support to their members at a distance to deal with even small events.

### 2.3.3 Prevention and recovery: complementary sub-arrangements

Prevention strategy came to the forefront with the compensation policy that was introduced in 1982. This marked the starting point for a new flood risk policy that closely links precautions and solidarity principles (Ledoux, 2006, MRN, 2009). Although they are both seen first and foremost as a matter of general interest (public order) that must be handled at a central level, they also introduce collaborations and negotiations with local authorities for prevention and with private actors for recovery.

#### Prevention

To that prevention is the only governance sub-arrangement that includes an interactive component through the Flood Committee (CMI), created in 2011, which gathers together all public and private stakeholders and plays a central role in the definition of strategy and the distribution of resources (by granting PAPI contracts).

**Table 2.9 Summary of sub-FRGA prevention**

Description	Key Actors	Key Rules/Legislation	Key Discourses	Resources
Integration of risk and land planning necessitates collaboration between State services and local authorities.	<ul style="list-style-type: none"> <li>Ministry of the Environment;</li> <li>State services: <i>Départemental</i> Directorate for the Territories (DDT) and Regional Directorate for the Environment, Land Planning and Housing (DREAL);</li> <li>Water agencies (State);</li> <li>River basin and sub-basin Water Boards (EPTB), River Syndicates;</li> <li>Municipalities and inter-municipalities</li> <li>Regions;</li> <li><i>Départements</i>;</li> <li>Private: real estate agencies and Notaries;</li> <li>Academic: research centres: CEREMA, IFFSTAR;</li> <li>Public Consultants: inter-ministerial: CGEDD/ local authorities: European Center for Flood Prevention – CEPRI;</li> <li>Cooperation bodies: Flood Committee (CMI).</li> </ul>	<p><b>Planning tools.</b></p> <ul style="list-style-type: none"> <li>1995: State enacts Flood Risk Prevention Plan, PPRI: defines building restriction areas imposed on municipalities);</li> <li>2000: Local development plans (Local Plan - PLU, SCOT);</li> <li>FRMP ("Flood Risk Management Plan" - PGRI) and local strategies.</li> </ul> <p><b>Information</b></p> <ul style="list-style-type: none"> <li>Obligation of Information to tenants and buyers on risk exposure;</li> <li>Municipal Information Document on Major Hazards (DICRIM);</li> <li>Departmental Information Document on Risks (DDRM).</li> </ul>	<ul style="list-style-type: none"> <li>Risk as general order issue, State responsibility;</li> <li>Pro-active planning as only solution to fight against floods. Preserve unbuilt flood-prone areas;</li> <li>Local authority discourse: do not prevent development; find innovative ways to live with the risk.</li> </ul>	<p><b>Funding:</b></p> <ul style="list-style-type: none"> <li>«Barnier Fund»;</li> <li>Action Programme for Flood Prevention (PAPI).</li> </ul> <p><b>Powers</b></p> <p>Local expertise Judiciary: legal proceedings Political lobby: Parliamentary relations of local representatives.</p>

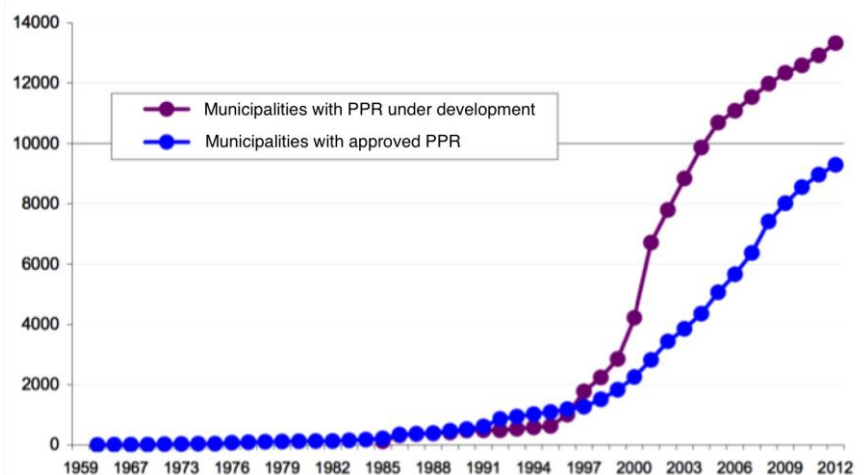
### *Traditionally centralised governance sub-arrangement*

Although France has a long tradition in the field of flood prevention, starting from the 19<sup>th</sup> century (with the idea of floodplain preservation and the first flood planning documents introduced in 1935) (Billet, 2007), it remained undeveloped for a long period due to the dominance of the defence strategy.

Since the creation of the Department for Risk Prevention in the Ministry of the Environment at the end of the 1980s, risk prevention has been an independent (and multi-dimensional) field of action dominated by the central role of the State. It is part of a broader planning culture that is dominated by the principle of rigorous restrictions on construction in risk areas. The current Flood Risk Prevention Plan (PPRI) (cf figure 2.7), which was introduced in 1995, reinforces this principle, and reaffirms the State's responsibility for its development (Fevrier, 2008). Many researchers and interviewed civil servants believe that the risk prevention plan directly expresses the "national doctrine" on flooding (Ledoux, 2006:358). Municipalities also play a central role, as they are responsible for land planning and issuing building permits. It is worth noting that the principle of independence of the law leads to a separate implementation of risk policy and urban planning policy. The two main planning tools (the Risk Prevention Plan and the local land-use plan) are then used by two independent public authorities. However, the State imposes its vision of the risk of flooding on local authorities through the use of public easements. Local authorities are obliged to take risk into account in their land use plans, but they only participate in the definition of this risk to a marginal extent (Hubert and Pottier, 2006).

This division between risk and land planning competence is proving to be problematic in the light of the movement towards decentralisation; from a local perspective, in fact, local elected representatives are capable of managing risk. Prevention is therefore marked by a constitutive tension between central government and local powers, with their relationships oscillating between confrontation and collaboration (Le Bourhis and Bayet, 2002). The affirmation of new institutional actors (such as Inter-municipal bodies) and the distribution of resources (expertise, power and financial means) are leading towards the territorialisation of risk management policy.

In this context, it is worth noting that reductions in the State budget do not affect its ability to impose its plans, since they are now over 90% funded through the "Barnier Fund" (FPRNM, 2014). The creation of this Fund in 1995 marked a turning point in flood management policy at a national level towards a broadening of the policy scope and its funding basis. Firstly, the fund was created to finance expropriation and re-allocation (Haustiou, 2012), and was progressively expanded to other measures (*e.g.* vulnerability reduction, studies, infrastructure works *etc.*). Secondly, it represents a means of involving private actors in the financing of the FRM, as the resources for the "Barnier Fund" are entirely drawn from a tax charged directly on insurance premiums (the Natural Disaster Scheme contribution – CAT-NAT). The legislature has based the resources for this fund on a tax charged on premiums to cover property damage caused by natural disasters (12% of the CAT-NAT premium). In 2012, the fund's total revenues amounted to €190 million (with a positive balance of approximately €104.8 million) (CGDD, 2013; Cans *et al.*, 2014). It is managed by a special Management Committee, which includes representatives from the various Ministries, the insurance sector and the Central Reinsurance Company, which acts as secretary, accountant and financial manager of the fund's assets.



**Figure 2.7 Number of approved and prescribed PPRNs since 1959**

Source: MEEDE-DGPR, 2012

Finally, we see the current tendency to include all flood management actions within prevention. The term chosen for the specific Action Programme for Flood Prevention (PAPI), which is an integration-based programme, is particularly illuminating. Some observers see the PAPI as the “expression of the new official doctrine on flood management” (Vinet, 2010:148).

From the outset, the aim of these Action Plans has been to build global management of flood issues (beyond simple work programmes, through dikes, for instance). Designed at a watershed level, PAPI must combine measures on knowledge improvement, monitoring and forecasting, information, planning, protection works, reduction of vulnerability (of buildings), crisis management preparedness and feedbacks on operating experiences.

Secondly, the aim of PAPIs is to integrate a wide range of actors into the funding of expertise and actions. Funding is granted through a call for projects, illustrating a shift in the State’s policy line from a “one-stop shop” logic (counter-based) to a project approach. When a PAPI is approved by the Flood Committee (Commission Mixte Inondation – CMI), State resources can be mobilised, as can the “Barnier Fund”.

### *Tensions between centralised and decentralised governance in the area of prevention*

Prevention can be viewed as a centralised and institutionalised sub-arrangement due to the central role of State services in risk planning and controls on building in flood-prone areas. At the same time, the competences held by local governments in land planning and their obligation to take flood risk into account have introduced a number of decentralised dimensions. Recent developments would seem to strengthen this tendency, and local authorities are generally seeking additional responsibility in this area (Tricot and Labussière, 2009). As a consequence of this, tensions between centralisation and decentralisation lie at the heart of the prevention sub-arrangement dynamic. These tensions represent an important challenge for public authorities, as the rise in prevention goes mostly through risk integration into planning (Pigeon, 2005, Pottier *et al.*, 2003).

Despite these tensions, there have always been negotiations with public authorities, which bargain more or less officially and voluntarily for adjustments to their tools (water, urban and risk

regulations) (MEEDE, 2007, 2009). Negotiation on the definition of risk between local State services and local authorities leads to a mutual adaptation between risk planning and local development projects (Douvinet, 2011). In particular, negotiation is possible because the law leaves a wide margin of discretion to the State, as stated by interviewed civil servants from the state services and local authorities (Debono, 2011; Sousse, 2014). Collaboration is also supported by the development of partnership tools (contracts between State services and local authorities) and the implementation of the planning tools introduced by the EU Directive, which potentially offer a more significant role to local actors (Van Lang, 2012; Ben Maïd, 2013).

## Recovery

**Table 2.10 Summary of recovery sub-FRGA**

Description	Key actors	Key rules	Key Discourses	Resources
Private & public cooperation: - the State declares natural disasters and governs the mechanisms - insurance companies manage the system (public service mission) - insured citizens as contributors through their home insurance - Reinsurance Company (CCR): monopoly and unlimited guarantee from the State	<ul style="list-style-type: none"> <li>Ministry of the Environment &amp; Ministry of Finance &amp; Ministry of the Interior (Inter-ministerial Committee);</li> <li>Local State authorities: Prefects of <i>Départements</i>;</li> <li>State-owned reinsurance company: CCR;</li> <li>Insurance and reinsurance companies;</li> <li>Private citizens (home insurance contractors);</li> <li>Mediator: Central Tariff Office (BCT);</li> <li>Experts: National Mission for Natural Hazards (MRN), National Observatory of Natural Risk (ONRN).</li> </ul>	<ul style="list-style-type: none"> <li>1982: CAT-NAT system definition: solidarity principle (Constitution) is implemented through a private-public insurance regime involving the national community as a whole;</li> <li>2000-2001: bridging mechanisms with prevention.</li> </ul>	<ul style="list-style-type: none"> <li>Solidarity mission;</li> <li>Risk of victimisation (more links needed with prevention);</li> <li>Opacity and privileges: need for a clear definition of "natural disaster" and clarification of insurance roles and duties.</li> </ul>	<b>Funding:</b> <ul style="list-style-type: none"> <li>home insurance: mandatory contribution to natural disasters: 12% of insurance premiums (insurance revenues: €1.3 million per annum; costs: €800 million);</li> <li>unlimited State guarantee;</li> <li>Barnier Fund: 12% of natural disaster contributions of home insurance income.</li> </ul> <b>Knowledge:</b> Database on claims and risk exposure developed by insurance companies.

### *The compensation system as a distinctive feature of French FRM*

Today, the Natural Disaster Compensation Scheme "CAT-NAT" embodies the solidarity principle, and can be considered to be one of the main features of the French flood policy, as underlined in several interviews.

This principle was put into practice effectively with the coming to power of François Mitterrand in 1981 (socialist party). In 1982, when the CAT-NAT regime was introduced by the 1982 law, parliamentarians had the perspective of the welfare state in mind (Bentoglio *et al.*, 2005). CAT-NAT is a hybrid insurance system based on the involvement of both the State and insurance companies. In many ways, it appears to be a freestanding competence. From the actors' perspective, it is based on



an original collaboration between the insurance market and the State whereby private insurance companies relay a public national policy of solidarity and public interest. Insurers and policyholders are bound by a private contract that includes excesses payable by the policyholders. Insurers are first required to cover the risk of natural disasters at a rate fixed by the State, and each insurance contract then adds a risk premium (that is, an additional contribution calculated at a single rate determined by a Ministerial Decree (it has been 12% since 2009), which finances CAT-NAT. This legal requirement applies to all French home insurance contracts. As the penetration rate of this insurance is very high (98%), almost everyone is protected.

The CAT-NAT regime seems to be well-balanced, at least with regard to normal years (in which no exceptional events occur), and is extremely stable (between 1982 and 2006 and the ratio premium and claims is 50% in average between 1988 and 2012). Floods represent 60% of losses (€4.7 billion out of a total of €8.3 billion, including €1.2 billion in 1999 and €1.5 billion in 2010, CGDD, 2010).

The average cost is estimated to be € 800 million per annum in compensation paid out by insurance companies (the total cost, including those for non-insured property, is generally estimated to be twice this amount), while annual direct revenues from the CAT-NAT premiums have risen to € 1.3 billion. Notice that 80% of Départements have paid more in contributions than they have received as compensation, while 5% of Départements have been paid three times the amount of their contributions.

### *An original mix of centralised and public-private governance*

The Natural Disaster Scheme – CAT-NAT is the incarnation of a centralising approach that remains at a considerable distance from local authorities both in its concept and management. The State possesses the design and operational mechanisms for the system, and intervenes to determine the legal insurance obligation, insurance rates, and acknowledgment of a state of natural disaster. The absence of any normative definition of the term “natural disaster”, which exposes the State to criticism for the arbitrary nature of its actions, must be noted.<sup>5</sup> The State also ultimately reinsures the insurance companies in the event of an extreme catastrophic event. Within this system as framed by the public sector, the private sector is merely a manager, and has no influence on legal operational aspects.

The solidarity discourse that lies at the root of the system has led a number of insurance managers to believe that they have been entrusted with an important public utility task that has no ties to the market. Some critics have pointed out the potentially negative effect of this situation, arguing that the system might lead to victimisation and a lack of responsibility, and some insurers believe that they have a financial role to play in encouraging citizens and Mayors to shoulder responsibility by taking risk into account before deciding or approving where to live and where to build (see Kessler & Vandier, 1994). In response to these critics, the aim of recent developments has been to find ways to establish a stronger link to the prevention strategy (for example, since 2001, an insurer has had the legal right to refuse to cover flood risks in unbuildable areas of a PPR if the property was built after

---

<sup>5</sup> The State declares a state of natural disaster following a case-by-case approach, without a general list or criteria. Ministerial decision-making practices reveal that they mainly relate to floods (56%, including surface runoff, overflow, rises in the water table and marine submersion), tidal waves and storms (9%), mudflows, earthquakes and earth movement (18%), droughts (11%), subsidence due to underground cavities and marl pits (except mines) avalanches and high cyclonic winds.

publication of the plan. In addition, in the absence of a PPR, excesses will be increased in the case of repeated natural disasters).

The combination of these centralised and public-private modes of governance can lead to opacity and uncertainty. When the state intervenes strongly, the system is more like a tax regime than insurance. Conversely, private insurers have valuable information about the risks that are not necessarily available for the public sector. This public-private combination may well lead to confusion between public and private sphere.

#### **2.3.4 Bridging processes linking sub-arrangements**

Despite a certain level of fragmentation in the system, none of the four sub-arrangements is isolated, and bridging processes can be recognised among them. Prevention is the sub-arrangement that has developed the highest number of links with other flood policies, while preparation represents a somewhat autonomous strategy. Some are formally provided for in the legislation, whereas others may be more informal, or may merely represent future foreseeable consequences of ongoing institutional reforms.

##### ***Bridging processes between prevention and recovery***

The economic stability of the Natural Disaster Scheme (CAT-NAT) is built on the connection between prevention and recovery (Hubert, 2012): this financial recovery system is not viable without proper prevention policy. Indeed, it should be noted that the “Barnier Fund” is dedicated to prevention but it is financed by the insurance premiums (Hubert, 2012). Moreover, in the CAT-NAT system, insurers can refuse to refund in the case of non-compliance with the regulation on flood prevention.

##### ***Bridging processes between defence and prevention***

The administrative principle that guides the development of PPRI has been based on the principle of “dike transparency”, meaning that the protection assured by dikes should not be taken into account when establishing the conditions under which urbanisation is permitted in an area.

However, in practice, implementation of the principle is a matter of “policy discretion”: the right to build behind dikes is left to a complex balance between technical criteria and political bargaining. Finally, in order to take local development needs into account, and under certain technical conditions, urbanisation is possible behind dikes that have been assessed as “resistant”.

##### ***Bridging processes between defence and preparation***

This bridging process must be seen as a result of the ongoing decentralisation. With the newly approved MAPAM Law (2014), local authorities (mayors) will be responsible for both defence infrastructures and preparation against floods. These two issues will consequently have to be part of the same local policy.

##### ***Mitigation as a bridging strategy***

In the French FRM system, mitigation does not represent a clearly-identified sub-arrangement with coherent actors, rules, resources and discourses. The so-called “measures for the reduction of vulnerability” represent a new policy domain that is emerging from a (partial) reconfiguration of the more traditional policy sectors. In particular, two sets of mitigation measures can generally be identified:

- 
- water planning programmes (flood control areas, managed retreats, *etc.*), such as the Water Management Master Plan (SDAGE), the Local Water Management Plan (SAGE) and River Contracts;
  - Campaigns (mainly by the European Center for Flood Prevention (CEPRI), local authorities and associations) to raise awareness and promote individual action in this area through special measures and funding for reductions in the vulnerability of buildings.

The strategy is very much characterised by the lack of a strategic and coherent programme and specific legal and technical requirements. Although several informal rules apply (eg guides), there is still no law to regulate the mitigation strategy. Every actor seems to deal with the question voluntarily and in particular locally, without there being any overall frame of action.

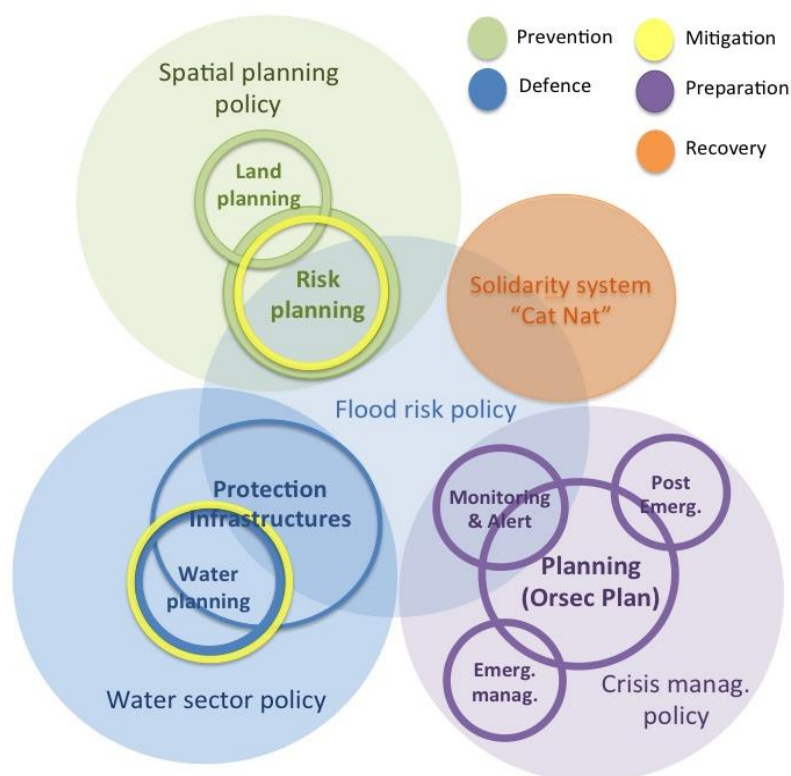
Its very lack of autonomy is also what lends it its bridging nature, however. Reductions in the vulnerability of buildings and protection infrastructures may be seen as an element of prevention sub-arrangements and defensive sub-arrangements respectively. In other words, one portion of each policy we have identified would actually constitute mitigation measures, as follows.

- prevention: while the essence of the prevention policy consists in the zoning principles introduced by the Flood Risk Prevention Plan (PPRI), the requirement of reductions in vulnerability complete and support this core policy to a certain extent;
- defence: mitigation can be considered to be the “soft” part of the protection infrastructures (for example retention basins and floodplains) that complements the “hard” ones (such as dikes);
- recovery: reducing vulnerability is a part of the effort to reduce the costs of damage.

Being an element of other policies, mitigation has a “bridging role” among all the sub-arrangements. It serves to align and integrate at a discourse level, as well as that of tools (through the PPR, in particular), regulatory norms and resources (financial resources through the “Barnier Fund” and knowledge resources).

### **Conclusion**

The figure below provides an overview of the French FRGA system. In particular, it shows that what for the purpose of this research has been identified as the “flood policy domain” does not constitute a unique and consistent sub-arrangement; rather, it takes its shape through a variety of sub-arrangements stemming from different, and more traditional, policy domains, such as spatial planning, civil security and emergency management and the water sector. This (partially) explains the degree of fragmentation between the different FRMS that characterises the French context.



**Figure 2.8 French flood risk management system**

## 2.4 Explanations of stability and/or changes in Flood Risk Governance in France

### 2.4.1 The extent of governance dynamics in French FRGA

The overall stability of the French FRGA has been remarkable throughout the period of our analysis. Since 1982, French FRGA appears stable, as the main actors involved and the principal rules and instruments have largely remained the same. The central State still dominates the overall French FRGA by defining the objectives and rules of risk policy and controlling their effectiveness. The four sub-arrangements have remained the same, and are organised according to stable principles and features. The defence sub-FRGA has been reinforced especially by the determination of safety standards, while the preparation and recovery sub-FRGAs remain similar to their initial architecture. As for prevention, the long-lasting monopoly of State services over risk mapping and building regulations in flood-prone areas has been reinforced since 1982, in particular by the Barnier Act of 1995. Today, risk planning still stands as the cornerstone of the prevention sub-arrangement.

Even though no radical changes can be observed, incremental, evolutionary changes occurred. From a historical perspective, the movement away from a technical approach to a more political view must be acknowledged. Technical solutions that had been adopted to protect the national territory have made way for diversified approaches, tools, actors and discourses. Two main change dynamics can be identified that have to do with a shift in balance not only among actors, but also among FRMSs, by means of their associated means and instruments. First we will identify the diversification and integration of FRMS and secondly the localisation of flood risk management.

At the national level, there has been a clear attempt to achieve a certain consistency in the definition and implementation of flood policy. The national strategy for flood risk prevention, which indicates the overall direction in which the FRGA is heading, relies on a mixture of prevention, defence (completed by mitigation) and preparation.

Generally, **diversification of strategies tends to be associated with a discourse that favours integration under the banner of prevention**. Indeed, prevention tends to “incorporate” them, at least at a discursive level:

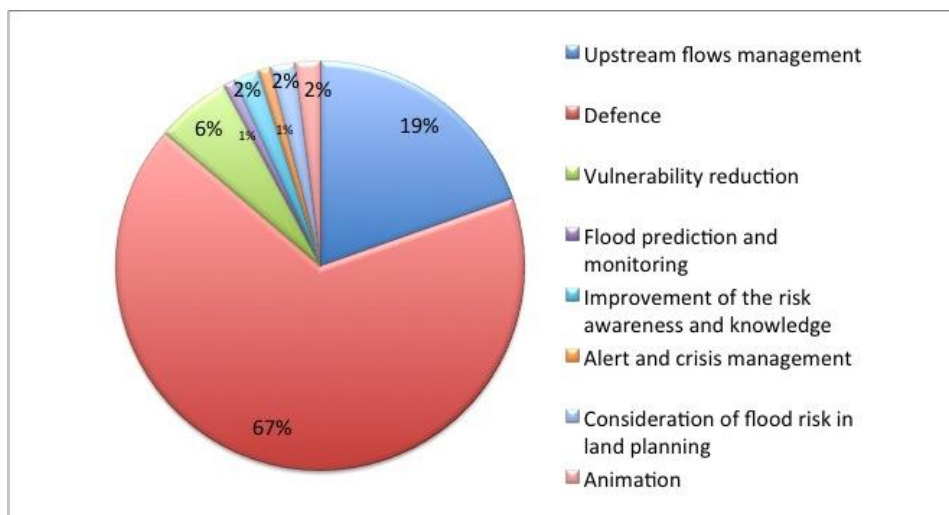
- defence is considered less as a strategy in and of itself (as opposed to the preventive strategy) and more as a part of a newly macro “preventive flood risk policy”;
- preparation becomes part of the macro “preventive approach”; and
- mitigation also tends to be considered to be a part of it.

In terms of policy instruments, both traditional and new tools illustrate this tendency. First, the strengthening and broadening of Risk Prevention Plans move towards the inclusion of vulnerability reduction and safety measures and the construction of bridging mechanisms with recovery and defence (see table 2.11).

**Table 2.11 Evolution of risk prevention plans**

Law	Measure	Associated Strategy
Law 2001	Increase in deductibles (modulations) depending on the number of declarations of natural disasters (CAT-NAT) in five years, in the absence of prevention plan	Recovery
Circulars of 20 April 2002 and 21 January 2004	Building behind a dike: to be avoided, but possible if certain security criteria are satisfied	Defence
Law of 30 July and 30 December 2003	Funding of vulnerability reduction measures (works on existing buildings) from the Barnier Fund (private and public buildings)	Mitigation Recovery
Circular of 3 July 2007 and June 2011	Affirms the need to involve local communities in the preparation of a prevention plan	Prevention: integration of risk into urban planning
Circular of 13 July 2004 (Article 13)	Obligation to set up a Municipal Crisis Management Plan (PCS) for municipalities involved with risk prevention plans (PPR) (condition for funding of Action Programme for Flood Prevention - PAPI)	Crisis management
Decree of 28 June 2011	Possibility of updating plans within a streamlined procedure in case of changes in protection levels (new dikes or maintenance works that increase safety).	Defence

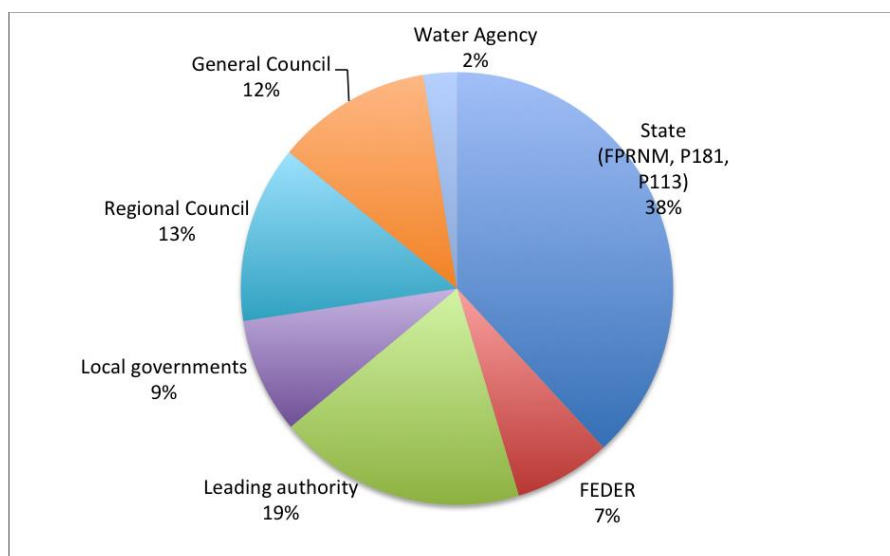
This tendency towards diversification and integration is also represented by the **development of new tools such as the PAPI** (Action Programme for Flood Prevention), which become the central instrument for public action in flood management. Although in practice PAPIs are mainly used for funding defence infrastructures (figure 2.9), they constitute an important opportunity for local actors to develop integrated strategies and collaborations.



**Figure 2.9 Distribution of PAPI funding per action (%)**

Source: MEEDE, 2014

Furthermore, through the introduction of the co-financing principle, implementation of the PAPI (Action Programme for Flood Prevention, figure 2.10) gives shape to a sharing of responsibilities among multiple actors.



**Figure 2.10 Distribution of PAPI funding among actors**

Source: Flood Committee – CMI - annual report 2012

The introduction of mitigation measures into all policy areas is also significant. Despite limitations related to the lack of a legal and technical framework, the low level of centralisation of actions makes mitigation the most dynamic strategy in terms of legitimacy, and technical and social innovation.

In the past few decades, the discourses of “living with a risk” and “more room for water” have gained legitimacy in association with global societal trends (pro-environment and pro-negotiation). Reducing vulnerability has become an important component of flood management policies which illustrates the diversification of the other strategies. Mitigation therefore plays a bridging role, it helps aligning and integrating the other strategies.

### **Decentralisation and local involvement in flood risk management**

Overall, the main change dynamic is related to an expansion of the set of actors, with an increase in the number of stakeholders involved and the distribution of responsibilities. The redistribution of power and resources to the local level as part of a national decentralisation process is reinforced by the claims of local actors to be entitled to define risk levels and the measures to be adopted. Urban *agglomérations*, which usually become central actors in FRM by more or less voluntarily taking over both risk assessment and management strategies, are the most remarkable of these.

### **Conclusion**

None of the dynamics described above can be seen as radical and fundamental changes; they emerge from a shifting balance of the actors' powers and resources. Changes in discourse appear to support them by legitimising them, but they do not necessarily bring them about. The limitations in the development of the mitigation strategy typically illustrate this situation: although it is promoted in discourses, the resources, instruments and powers made available do not support it? In view of these main trends, it could be said that French flood risk policy at a national level is torn between centralisation and decentralisation. While the State retains control of certain important sectors (such as the solidarity system, risk planning and crisis management), local authorities are incrementally asserting their roles in the development and implementation of policy goals.

Even though the changes have mainly been incremental, they seem to have been profound enough to lead in the long term to fundamental change (especially if one considers the continuing trend for decentralisation and the foreseeable developments associated with the recent institutional reforms brought about by the MAPAM Act).

### **2.4.2 Explanatory factors in French FRGA**

**Table 2.12 Stability and change factors of the French FRGA**

	<b>Stability Drivers</b>	<b>Change drivers</b>
<b>Factors internal to the FRGA</b>	<p><b>Path dependency towards protection</b> (technical and expert-based State culture and trust in the public sector)</p> <p><b>Shock events:</b> legitimate the traditional centralised and security oriented policy;</p> <p><b>Existing legislation</b></p> <ul style="list-style-type: none"> <li>• Existing systems of liability and compensation measures;</li> <li>• Existing risk planning;</li> </ul> <p><b>Existing institutional and legal design</b></p> <ul style="list-style-type: none"> <li>• Concept of risk as a general interest issue (centralised policy);</li> <li>• Welfare state and constitutional principle of national solidarity and equality among territories;</li> <li>• Prevention and precaution principles.</li> </ul>	<p><b>Reform of the institutional framework</b></p> <ul style="list-style-type: none"> <li>• <b>Decentralisation:</b> the rise of inter-municipal cooperation and the role of basin organisations;</li> </ul> <p><b>Reforms of legislative frameworks</b></p> <ul style="list-style-type: none"> <li>• Civil security reform;</li> <li>• New protection security levels;</li> <li>• Participation procedure reforms;</li> </ul> <p><b>Change agency: towards more partnerships</b></p> <ul style="list-style-type: none"> <li>• State disengagement: budget reductions;</li> <li>• Involvement of local governments and urban governments;</li> </ul> <p><b>Court judgments</b> (for example, in 2014 the Mayor of a village was sentenced to four years in prison for concealing flood risks);</p> <p><b>New discourse on urban development (including risk)</b></p> <ul style="list-style-type: none"> <li>• Sustainable development discourse: compatibility development and risk issues;</li> </ul>

		<ul style="list-style-type: none"> <li>• More room for water;</li> </ul> <p><b>Development of knowledge:</b></p> <ul style="list-style-type: none"> <li>• National level: Ministries, insurance companies;</li> <li>• Local expertise;</li> </ul> <p><b>The implementation gap</b> between legislation and the way it is put into practice</p> <ul style="list-style-type: none"> <li>• Local doctrines;</li> <li>• Negotiations between the State and local authorities.</li> </ul>
<p><b>Factors external to the FRGA</b></p>	<p><b>Shock events</b></p> <ul style="list-style-type: none"> <li>• International disasters (such as Chernobyl, 1986, New Orleans, 2005);</li> <li>• National industrial disasters (such as the AZF accident in Toulouse, 2001);</li> </ul> <p><b>Existing institutional and legal design</b></p> <p><b>Existing formal legislation processes</b></p> <ul style="list-style-type: none"> <li>• Flood Directive: legitimisation of zoning systems.</li> </ul>	<p><b>Shock events</b></p> <ul style="list-style-type: none"> <li>• <b>Storms of 1999 and 2010</b> (triggered reforms of legislative frameworks);</li> </ul> <p><b>EU Flood Directive</b> (push towards insurance against flood risks or EU Water Framework Directive, EIA Directive);</p> <p><b>Change agency:</b></p> <ul style="list-style-type: none"> <li>• Changing ideas on the State/market/civil society relationship;</li> <li>• Public action is decreasingly based on coercion (incentives, flexible legal rules, etc.);</li> </ul> <p><b>Judicialisation process</b> (criminal law enters the flood risk arena): an increase in the number of disputes (legality, liability) strengthens the role and powers of the courts.</p>

### *Stability drivers*

#### *Legal, institutional and administrative characteristics*

As we have pointed out, the centralisation of FRGA is linked to core elements of the political-administrative system, as well as to constitutional and legislative principles. The constitutional, political and administrative culture contributes to defining risk as a State mission and a push towards stability. As French flood risk policy is fully embedded in these constitutive elements, radical changes are very unlikely.

If we look at how centralisation works to maintain stability, we see several factors that are worthy of mention. First, centralisation is associated with the weight of the public sector. Since risk management is viewed as a mission of public security, the opportunities for actors other than the State (local authorities as well as private actors) to engage in the field are extremely limited (in terms of material means and legitimacy). The recovery sub-arrangement is the most striking example of this: it is the only one that involves private actors, who act on behalf of public authorities and are governed by them and are also insured by the State (through its unlimited guarantee).

The fragmentation within State services also contributes to stability. The multi-risk approach that guides the preparation strategy removes it from environmental services (at a ministry and territorial levels). The unique role of the Ministry of the Interior makes this an isolated strategy that is less



influenced by changes in other domains. The division between the Water Directorate and the Risk Prevention Directorate within the Ministry of the Environment contributes towards limiting development of the mitigation discourse and measures (which are mainly supported by the Water Directorate).

### *Path dependency and the technocratic culture*

Since the early 19<sup>th</sup> Century, State intervention has been principally justified by the challenges of economic development (Allard, 2006). This may be related to the construction of a modern secular State (Borraz, 2008, Hague, 1998) whose power does not derive from God, but from its capacity to guarantee the safety and growth of both the territory and the population (this growth was even more concentrated along rivers with the development of the railways, Ledoux, 2006). Even though the State has no obligation to finance protection infrastructures, it took the lead on the main rivers.

In this context, the State's main arm was technical administration. Engineering corporations (such as *Ponts et Chaussées*) were the principal providers of actual practices, operational routines and norms, thereby nourishing path dependency in the area of protection. This technocratic culture and management, which is closely linked to the State (through the engineering corporations), is still very much alive, and constitutes a further fundamental stability factor (see Box 2.5).

#### **Box 2.6 Protecting development: a mission for the modern élite**

**State doctrine has been closely associated with the engineering discourse since the 18<sup>th</sup> Century.** Floods are a natural phenomenon that scientists should be able to understand and therefore control: the occurrence of floods is interpreted as a lack of understanding of the phenomenon (Coeur, 2001, Hague, 1998). The aim of the scientific and technical approach is to control natural elements; this is also the key to the protection and safety policy. Knowledge and an engineering capacity are fundamental to the construction of the State's legitimacy, as they allow it to control its territory and guarantee the safety of the population.

A number of researchers have shown that the construction of the State's discourse on risks in general (and consequently on floods) relies on the engineering corporations that were created to work in the service of the State, in particular *Ponts et Chaussées*, which is responsible for waterways (Rosanvallon, 2004, Favier, 2005). These corporations are the main providers of current practices, operational routines and norms, and are noteworthy for their scientific and technical expertise (because identification of the problem took place while the corporations were affirming their position as representatives of modern engineering Picon, 1991). They began building representations of floods that are produced and reproduced in order to develop an official vocabulary on public policies based on technical expertise. The centralised political organisation is paralleled by a centralised expert organisation, and they act jointly to transmit the doctrine. These corporations form a technical elite that is proud to remain neutral, works at the service of the State administration (and not its elected representatives) and has the capability to face up to local élites.

### *Catastrophic events*

Contrary to what one might have expected, choc events are rather factors of stability, not change. Since 1982 and before, flood events have legitimised the traditional centralised and security-oriented policy. This was the case after the Xynthia storm (mobilisation of exceptional resources by the State). Shock events also strengthened the prevention policy. Indeed, the 1999 storm triggered the launch of a mass drafting of Flood Risk Prevention Plans (PPRIs).

### *Change drivers*

---

### *Institutional and administrative factors: decentralisation*

First and foremost, the progressive decentralisation of powers towards local governments since 1982 would appear to be the main explanatory factor for the expansion of the set of actors. In the preparation domain, the responsibilities of municipalities have gradually been reinforced by the introduction of specific tools (Municipal Crisis Management Plans (PCS) and Municipal Information Documents on Major Hazards (DICRIM)). Municipalities are also identified as the sole party with liability for maintenance of the defence infrastructure. The MAPAM Act of 2014 represents the last step in this process, and clearly pointing to (inter)municipalities as the competent actor in terms of water and flood risk management.

Two other factors have emerged that are closely linked to the decentralisation process. Firstly, there are the budget restrictions on public expenses that have been in place since the 1980s have been the driving element in reviews of the interventionist role of the State. The State, together with other actors, participates in the efforts against flooding and the development of a multi-strategy approach to flood management.

Secondly, the State's economic disengagement is associated with a strengthening of inter-territorial cooperation in the form of inter-municipal bodies and public basin organisations. The recent introduction in the MAPAM Act (2014) of "management of the aquatic environment and flood prevention" (the French acronym is "GEMAPI") is likely to strengthen this dynamic by placing FRM under the direct responsibility of municipalities, thereby legitimising existing initiatives and their proponents, and obliging others to become involved.

### *Shock events*

National shock events may have provided the main stimulus for recent legislative reforms, but industrial disasters have had as great an impact as natural ones. The AZF disaster in Toulouse in 2001 led to a reform of civil security, which states that private citizens are responsible for their own safety (see the law of 2004). While some national events may provoke renewal of the national policy approach, it seems that physical events have an impact if they coincide with existing institutional and legal trends; they lead to somewhat incremental changes, possibly because, since our selected baseline year (1982), France has not (yet) suffered a national-scale flood event that might have a radical effect on policy. Still, dramatic local catastrophic events have had as much impact as national ones, and have served as triggers for the incremental evolution of national policy by raising public awareness of flood risk and pointing up the limitations of State policy (for example, Vaison-la-Romaine in 2002 and Xynthia in 2010).

### *The Floods Directive*

The Floods Directive has contributed in some way towards legitimising the existing French flood risk management system: certain of its tools, such as the zoning system, might in fact have been inspired by French flood policy because they fit to spatial scales required by former legislation (e.g. water act). At the same time, the FD also represents a driver for change by requiring that objectives be defined and that a formal programme of actions in the flood domain be developed. It has also provided an opportunity for local actors to take specific positions (identification of coordinating actors), initiate actions and improve their competences in this area.

## 2.5 Evaluating flood risk governance on a national scale

STAR-FLOOD assumes that the flood risk governance arrangement should:

- 1) enhance society's resilience to flooding;
- 2) be perceived as legitimate; and
- 3) make efficient use of resources.

### 2.5.1 Resilience

To what extent does flood risk governance in France enhance society's resilience to flooding? There are three facets through which resilience has been assessed, these include the capacity to resist, capacity to absorb and recover from a flood event and the capacity to adapt (including the capacity to learn, innovate and improve). The key findings at the FRGA level are presented in table 2.15. One may say in general that flood risk governance already provides a somewhat diversified set of strategies and measures: all the strategies are present, in fact. This diversification is strengthened by funding partnerships and also, potentially, by the new tools from the Floods Directive that are being implemented. Consequently, societal resilience appears to be enhanced by having a multitude of FRMSs to act at various stages within the disaster management cycle. Nonetheless, there are major weaknesses, which mainly consist in a lack of coordination and a low level of effectiveness. Particularly worth noting is the separation of laws and powers among strategies, in particular the water sector, urban planning and risk planning. This lack of effectiveness is due to various elements: budget restrictions affecting both the State and local authorities in the implementation of measures, as well as conflicts between the State and local authorities (risks not properly taken into account in planning documents, while the State has reduced powers to impose constraining measures).

The capacity to "return to a normal situation" is difficult to assess in the absence of major events and a formal buffer capacity assessment framework and culture. With regard to the ability to adapt, it is possible to observe a certain capacity for innovation, and there have been various technological and normative reforms in all the strategies. As we have said, flood policy is a very dynamic sector, but it is not easy to establish to what extent the changes may be described as "innovative". Very often it is more about minor changes to an already-established policy trend. As we have seen, flood policy has changed progressively since the 1980s towards more decentralisation and the responsabilisation of local authorities, but none of these changes has brought about a radical change in the policy, which remains a centralised State matter, relying on the solidarity system. The table below shows the three dimensions used to assess flood resilience

**Table 2.13 Evaluation of flood resilience at a national level**

	Characteristics of flood risk governance	
RESILIENCE	Enhancing	Constraining
<b>Resistance</b>	<ul style="list-style-type: none"> <li>- Diversification of tools for resistance: a long tradition of defence infrastructures, national flood forecasting system and flood zoning system</li> <li>- Defence in particular is a quite efficient and legitimate strategy;</li> </ul>	<ul style="list-style-type: none"> <li>- Significant sources of weaknesses (which the new regulations have tended to reduce): 1. Too many fragmented managing situations that hinder a clear attribution of responsibility (still too many “orphan dikes”) 2. Lack of funds for maintenance. 3. Lack of knowledge of dike dynamics (simulations of breaches);</li> </ul>
<b>Buffer capacity</b>	<ul style="list-style-type: none"> <li>- Diversification of strategies and measures is noticeable: the governance arrangement favours the expansion of measures through operational and financial tools such as the Action Programme for Flood Prevention (PAPI) and other funding systems;</li> <li>- Partnership funding (through contractualisation) ensures the sustainability of measures (which are less dependent on one single actor);</li> <li>- Although it is too soon to make an assessment, the Flood Directive is being implemented in accordance with the European timeline. Flood Risk Management Plans projects have been set, and will now follow a public consultation process for the next six months;</li> <li>- Some bridging mechanisms have a tendency to attenuate the fragmentation of strategies: the specific role of protection infrastructures for prevention and defence, the strategic pillar of the system connecting prevention to recovery, and the role of Mayors connecting preparation to defence;</li> </ul>	<ul style="list-style-type: none"> <li>- Strategies remain fragmented: there is a lack of coordination among strategies. Preparation remains somewhat isolated, recovery is totally independent and absent at a local level and mitigation does not represent a well-defined and well-funded strategy;</li> <li>- Limited diversification of actors in implementation of the strategies: the public sector is still dominant;</li> <li>- The separation of legal codes (water, urban planning and risk planning) is considered to be a burden on the coordination and integration of the various strategies;</li> <li>- Budget reductions: difficulty in ensuring a long-term sustainability of action (in particular, uncertainties regarding maintenance of the protection system);</li> <li>- Nonetheless, the legal framework in the flood domain is considered not to be sufficiently flexible to allow adaptation and innovation;</li> <li>- Absence of a formal framework and culture of assessing the capacity to “return to normal”;</li> <li>- The PAPI has the potential to be a bridging mechanism, but in reality it works as an instrument for the coordination of different measures and their funding.</li> </ul>
<b>Adaptive capacity</b>	<ul style="list-style-type: none"> <li>- There seems to be scope for innovation: floods represent a very lively policy sector (increasing (knowledge and technical development, legal production, participation in European and nation research programmes, etc.);</li> <li>- Measures against climate change are developed (such as the Climate Change Adaptation Plan).</li> </ul>	<ul style="list-style-type: none"> <li>- Innovation seems to be framed by old policy trends and configurations: despite changes, the State still has control over risk planning, and little is being done to improve the integration of risk into urban planning documents;</li> <li>- National regulations and European tools are seen as a standardisation vector and obstacles to innovation;</li> <li>- Global lack of participation leads to a reduced capacity to adapt;</li> <li>- Nonetheless, climate change is not a policy issue: there is very little concern at a national or local level. However, it has begun to be integrated through marine submersion issues (put forward in Le Havre, with the first tentative steps being taken in Nice).</li> </ul>

### 2.5.2 To what extent can flood risk governance in France be described as legitimate?

Public authorities represent the main source of legitimacy. This is traditionally a technical legitimacy that relies entirely on the state (centralism). However, local authorities gain more and more legitimacy, both technically and politically. This is why partnerships are multiplying between the central and local scales. Similarly, the law increasingly shares the powers between public authorities.

If the technical legitimacy of the state tends to be challenged by local authorities, citizens seek also for political action. They ask to be directly involved in decisions that affect them locally. Public participation, however, is often limited to public enquiries. Although they are a participation requirements for the main procedures (Risk Prevention Plans, Water Management Plans *etc.*), they do not achieve proper public participation because the public is not actually in a position to influence decisions taken by the public authorities. Indeed, public participation comes too late in the decision-making process and there is no obligation to take comments into account. At the same time, France has developed a number of different participatory instruments, especially at a local level, such as public debate, but observers have tended to highlight the limited impact of these tools on decision-making (Blatrix *et al.*, 2007). However, these instruments are frequently mobilised by project managers to enhance public acceptability instead of effective participation.

This transfer of technical and political legitimacy to the local level (local authorities and citizens) is accompanied by the growing intervention of the courts. First, a recent court decision strongly condemned a mayor in the Xynthia case. This case law marks a significant change in the intervention of the courts in the field of floods. Furthermore, the criminalisation of public life has corresponded with an increase in the number of applications being made to the criminal courts to assert the liability of policy-makers (politicians and public officials) (Larroumec, (2012; Braud, 2012). The compensation awarded to victims by the administrative or civil courts is not an issue here: the victims want a culprit to be identified by a criminal judge and punished in person. In terms of risk, the most emblematic example is the conviction of the Mayor of La-Faute-sur-Mer (Xynthia) by a criminal court (Cans *et al.*, 2015). Second, a judicialisation phenomenon should be emphasised. The literature has highlighted a growing crisis in the traditional mechanisms of political confrontation and the rise of the judicial sector to solve conflicts and ultimately to take positions and resolve political matters. In this regard, one talks about a progressive judicialisation of the democratic system (Kaluszynski, 2006; Rouvillois, 2008). The table below shows the three dimensions used to assess flood legitimacy.

**Table 2.14 Evaluation of FRGA legitimacy at a national level**

LEGITIMACY	Enhancing	Constraining
	<ul style="list-style-type: none"> <li>- Overall opening up to local governance processes, through participation procedures or partnerships that are mostly formed among institutional stakeholders (public participation is rarely sought);</li> <li>- Legitimacy is more and more sought after and based on (institutional) participatory processes, and less on the unique and self-legitimising position of the State;</li> <li>- Knowledge gained from participatory processes is taken into account and encouraged in decision-making processes, but mostly where institutional stakeholders and ‘recognised’, ‘formal’ experts are involved;</li> <li>- Reasonably good access to environmental information;</li> <li>- Ultimately, legitimacy is sought by applying:               <ul style="list-style-type: none"> <li>→ the objectives stated in European legislation (all case studies);</li> <li>→ catastrophic events as driving factors for political initiatives (the Xynthia storms);</li> <li>→ the former “best practices” of river and risk management (Plan Loire) (and lessons learned);</li> <li>→ the increasingly common adoption of a multi-strategy approach (less on protection and more on a combination of the 5 FRMS);</li> <li>→ the public sector as a source of legitimacy.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- “Judicialisation” of the French system: consensus is not sought upstream (in the political arena) but downstream (in the judicial sphere);</li> <li>- Geographical inequalities relating to project priorities of national interest;</li> <li>- Lack of transparency noted in certain local arrangements;</li> <li>- The questions “to what extent are opportunities created whereby stakeholders (including the public) are able to challenge and appeal against decisions made?” and “to what extent is this accessible to everyone?” do not represent a clear or sought-after objective on their own at either a national or local level;</li> <li>- Distributional effects are generally considered but are normally integrated into political bargaining → lack of transparency.</li> </ul>
<b>Public participation</b>	<ul style="list-style-type: none"> <li>- Consultation of the public through public enquiries is widely established;</li> <li>- Multiplication of participatory democracy instruments upstream of the decision-making process (public debate, negotiating tables, <i>etc.</i>).</li> </ul>	<ul style="list-style-type: none"> <li>- Public enquiries are held too late in the decision-making process to have a real impact. There is no obligation to take comments into account;</li> <li>- Participation by the public is sought but has no constraining force (it is very often reduced to communications objectives);</li> <li>- Although the right of access to environmental information is fairly well implemented in France regarding floods, the rules on public participation appear to be somewhat weak. Few public debates are held when it comes to floods (to date, just one has been organised in France on this issue).</li> </ul>

### 2.5.3 To what extent can flood risk governance in France be described as efficient?

As far as the efficiency process is concerned, there are no elements that allow an assessment of the use of financial resources. The French administrative culture is underdeveloped in this area. Public authorities hold the global discourse that the dikes are too expensive compared to their profits. A cost-benefit analysis is required by law for the most important water infrastructures. As stated in interviews, the state authorities are trying to improve the cost-benefit analysis by developing the multi-criteria analysis.

With regard to the CAT-NAT system, with the increase of flood events, observers have questioned the capacity of the system to provide an economically efficient solution in the long term.

Conversely, the fact that knowledge resources and innovation tend to be more diversified and to have been developed with more cooperation with end-users (local operators) compared with the past is positive: from State-science to a more diversified, tailor-made solution. The table below shows the three dimensions used to assess flood efficiency.

## 2.6 Conclusion

In conclusion, we can say that the national FRGA formally provides the main tools for a resilient, efficient and legitimate flood system, but the implementation of those tools should be improved. This includes, in particular, the low effectiveness of laws and actions, coordination problems between the powers of public authorities, and finally the difficulty of the processes (legal and institutional) to adapt to local contexts.

The following chapters will review our analysis of the case studies in the second part of this report. We will evaluate the extent to which the national FRGA enables or constrains flood risk governance on a local scale by asking the following questions: how do local actors implement and adjust the centralised flood risk policy defined at the national level? Are there gaps or tension between national and local FRGA?

Using the case studies, we will attempt to answer four principal questions:

Firstly, considering the historical narrative that defines risk as a State matter, does decentralisation influence the definition of risk? The cases will be used to validate and assess the finding that risk moves from being defined as a State matter to being defined as a local issue. Is risk policy implementation dominated by confrontation or negotiation? Based on the various contexts and actors, how is flood risk apprehended? Is flood risk in conflict or compatible with local development?

Secondly, considering the role of local authorities in land planning, to what extent do urban pressures impact the integration of flood policy into land planning?

Thirdly, although the flood risk policy appears to be fragmented at the national level, do we observe integration achieved through actions taken at the local level and the territories? In particular, we will reflect on the extent to which local actors use decentralisation processes to diversify and align FRM strategies.

Finally, it seems that there is a gap between the discourse on “integrated management” at the national level and its implementation in the field. We will therefore examine whether the tools developed on a national scale enable integration at a local level. In particular, one would expect PAPIs (Action Programmes for Flood Prevention) to play this role: do they have this coordination function and role in practice? Furthermore, we will examine the impact of the Floods Directive on local FRGAs. How are the European tools perceived and used at a local level



**Table 2.15 Evaluation of FRGA efficiency at a national level**

	Characteristics of flood governance	
	Enhancing	Constraining
<p><b>EFFICIENCY (cost-benefit analysis)</b></p> <p><b>Institutional efficiency</b></p> <p><b>Knowledge Resources</b></p>	<ul style="list-style-type: none"> <li>- Integration of cost-benefit analysis to operational decision-making processes through the PAPI “application” (circular of 12/05/2011: CBA obligatory for projects &gt; €2 million);</li> <li>- Current development of CBA and multi-criteria analysis by national experts (European Center for Flood Prevention – CEPRI, CGDD, CEMAGREF and the Ministry of the Environment,) (CEPRI, 2011; CGDD, 2014) and regional and local actors (methodological guides developed by Regions such as Rhône-Alpes);</li> <li>- Integration of cost-benefit analysis into new planning documents introduced by the Flood Directive. The content of the FRMP (PGRI) also reflects an effort to diversify evaluation of efficiency (Article R. 566-10 of the Urban Code);</li> <li>- Budget restrictions and the decentralisation process encourage progress towards an improved and more efficient coordination of strategies and actors;</li> <li>- Major technological innovations (flood forecasting systems) in the flood sector are largely used by local authorities and positively evaluated;</li> <li>- Increasing co-development of knowledge production resulting from cooperation between local research institutions and local operators (local authorities, private actors).</li> </ul>	<ul style="list-style-type: none"> <li>- Efficiency analysis is poorly developed in France. This partly concerns cost-benefit analysis, but more generally relates to economic, social and environmental efficiency assessment;</li> <li>- Still limited to infrastructural works (dikes and dams) through the Rapid Submersion Plan (PSR) of 2010;</li> <li>- Lack of assessment of actions produced and expected outcomes, for example between the production of information and the development of risk consciousness.</li> </ul>
<b>FRGA Defence-mitigation-preparation</b>		Cost-benefit analysis non-existent for soft measures (prevention, mitigation, preparation).
<b>Prevention</b>		Risk Prevention Plans are implemented locally by the State. They appear to be well implemented from a legal point of view, although their efficiency can be questioned (due to a failure to take into account of local development). Some local doctrines (in Nice for example) permit the introduction of flexibility.

<p><b>Recovery</b></p>	<p>The financial balance of the French compensation system (the Natural Disaster Scheme – CAT-NAT) is positive (loss/premium ratio = 50% on average since 1982). The State guarantee has only been needed twice, in 1999 and 2010.</p>	<p>Questions are raised about the limitations of the CAT-NAT regime in the case of repeated catastrophic events. There are overall weaknesses due to strong imbalances among the Regions and from one year to another.</p>
------------------------	--	--



## 3. Nevers: when a local strategy fits into the national policy

### 3.1 Introduction and scope of the analysis

This Chapter provides an analysis, explanation and evaluation of flood risk governance in Nevers, with the aim of raising and answering some of the questions that arise out of the national analysis.

We will evaluate the extent to which the national FRGA enables or constrains flood risk governance on a local scale by examining:

- the potential gap and tensions between the national and Nevers FRGA;
- the way in which the Nevers actors carry out and adjust the centralised flood risk policy, which is developed at a national level;
- the extent to which local actors in Nevers use decentralisation processes in order to diversify and align FRM strategies. We will reflect especially on the role and impact of a strong, historical River Basin Water Board (EPL) as well as on the role of the Nevers *agglomération*, which anticipates the flood policy decentralisation process;
- the potential gap between the “integrated management” discourse and its implementation in the field. Do the tools developed at a national level, such as the Action Programme for Flood Prevention (PAPI), enable this integration at a local level?
- The impact of the Floods Directive on local FRGA. How are the European tools appropriated and used at a local level?

We will argue that the case of Nevers is a good illustration of the national flood risk management policy:

1. It exemplifies application of the national policy with just a few adjustments for the local context;
2. It also illustrates the recent engagement of local actors, especially at an inter-municipal level;
3. Its main specificity can be associated with the position granted to water basin actors;
4. Finally, it bears witness to the main change and stability drivers that have been observed on a national scale.

We will first describe the main characteristics of the case study area (3.2), followed by an analysis of the dynamics (stability and change) of the flood risk management strategies and their embedding in local/regional sub-arrangements (3.3). We then go on to explain these dynamics (3.4) and to evaluate them (3.5), before providing our conclusions for this case study.

### 3.2 Main characteristics of the case study

The flood issue in Nevers can be viewed as a typical case with regard to both its geographical and strategic characteristics.

#### 3.2.1 A city with few development issues

Nevers is a medium-sized city located on the banks of the Loire River in the Bourgogne region. It is the main city of the rural *Département* Council of Nièvre. Its urban area is located at the confluence of three rivers: the Loire, the Nièvre and the Allier. Slow floods are the main natural hazard in this territory. There is no competition with other natural or industrial risks.



**Figure 3.1 Location of Nevers.**

Source: MarCom-Carto – Faculty of Geoscience – Utrecht Univeristy



**Figure 3.2 Location of Nevers in the Loire Basin**

Source: wikipedia.org/wiki/loire)

As table 3.1 shows, Nevers is experiencing economic difficulties. The contemporary demographic context is marked by an exodus from the city centre (which has lost 10% of its population in ten years) towards outlying areas. This has enabled the urban agglomeration population to remain stable overall. Economic development in the past twenty years has been marked by a general context of adaptation to changes, especially in the automobile and metal industries. In 2009, the Grand Nevers

area included a working population of 42,607, compared with more than 45,000 in 1999, while on a regional scale, the working population has increased by 4.6% and the unemployment rate has declined (-1.4%).

This specific context leads to the absence of land pressures at a local level. Economic development is the main priority and outweighs risk prevention, but it is not necessary to use flood-prone areas for this purpose. They are not considered to have potential for local development, and local representatives tend not to treat them as a political matter.

**Table 3.1 Key characteristics of Nevers (2013)**

Key facts and figures	
<b>Region</b>	Bourgogne, Central France
<b>City population</b>	City: 36,700 Urban agglomeration: 68,734 ( <i>Insee 2012</i> )
<b>Population density</b>	314 inhabitants per km <sup>2</sup>
<b>Population growth per year (99-2009)</b>	City: - 1% Agglomeration: - 0,6%
<b>Elevation</b>	Minimum 167 – Maximum 238 m
<b>River basin</b>	River Loire, approximately 2822 km <sup>2</sup> , confluence of three rivers: the Loire, the Nièvre and the Allier
<b>Properties at risk</b>	12,800 inhabitant (18% of the Nevers Agglomeration) 5,700 properties more than 500 companies (source: Egrian)
<b>Types of flooding</b>	Slow fluvial floods
<b>Local business</b>	Industrial and rural sectors
<b>Household income</b>	€18 205

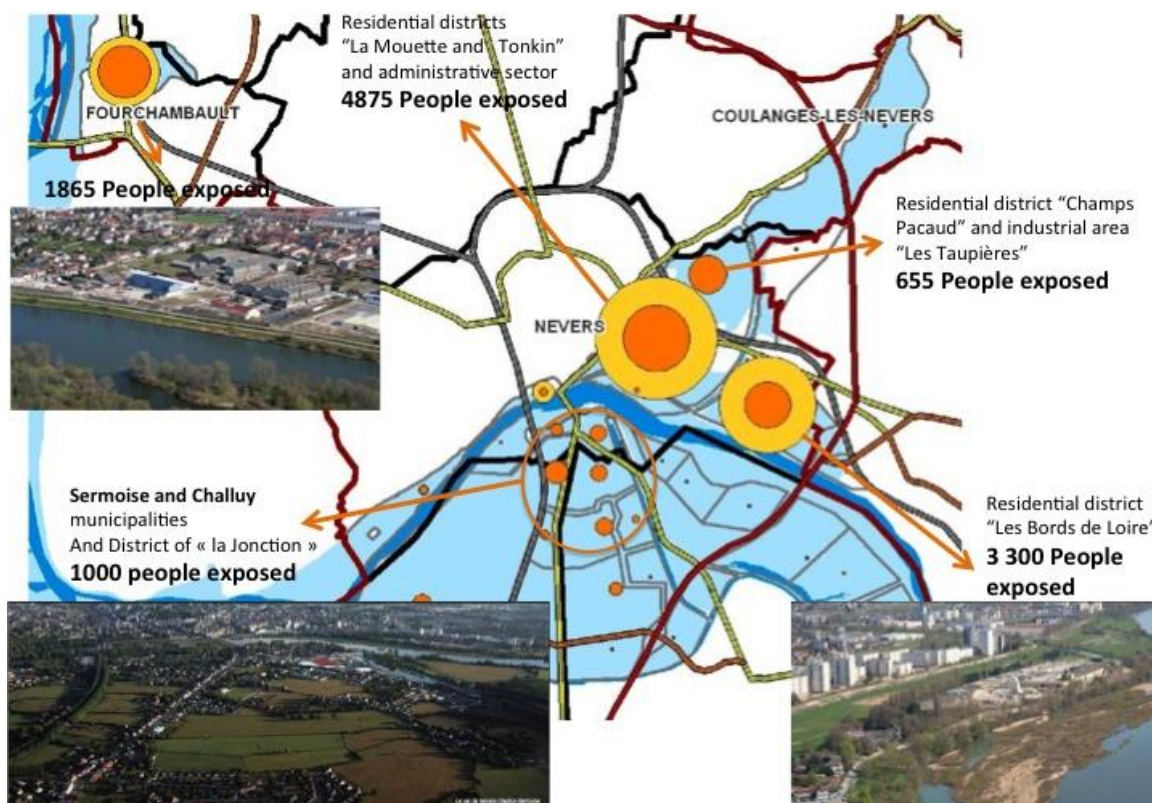
### 3.2.2 Flood risk characteristics: slow floods on the largest French river

At 1,012 kilometres, the Loire is the longest river in France. Its catchment basin covers one-fifth of France’s land area (117,054 km<sup>2</sup>). Relatively narrow when it leaves the Massif Central, its flow doubles when it receives water from its first large tributary, the Allier. This confluence, which is called the “Bec d’Allier”, is the location of Nevers. The land is very flat along the entire length of the Loire and the riverbed is sandy, and slow floods consequently affect wide expansion areas. In the absence of dam and dikes, a great flood of the Loire would rise to a height of five to six metres above the low water level, with a flow of 6,000 to 9,000 m<sup>3</sup> per second downstream of the Bec d’Allier (the Villerest dam lowers it by one metre).

Three types of flood can be distinguished. “Oceanic” floods are the most frequent: they are the result of long periods of rainfall from the Atlantic Ocean, and generally occur in the cold season. “Cevenol Episodes” are caused by sudden violent storms (from the Mediterranean) and mainly affect the upstream section of the Loire. Finally, “mixed” floods correspond to a conjunction of these two events and often occur in Spring or Autumn. The three major floods of the 19<sup>th</sup> Century (in 1846, 1856 and 1866) represent the reference level for the highest known water levels, and were mixed floods<sup>6</sup>.

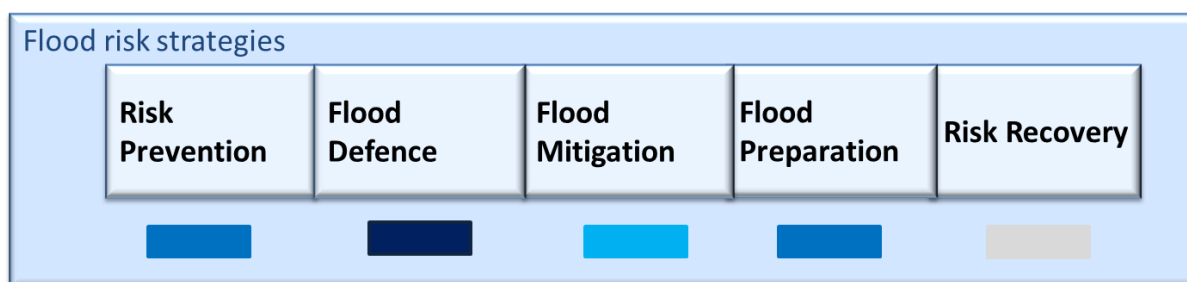
<sup>6</sup>They are considered to be 500-years floods, and have affected all the principal French rivers (the Seine, the Garonne and the Rhône) at the same time.

The city of Nevers is located on the right bank (figure 3.3), and was originally developed on a hill. The areas located directly along the river remained undeveloped until the 20<sup>th</sup> Century. The left bank of the Loire, which is the most prone to flooding, was less developed: small villages (Sermoise and Challuy) only developed at the ends of the main bridge across the river. In Nevers, the districts that are most exposed to floods were built after the Second World War. The urban pattern changed considerably under pressure from population growth, especially on the outskirts, where large areas of council housing and individual estates replaced the hitherto agricultural areas alongside the river (for instance, the “Bords de Loire” districts). In total, 12,000 inhabitants are currently exposed to flood risk (EGRIAN study). This is much less than is the case with other major cities on the Loire, Orléans (20,000 inhabitants representing 17% of the total population) and Tours (70,000 inhabitants, 54%) and explains why Nevers would not be a priority for State action if a general flood were to occur on the Loire. Still, Nevers is the only city on the river that has faced floods in the past ten years or so (in 2003 and 2008). They were not major events: some homes were flooded and the main consequence was a disruption of water and sewage services. They clearly raised the local authorities’ awareness of the potential damage they might face, however.



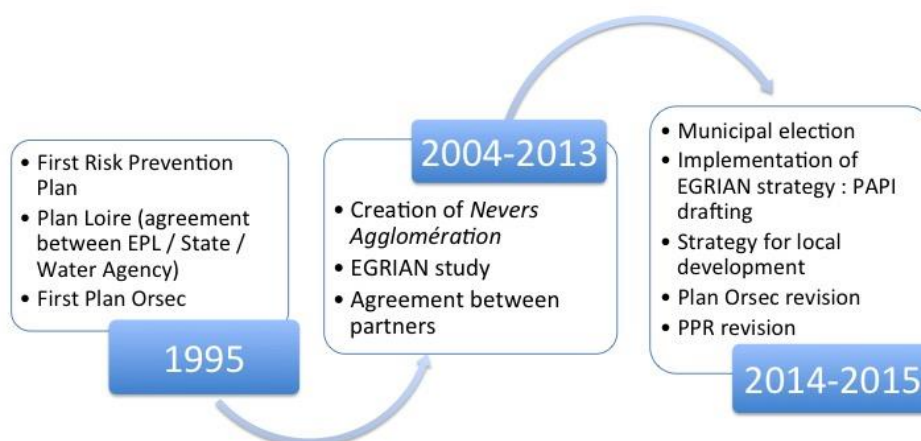
**Figure 3.3 Flood-prone areas and the exposed population in Nevers**  
Adapted from EGRIAN 2012)

### 3.2.3 Characteristics of flood management strategies: a focus on defence-mitigation and preparation



**Figure 3.4 Overview of strategies present in the case study Nevers.** Dark blue indicates the most dominant strategies, and medium blue establishing strategies, light blue minor strategies, grey-blue strategies do not play a role.

FRM in Nevers is noteworthy for two main characteristics: (1) the influence of the policy developed on a Basin scale, and (2) the current commitment of the *Agglomération* through a local strategy. Flood management on the Loire has a very long history that still constrains and influences the local flood risk policy and governance organisations, but Nevers also offers an opportunity to analyse a situation in which local actors made an early commitment at both the basin and local levels. Indeed, Nevers took an early interest in the flood management issue compared with other cities on the Loire. In the early 2000s, it was a pioneer in its willingness to develop an innovative approach, organising visits to the Netherland and becoming involved in the “Freude am Fluss” Inter-Regional Programme. Orléans followed in 2010, as did Tours more recently.



**Figure 3.5 Nevers flood policy milestones**



### The Loire model: influence of the policy developed on a basin scale

FRMs developed on national and basin-local scales are closely linked, and influence each other for decades, if not centuries. On the one hand, flood management on the Loire has been a place for trying out the national FRM policy, while on the other, the policies developed by basin and local actors have been initiating trends that are now being developed at a national level.

### A model based on defence associated with mitigation

As regards its defence system, the Loire was the first river for which the State took responsibility for ensuring the safety of the population. While the course of the Seine and Rhone rivers had only been slightly restricted until the 19<sup>th</sup> Century, the Loire has had a long history of massive embankments since the 12th Century. The first embankments served the interests of transportation and economic development and later evolved to protect population. As a result, no less than 700 km of dikes have been built along the river. In Nevers, there are dikes for 10 km upstream and downstream, on both the left and the right banks (see figure 3.3).

The containment policy for the Loire was questioned very early on, and this led to the development of the “room for water” measures, which were applied after the major floods of the 19<sup>th</sup> Century. The chief engineer, Comoy, was the first promoter of a mitigation solution developed for the Loire. Some of the proposed works were carried out between 1870 and 1890, but these technical solutions for water control were then set aside for more than a century (*e.g.* spillways).

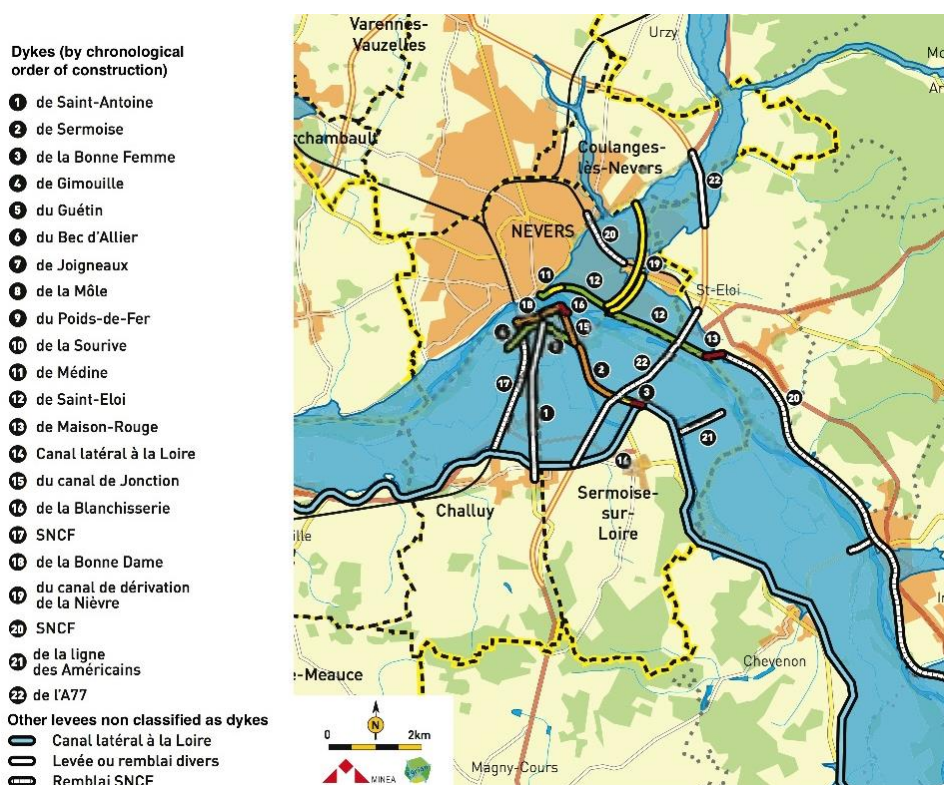


Figure 3.6 Map of the defence system

Source: EGRIAN, 2010

Mitigation measures were only brought back on to the agenda during the 1990s. At this time, local opposition to dam construction projects provoked conflicts involving associations, the Loire Basin Water Board ("*Etablissement Public Loire*", EPL) and State services, which triggered developments on

a national scale. This led to the creation of the *Plan Loire Grandeur Nature* (PLGN) in 1994 which aimed to combine development, environmental and flood prevention issues. The PLGN resulted in the development of diverse measures that included defence, mitigation and environmental protection. Thus, a consensus emerged among several actors.

### **Box 3.1 The Plan Loire Grandeur Nature**

The 1970s and 1980s were a time of realisation of dam projects on the Loire. In the early 1970s, the government issued a favourable opinion on the construction of four dams, at Serried la Fare, Villerest, Naussac and Chambonchard. The Naussac and Villerest dams were the first to be scheduled, in the Sixth Plan (1971-1975). They were commissioned in 1983 and 1984 respectively.

In 1986, a memorandum of understanding (protocol agreement) was signed between the Loire Basin Public Organisation (EPALA), the Water Agency and the State for the construction of new dams to complement the existing ones at Serrede la Fare (in the *Département* of Haute-Loire), Chambonchard (on the Cher, in the *Département* of Creuse), Naussac II (to complement the Naussac dam) and Veurdre (near the confluence of the Allier and the Loire). None of these dams have been built, however: indeed, they have had to face strong local opposition, which has led to the gradual abandonment or postponement of these various structures.

The *Plan Loire Grandeur Nature* was developed in 1994 in response to the debates in the 1980s on dam projects. It is a comprehensive development plan that aims to reconcile the safety of individuals and property with environmental protection and economic development. The first plan initially only covered the Loire river, but its perimeters expanded progressively (it was recast as six-year programmes) and it now covers the entire Loire watershed (comprising nine Regions and twenty-nine *Départements*). The first three programmes between 1994 and 2013 helped build a consistent policy on flood risk prevention by developing new knowledge, improving collective awareness of flood risk and conducting major dike reinforcement works. For the future, the next three programmes will be part of a twenty-year strategy (to 2035). Among the objectives of this strategy are "reducing the negative impact of floods on the territories" and reliance on future *Plan Loire Grandeur Nature* programmes as political and financial tools for the implementation of the measures established by the FRMP ("PGRI").

As a result, the dam construction policy begun in the 1950s to regulate the course of the Seine and Rhône could not be implemented on the Loire (the Villerest and Grangent dams are the only two that have been constructed on the Loire, along with Naussac on the Allier, which is the major tributary of the Loire).

Owing to the historical role of the Multidisciplinary Team and the contemporary action of the EPL in Loire flood policy, this attention to mitigation solutions represents a specific feature of FRMS on the Loire River. The current proposal by river managers in Nevers to provide more room for water echoes a long tradition of reflections on the association of defence and mitigation measures (see below).

### ***Prevention and preparation exemplifies the sector-based approach of the State***

With regards to prevention, the Loire area was the first location for the development of the State's prevention policy (Rode, 2009:116, Fournier, 2010:225). Before the development and implementation of Risk Prevention Plans (PPR), the State services had already used other available planning tools (submersible Areas Plan (PSS) created in 1935 and the General Interest Project (PIG)<sup>7</sup> introduced at the beginning of the 1990s in the Loire region) to prevent flood plain areas from urbanisation, thereby causing tension with local governments that wished to promote development.

<sup>7</sup> This is a legal tool enabling the State to control the development of a particular area for public interest (eg public safety). Here, this tool has been used especially to counter the disagreement of local authorities and thus implementing the state policy on flood risk.

The introduction of the Flood Risk Prevention Plan (PPRI) marked another step forward in this policy. According to the Sermoize municipality, the introduction of the PPRI represented a cut-off point for development. The *départementale* State Service (the *Départementale* Directorate for the Territories – DDT) seems to have developed the first plans quickly (the first projects were officially presented in 1998 and were discussed even earlier). The areas were delineated according to hydraulic criteria and the principles applied to regulate the occupation of land were believed to ensure an equal treatment of all territories. The same rule was intended to apply to all municipalities, and consequently often failed to take local development issues and strategies into account.

Despite the lack of negotiation and integration of development issues, in the absence of important development projects no conflicts developed and the PPRI of Nevers came into force in 2001. Some municipalities, such as Sermoize, not only incorporated the requirements of the PPRI into their local development plan but also proposed even stricter regulations (as a consequence, one-third of the municipality's territory was severely restricted), and attempted to develop an acquisition project to buy exposed houses (but this proved too complicated).

In terms of preparation, the flood monitoring, alert and crisis management system was developed at an early stage, and counts among the most advanced at a national level (Doussin, 2009:101).

The CRISTAL network was created in 1985 by a partnership between the Loire Basin Water Board (*Etablissement Public Loire*), the State and the Loire-Bretagne Water Agency. It took over the existing monitoring systems that had been in effect since 1970. Emergency management relies mainly on a State competence held by the Prefect of the *département* and Defence zone, who is in charge of developing and implementing the ORSEC Plan (Civil security response organisation). In this area, subsidiarity and the sharing of responsibilities with Mayors are also traditional and anchored in practice.

### *Towards a local integrated strategy?*

The involvement of the Nevers municipality and inter-municipal body is also noteworthy. Their commitment is visible in the Nevers Flood Risk Assessment Study (EGRIAN), which was led by the inter-municipal authority and launched in 2007. This study specifically addresses the flood risk issue and aims to address a wide range of strategies (protection, mitigation, prevention and crisis management) through an integrated vision.

After seven years of study of the local situation, the inter-municipal body has gathered a large quantity of data and expertise, and has recently defined its global strategy for the years to come, as well as the measures to be taken.

The final version of the strategy identifies five lines of action, which combine both structural and non-structural measures. Among the structural works, priority is attached to reducing the risk of dike failure through reinforcement works and the implementation of spillways. The State services are also responsible for riverbed restoration (the works have already been carried out). The mitigation works to reduce residual flows are particularly interesting, such as the creation of a “waterway” that does not diminish the flow or the height of the water, but guides it along a preferred route in the event of major flooding.

The strategy comprises the measures to be taken in order to better inform and prepare inhabitants or companies located on the floodplain by planning and reducing the vulnerability of property, equipment and networks. Here, the *agglomération* takes the lead, and priority is clearly given to preparation rather than prevention.

The draft of the strategy stemming from the study also aimed at the development of a partnership-orientated policy, associating all actors concerned at all levels: The PAPI (Action Programme for Flood Prevention) was seen as the best tool for achieving this (see *infra*).

To what extent are local actors taking responsibility? Do they integrate their knowledge and expertise with their prevention tools? Does this expert-based initiative take root in political and strategic actions? What are the forces and weaknesses of this integrated management strategy? Our analysis of flood risk governance in Nevers will now seek to answer these questions.

**Table 3.2 Flood risk management strategies in Nevers**

Flood prevention	Flood defence	Flood mitigation	Flood preparation	Flood recovery
<ul style="list-style-type: none"> <li>• Spatial plans;</li> <li>• Prohibition and regulation of construction through planning;</li> <li>• Risk paragraph in purchase deed;</li> <li>• General information on flooding (e.g. flood maps).</li> </ul>	<ul style="list-style-type: none"> <li>• Dikes;</li> <li>• Weirs and dams;</li> <li>• Retention basins outside area to be protected;</li> <li>• Water course maintenance;</li> <li>• Quay walls;</li> <li>• Compartment dikes.</li> </ul>	<ul style="list-style-type: none"> <li>• Retention basins inside area to be protected;</li> <li>• Human-controlled flood zones;</li> <li>• Rainwater reservoirs;</li> <li>• Flood-safe buildings;</li> <li>• Sustainable Urban Drainage Systems (SUDS, including green roofs, urban green spaces and permeable pavements) (Information, funding of diagnosis and works).</li> </ul>	<ul style="list-style-type: none"> <li>• Forecasting (24-hour monitoring and intervention teams);</li> <li>• Flood warning systems;</li> <li>• Intervention and evacuation plans;</li> <li>• Sandbags;</li> <li>• Pumps;</li> <li>• Repair works on flood protection measures;</li> <li>• Crisis communication;</li> <li>• Community awareness-raising activities;</li> <li>• General information on flooding (e.g. flood maps).</li> </ul>	<ul style="list-style-type: none"> <li>• Insurance systems;</li> <li>• Solidarity fund;</li> <li>• Repair works.</li> </ul>

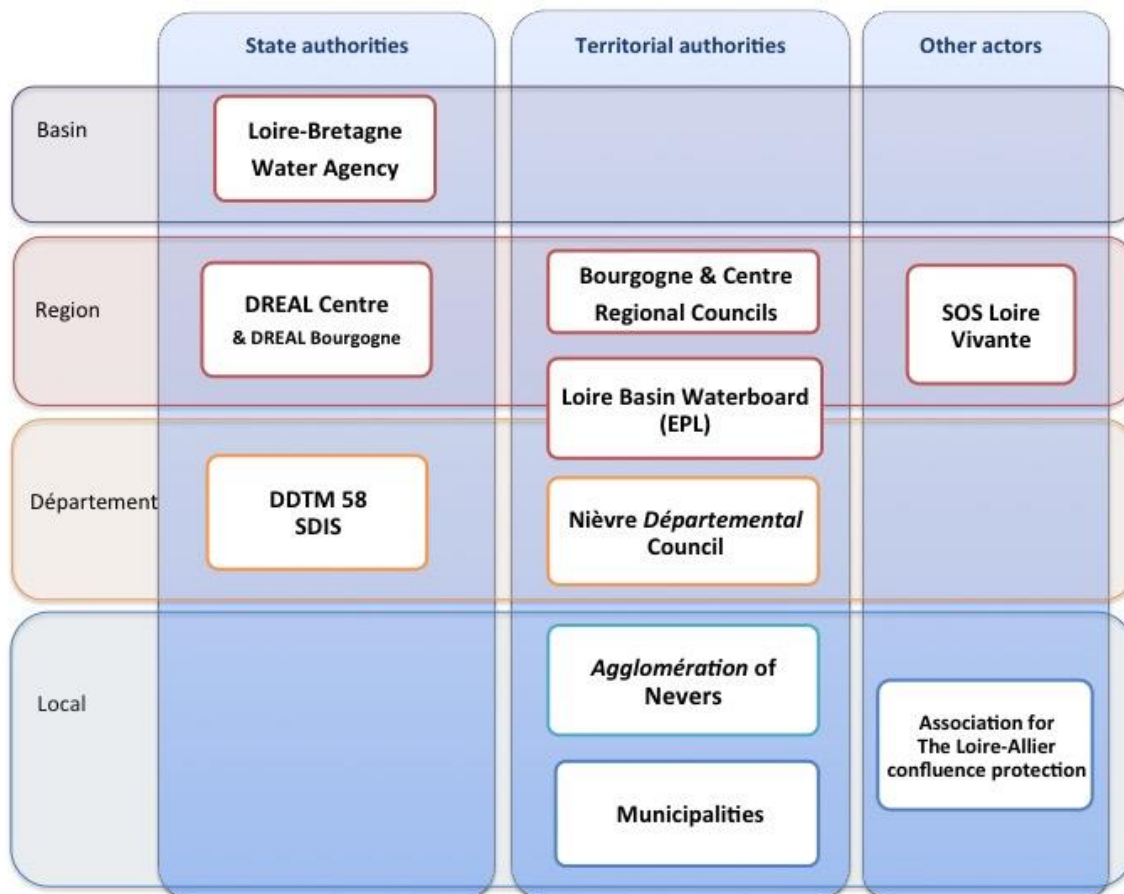
### 3.3 Analysis of flood risk governance in Nevers

The Nevers case study overall appears to follow and confirm the national FRGA and its main dynamics. Three different sub-arrangements appear that coincide with the national ones:

1. the historical importance of defence, which tends to be more and more associated with mitigation;
2. preparation as a sector-based and isolated sub-arrangement;
3. prevention marked by a centralised risk-planning approach.

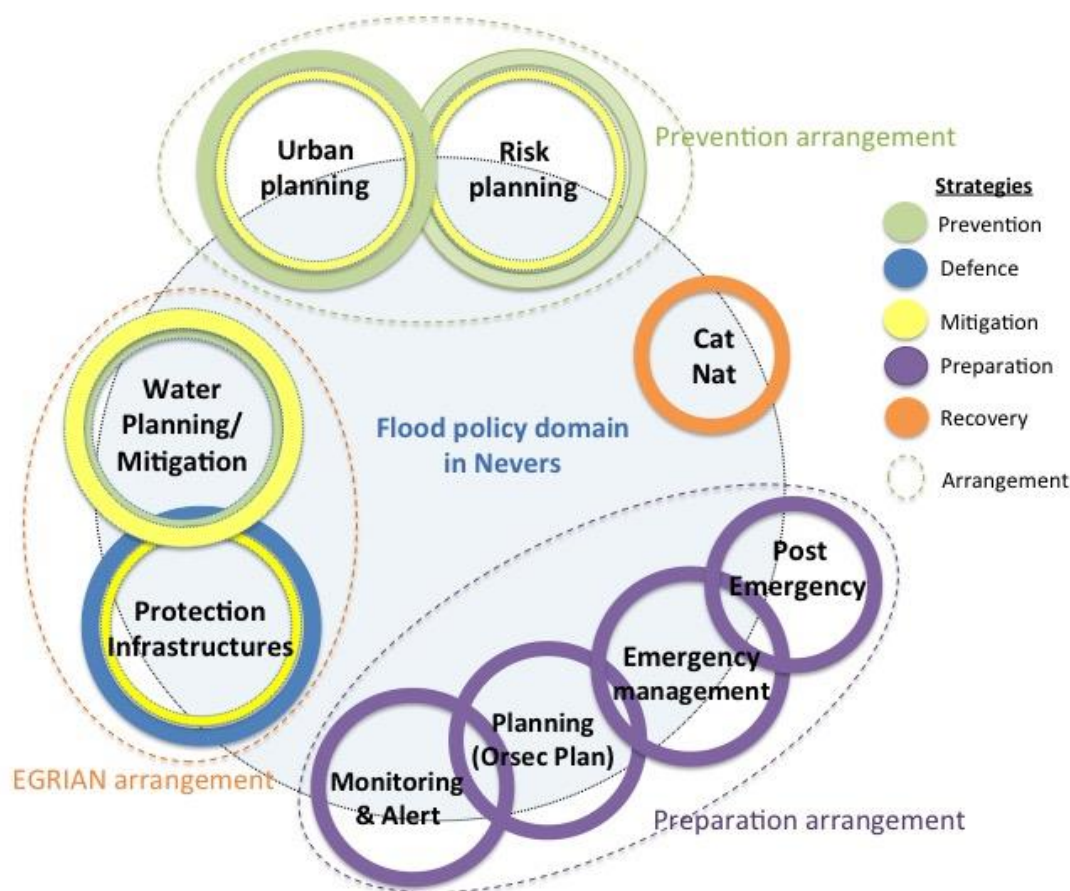
It is important to note that recovery is not managed at the local level. Catastrophic events are reported by victims and then managed in the national system CAT-NAT. This applies to the other two case studies. This is why the recovery system is not mentioned by the interviewees.

We will begin our analysis with the first two sub-arrangements and then reflect on the prevention sub-arrangement. Figure 3.7 summarise the actors involved in the Nevers case at different levels.



**Figure 3.7 Main actors and their territorial scale of action**

Legend
DC: <i>Départemental</i> Council
DDTM: <i>Départemental</i> Directorate for the Territories and the Sea
DREAL: Regional Directorate for the Environment, Land Planning and Housing
EPL: Loire Basin Water Board
SDIS: <i>Départemental</i> Fire and Rescue Service



**Figure 3.8 Three Flood Risk Governance Sub-Arrangements of Nevers**

### 3.3.1 An expert-based and centralised vision of the risk

Nevers represents a significant observation area for identifying answers to the questions raised by a national analysis of the centralised character of FRM. It exemplifies local implementation of national policy, considering risk as:

- a technical issue;
- falling under the State’s responsibility; and
- disconnected (isolated from) from urban and development issues.

This risk concept is visible in the three main sub-arrangements: defence-mitigation, prevention, preparation.

#### *The defence-mitigation sub-FRGA*

The association between defence infrastructures (dikes and dams) and mitigation actions (such as the construction of spillways, waterway maintenance and vulnerability reduction) is the main feature of the Nevers FRGA; it is an expert-based sub-arrangement in which it is believed that mitigation operations will protect dikes and strengthen the security of the overall defence-mitigation system.

The strength of this defence-mitigation sub-arrangement relies on an actor coalition composed of:

- the State, responsible for the dykes on the left bank and riverbed restoration;
- the Basin Water Board (EPL), manager of the dams; and
- the Municipality of Nevers, the owner and manager of the dykes on the right bank.

This trio generates a stable governance arrangement over time. Their common discourse is rooted in the connection between defence and mitigation strategies that was promoted in the 19<sup>th</sup> Century with the Comoy Plan and was confirmed through the *Plan Loire* at the very beginning of the 2000s. First, the Equipe Pluridisciplinaire (a restricted group of experts) created in 1996 within the framework of the first *Plan Loire* was at the forefront of a policy turn that led to the development of a more diversified and integrated policy within the *Plan Loire Grandeur Nature*. Today, the Water Agency has taken over the human and expert resources of the team and is also considered to be an influential actor in the definition and implementation of flood management policies at a local level. It was the main funding partner of the Nevers Flood Risk Assessment Study (EGRIAN). The Loire Basin Water Board (*Etablissement Public Loire* - EPL) currently also plays an important role in promoting mitigation strategy with the economic stakeholders located on the floodplain through vulnerability reduction measures. Action is also taken with regard to the general public (displays and signage). Finally, it offers expert support (*i.e.* following up the EGRIAN study).

Although the role of the EPL and the Water Agency is indirect in Nevers, the policy developed at a basin level was, and still is today, very important (box 3.1) in terms of discourses as well as resources through the funding of multiple actions, the provision of expert support and the promotion of diversification of strategies.

### Box 3.2 The OREALM policy

Since the Second World War, the Loire has been an important site in the national spatial planning policy aimed at balancing developments between Paris and other cities. The Organisation for the Study of Middle Loire Development (OREALM) was established in 1968, and is responsible for establishing a long-term development plan for the Middle Loire. The Loire is to become a “support zone” for the Paris basin and a “major axis” for the exchange and development of the Central Region. For Chiaperro (1996), the Middle Loire is one of the “preferred areas for a voluntary easing (“*desserrement*”) policy [...] and [will] contribute towards halting migration to the Paris region”.

However, this evaluation of the land necessitated an improvement in the flood protection system. Two methods were proposed by OREALM and presented as complementary: better maintenance of dikes and the construction of dams in the upstream portion of the watershed to regularise river flows and reduce pressure on the dikes. The construction of several dams is mentioned: “the Villerest dam (270 million cubic meters), which controls a third of the Loire basin and the Verdure dam (130 million cubic meters), which controls the entire Allier basin.

Local authorities, first the City of Nevers and then the *agglomération*, have adopted the same approach. With the EGRIAN study, the *agglomération* has begun to develop its expertise and resources and to take over responsibilities. The study remains focused on an expert-based approach: it brings new developments to connections between defence and mitigation strategies, but does not introduce a major change in the vision of the historical actors in this field (State and Basin). The main financial partners were the State and the Water Agency, which contributed to 80% of the total cost, which rose to €800.000. The strategy mainly focuses on the refurbishment of local dikes, the construction of a number of spillways and coordination between these different works. The EGRIAN strategy also identifies the need to settle on and stabilise a local governance system for the defence works and flood management as a priority issue.

As things stand, the Nevers Agglomeration plans to be a candidate for implementation of a PAPI. Even though flood risk management policy at a national level promotes an ever more integrative

approach, this appears to be a difficult ambition to attain locally. PAPIs facilitate coordination between actors, but not really integration between strategies. Within this process, the focus remains on defence and mitigation measures. The main aim is to involve all the local authorities: *Départementale* and Regional Councils as well as the State for contributions to the funding of the defence-mitigation works. As stated by an interviewee in the flood prevention department of Nevers, the main objective of the *agglomération* is using the PAPI to find partners in financing defence and mitigation infrastructures.

**Table 3.3 Funding sources for the EGRIAN action plan**

Source	Measures and priority	Completion date	Amount (€)
Agglomeration municipalities	<b>Non-structural measures</b> (urban renovation and property protection) (Objective 1)	2014	2 million
State	<b>Riverbed restoration</b> (Objective 1)	2013-2018	5 million
Partnership (Region/Département/Agglomération)	<b>Structural measures</b> (dike reinforcement: left bank and Nièvre, weirs) (Objective 3)	2018-2019	12 million
Agglomeration municipalities	<b>“Waterway” and rail closure</b> (Objective 4)	2018-2021	10 million
Agglomeration	<b>Information and communication</b> (Objective 5)	2014	0.5 million

### *The preparation sub-FRGA*

This sub-FRGA is sector-based but also illustrates the rise of the inter-municipal scale. Preparation brings the State and municipalities together in accordance with their traditional police powers. The sharing of police powers and responsibilities between the State and municipalities is a key feature of preparation sub-FRGA, and also the element that distinguishes it from other sub-arrangements. It enables them to establish a relatively stable equilibrium in their relationships; indeed, they develop a compatible discourse on the complementarity of their actions and responsibilities and organise their coordination within the framework of the Civil security response organisation Plan (ORSEC) and local safety plans.

Since 2004, the reform of civil security has increased the number of partnerships in action and sharing responsibilities. In the context of this process, the Nevers Agglomeration has seized the opportunity to take the lead. As the head of the Defence and Civil Security Service (SIDPC) explained, mayors are his direct contact person, both officially and legally speaking. Inter-municipalities are not officially included because they are not elected and do not have local government status. However, as explained by the interviewee, the state services are well aware that the inter-municipal body has expertise in the flood area, and so they contact its official representative. As a matter of fact, their main contact person in Nevers is the inter-municipal body, even when the issue concerns a neighbourhood or town.

To some extent, **decentralisation is being anticipated and accelerated by the inter-municipal cooperation**, which is using it to assert itself. Although the powers of this inter-municipal body remain legally uncertain (between formal and informal rules, as police powers traditionally belong to



municipalities), the Nevers Agglomeration has developed a local policy on preparation that strengthens the role of the thirteen municipalities involved in it. Preparation was one of the core element of the EGRIAN study and the Agglomeration has used it to take the lead in several action fields:

- alerts: the development of an automated call triggered in accordance with Vigicrue alert levels (national meteorological forecast dedicated to flood risk);
- emergency management: support to municipalities for the preparation of Local Safety Plans (joint drafting) and for organising the means of response to a potential crisis, agreement with network infrastructure managers (such as EDF and transport) and other public authorities (Regional and *Départemental* Councils) on the organisation of emergency hosting;
- post-emergency management: the inter-municipal body has specific competence in certain areas such as waste management that will be directly involved in the return to normal phase.

It is worth noting, however, that the increase in decentralisation does not imply an extension of powers with other Communities (*Départemental* or Regional Councils) or a change of scale for flood management governance. In particular, decentralisation does not encourage wider governance at a basin level.

While inter-municipal bodies are on the increase, the position of the *département* State service in charge of crisis management (SIDPC) has been weakened. The problem lies in the actual shift of information and decision centres from a *départemental* to a regional scale. Many interlocutors are not located in the *département* (dam experts work in the Regional Directorate for the Environment, Land Planning and Housing – DREAL – in Dijon, the experts on the facilities classified for environmental protection (ICPE) are in Auxerre and the Weather Centre will be moving to Macon) and they will not travel to the *Département* Crisis Centre (COD) in the event of flooding (they would be mobilised in other more sensitive territories, such as Tours and Orléans). According to the head of the SIDPC, this distance between the event and crisis management may lead to less reliable expertise, and undermines the response capacity in terms of operational resources. This gap between the organisation of crisis management at *départemental* level and how it works in real life at a more regional level tends to strengthen the role of local authorities.

### 3.3.2 A lack of articulation between risk and development issues

#### *The Prevention sub-FRGA*

It is difficult to identify a governance arrangement on flood prevention in Nevers. The prevention strategy remains characterised by a dual approach (national risk planning versus local land-urban planning):

- a centralised approach: the State imposes risk prevention measures with a top-down approach (Flood Risk Prevention Plans, PPRI, and Flood Risk Management Plan - FRMP); and
- a decentralised approach, with land planning and water planning handled by the local authorities.

The Nevers Flood Risk Prevention Plan (PPRI) is an old document. It was adopted in 2001 and remains an example of initial attempts by the State administration. At that time, PPRI were more legally

---

binding on the local authorities (the land-use plan had to be reviewed in order to be compatible with the risk prevention plan), and there was little bargaining between State services and local planners.

Since then, criticism has been levelled at the way those first PPRI were implemented. As PPRI will be revised in the years to come, the State administration has mainly sought to provide answers to these criticisms in two ways:

- vulnerability reduction measures will be strengthened for both new and existing buildings and activities located in the floodplain; and
- discussion and negotiations with local authorities have been reinforced.

The dual character of risk and land planning could have led to conflict, but there is very little of it to be found in Nevers. In the absence of local development projects, there is no opposition between risk prevention and development issues, and consequently, no negotiation scenario has been developed whereby State policy would be obliged to adjust to territorial issues. Although the Nevers Agglomeration is engaged in a wide-ranging study of risk analysis, both the Nevers Agglomeration and municipalities still play a fairly small role in the field of risk prevention. Whether this is the cause or the result of the top-down approach is the main question of this sub-arrangement. Indeed, municipalities seem to believe that they have no right to commence initiatives, and therefore underestimate the potential role of urban planning tools in terms of risk prevention. They only implement State regulations through the PPRI, arguing that risk is a matter of general interest and safety and must be regulated by the State, which rules over local interests. In this context, the main issue remains the decisions to be taken on dikes, and the various responsibilities of the owners and managers of these works.

### *The limited impact of the Floods Directive*

With regard to implementation of the Floods Directive, the Nevers case confirms the national situation. The impact of the Directive on French flood management policy is marginal, although some perspectives on local initiatives can be noted. A flood management plan is being adopted for the Loire-Bretagne basin. Some effort has been made to involve local actors and the local population through a specific consultation website<sup>8</sup> and institutional meetings and conferences; however, the actors interviewed indicated that they were not sufficiently involved in the decision-making process. Similarly, we see that the content of the flood management system repeats the traditional doctrine of the State. Despite the fact that in a legal sense the Flood Risk Management Plan (PGRI) is very close to the Water Management Master Plan (SDAGE), flood management policy in the Loire-Bretagne basin remains centralised and close to classic State doctrine.

Similarly, the flood management plan principally cites general objectives, which reduces the legal scope of the instrument. If the Nevers *agglomération* adopted a local strategy to give substance to its local flood management policy, this strategy would have an indirect legal effect. Although this would be limited or hypothetical (see the national framework), the local strategy still opens up a new perspective.

---

<sup>8</sup> <http://www.prenons-soin-de-leau.fr/cms/accueil/le-bon-etat-des-eaux/votre-avis-sur-leau/donnez-votre-avis.html>

### 3.3.3 Recovery

As for the two other case studies, recovery is outside the local FRMGA. At the local scale, flood victims report the damage they have suffered (insurance claim). However, the CAT-NAT system is fully managed nationally, and recovery is then applied directly to the local level, with no specific local arrangement. The table below shows the floods covered by the CAT-NAT system in Nevers.

**Table 3.4 List of floods covered as “natural disasters” by the CAT-NAT system**

Type of event	Date
Flood and mudflow	25-29/12/1999
Flood and mudflow	05-08/12/2003
Flood and mudflow	05-06/11/2008

### Conclusion

The Nevers case matches the FRGA as observed nationally. With regard to defence and mitigation, flood management is ensured at three levels of public action: State, Basin and the Municipality of Nevers. Despite a certain amount of diversification, an expert-based, centralised vision of risk has been implemented in Nevers with a top-down approach. This centralised policy on flood risk is not challenged by local actors, which take no initiatives in the field of urban planning, although they do have local powers. Similarly, the State remains dominant through its classic, exclusive plan (Flood Risk Prevention Plan PPRI), which leads to an ineffective transposition of the Floods Directive. In terms of preparation, the rise of inter-municipal body (Nevers *agglomération*) is mainly due to the State’s withdrawal.

## 3.4 Explaining dynamics in flood risk governance at the case study level

**Table 3.5 Change and stability factors in Nevers**

	Drivers of stability	Drivers of change
<b>Factors internal to the FRGA</b>	<ul style="list-style-type: none"> <li>• <b>Shock events</b> (1846, 1856, 1866, 1907, 2003 and 2008): reinforcement of the security principle, triggering of launch of flood prevention plan;</li> <li>• <b>Path dependency effect:</b> high level of investment in defence for two centuries;</li> <li>• <b>Traditional centralised approach in a rural context:</b> no strong local power and reliance on State action and legitimacy;</li> <li>• <b>Lack of urban development issues:</b> lack of integration between risk and urban development;</li> <li>• <b>Discourse on the defence-mitigation combination</b> supported by historical Basin actors since the 1990s (Multidisciplinary Team and Loire Basin Water Board).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Shock events (2003-2008):</b> initiation and legitimisation of the Agglomeration commitment;</li> <li>• <b>Empowerment of the inter-municipal body: Nevers Agglomeration:</b> technical support for municipalities, involvement in crisis exercises, information campaigns;</li> <li>• <b>EU Floods Directive:</b> EGRIAN Study as a basis, to be completed to develop a more integrated strategy;</li> <li>• <b>Water legislation (“water police”).</b></li> </ul>
<b>Factors from outside the FRGA</b>	<ul style="list-style-type: none"> <li>• Existing institutional and legal design: <b>centralisation, fragmentation</b> (preparation);</li> <li>• Existing systems of liability and</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Decentralisation process: transfer of competences to inter-municipal body;</b></li> <li>• <b>Reduction in public investment</b> and development of partnership tools;</li> </ul>

	compensation measures: <b>State/Mayor Complementarity;</b> <ul style="list-style-type: none"> <li>• <b>Path-dependency effect:</b> strong political legitimacy of the defence strategy.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Discourses on diversification and mitigation supported by several actors:</b> State, local, Flood Directive;</li> <li>• <b>“National” shock events (1999-2010);</b></li> <li>• Changing ideas on the state/market/civil society relationship?</li> </ul>
--	--	--

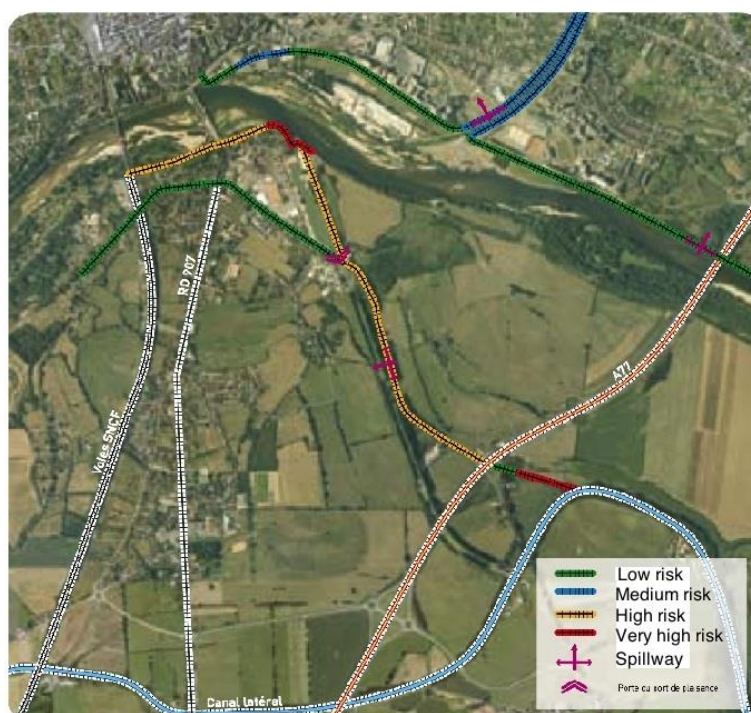
### 3.4.1 Explaining stability in Nevers: path dependency towards defence and centralisation

Defence has historically been the first strategy to be developed in Nevers and it remains very stable. Post-Second World War urban developments have greatly increased both the population and activity exposure. The southern and south-eastern areas of Nevers were built during this period on hitherto agricultural areas along the river. They comprise large groupings of collective and social housing as well as private housing, and an important administrative centre, businesses and an electricity distribution platform. Defence is still a significant strategy in terms of resources. It lies at the heart of the bargaining among the key players and therefore shows how challenging the maintenance of the defence system remains. The state of the dikes is a cause for concern.

Even though no radical changes can be observed, incremental, evolutionary changes occurred. The range of actors involved is growing in the defence-mitigation sub-FGRA. Historically, national actors have played an important role, and the consequences of their contemporary disengagement are ever more visible. Significant uncertainties have arisen concerning the place and role of the various actors involved hitherto, in particular the *départemental* council, the regional council and the State. With the enlargement of actors, the rules, discourses and powers are also changing. The involvement of the central State is weaker, requiring to involve local actors in partnerships. The Action Programme for Flood Prevention (PAPI), which is now in the drafting phase, therefore represents a strategic tool for sustaining investment. Although this change covers all the dimensions of the PAA, it remains incremental for the moment.

What are potential explanatory factors for this stability and this incremental change? Two stability drivers can be presented. First, the early development of defence has created a path dependency that constitutes a major stability factor at both the national and local levels. Second, there is a tradition to combine defence and mitigation. As we have explained previously, the defence-mitigation combination goes back to the 19th Century with the Comoy Plan, has been periodically put back on the agenda and is now well rooted in the main actors’ policy lines: discourse and expertise. It is important to understand that mitigation measures serve to protect defense infrastructure by releasing the hydraulic pressure. Thus, the defense-mitigation association is a factor of stability because it perpetuates defense infrastructure.

The factors of change are the following. On one hand, the central state is economically withdrawing from the local scale, forcing local actors to get involved in FRM. Indeed, the financial contribution of the government authorities, which are not directly responsible for infrastructure maintenance, has been weakened by budget cuts. On the other hand, the evolution of the institutional context at a national level has also impacted the current coalition on local strategy, with the redistribution of responsibilities and competences organised by the MAPAM Law reinforcing the power of the *agglomeration* (decentralisation and inter-municipal cooperation).



**Figure 3.9 Risk of dike failure**

*Source: EGRIAN, 2011*

The prevention sub-FRGA appears very stable. Local actors fail to integrate flood risk into their land planning competences. Considering the particular involvement of Nevers Agglomération in the flood issue, the lack of links between risk prevention and urban strategy may seem paradoxical. Local authorities and the State share a discourse on risk as a matter of general interest and agree on traditional, centralised top-down tools and rules (Flood Risk Prevention Plan - PPRI). They share expertise on hydraulic simulations and vulnerability analysis, but there is little action in this field. Local actors focus mainly on public information, but do not go much further. This gives the impression that strategic urban planning has nothing to do with flood prevention. This stability is observed in terms of rules and discourse. It is acknowledged that the regulation of construction in flood prone areas falls under the authority of the state, although Nevers has a competence and resources in land planning. So far, changes in the prevention sub-FRGA cannot be considered fundamental.

Even though no radical changes can be observed, incremental changes take place. The agglomeration of Nevers and the State are progressively linking land planning and risks prevention, but this change remains at the discursive level. Until today, implementation of flood management tools provided by the Floods Directive has not led to any real changes in prevention strategy in the case of Nevers.

Several factors explain the stability of the prevention sub-arrangement. The strong role of the central state in the field of public safety is explained by centralisation that goes with the unitary state and the principle of national equality. Additionally, in the absence of land pressure, local authorities have less need to develop construction on their territory. Local authorities do not try to fight against the state when it prohibits constructions in case of flood risk. Unlike Nice (see case study #3), there is less negotiation between municipalities (urban planning) and risk planning (State). Under these conditions, local authorities have every reason not to take the political risk to ban constructions.

Going further, one might wonder whether the implementation of the EU Floods Directive might provide the impulse for an improved integration of risk into land planning. However, with the Floods Directive, more urban and environmental issues will have to be included in the flood management local strategy in Nevers.

### 3.4.2 Explaining changes in Nevers: rise of the *Agglomération* mainly involved in preparation

Finally, the preparation sub-FRGA in Nevers is an illustration of national trends, as it is marked by a high degree of centralisation and specialisation. It is under the responsibility of the State. More specifically, the state is responsible for major crises while municipalities are responsible for minor flooding (subsidiarity principle). The preparation sub-FRGA is changing as the agglomeration of Nevers (inter-municipal bodies) is getting strongly involved. This includes the four dimensions of the PAA. At the discursive level, the state and the *agglomération* of Nevers agree to give priority to the local scale. Indeed, the State services have made it clear that in the event of a disaster, priority would be given to larger cities in terms of emergency rescues, for example. The Municipalities of the Nevers Agglomeration are being encouraged to take responsibility for their own safety, and some have taken this advice seriously. Similarly, the decentralisation process is observed at the level of the rules. Finally, the case of Nevers shows that the resources of the *agglomération* (technical, financial) allow it to get involved in the preparation against floods. This change can be considered rather deep.

There are two main factors that explain and strengthen this trend. Firstly, the process of decentralisation of powers has been a powerful driver of change since the 1983 decentralisation law. Local actors such as the Nevers Agglomeration are using flood risk management as a way to increase their political legitimacy. Preparation is a strategic field in which inter-municipal bodies can intervene to compensate the lack of technical and operational resources of small municipalities included in the *agglomération* area. The recent legislation has introduced more local responsibility and strives towards individual action.

Secondly, the reduction in the State budget encourages the mutualisation of expertise and operational resources at a regional level. The result of this is an increasing distance between the legally responsible decision-making level, *département* services, and actual crisis management, which is organised at regional scale. This increasing distance of State services from local crisis management makes it even more urgent for a small city like Nevers to develop its own crisis management capabilities.

### 3.5 Evaluating flood risk governance in Nevers

Table 3.6 gives an overview of the evaluating criteria used in STARFLOOD applied to Nevers case.

Evaluation		
<b>Resilience</b>	<p><b>Enabling</b></p> <ul style="list-style-type: none"> <li>▪ Capacity to resist</li> </ul> <p>Diversity of FRMS. The PAPIs should provide coordination Partnership funding allows responsibilities to be shared;</p> <p>Efforts to integrate private actors into the design of solutions (EDF, GDF, SNCF, water enterprises, etc.).</p> <ul style="list-style-type: none"> <li>▪ Buffer capacity</li> </ul> <p>The Flood Directive and national regulations are effective;</p> <p>Knowledge and expertise developed in the EGRIAN framework;</p> <p>Innovation is promoted, especially in the area of dike monitoring and the prevention of breaches;</p> <p>Stable role of the flood issue in the political agenda (regardless of political turnover);</p> <p>The absence of a strong interest in development means enhancing reliance (possibility of trying out solutions outside the political context).</p> <ul style="list-style-type: none"> <li>▪ Adaptive capacity</li> </ul> <p>The governance arrangement can be described as proactive and forward-thinking;</p> <p>Improvements in the water sector (drainage systems) and in the capacity to anticipate and forecast;</p> <p>Learning capacity from former experiences or good practices on the same river (Plan Loire).</p>	<p><b>Constraining</b></p> <ul style="list-style-type: none"> <li>▪ Capacity to resist</li> </ul> <p>Lack of integration of FGRA with other policies, especially spatial planning.</p> <ul style="list-style-type: none"> <li>▪ Buffer capacity</li> </ul> <p>Partnership funding makes the duration of interventions somewhat uncertain (especially in the case of dikes).</p> <ul style="list-style-type: none"> <li>▪ Adaptive capacity</li> </ul> <p>Climate change still a non-issue</p> <p>Low level of risk awareness among the population.</p>
<b>Legitimacy</b>	<ul style="list-style-type: none"> <li>▪ High level of participation by stakeholders in all strategies (except risk planning);</li> <li>▪ Environmental information, sharing, exchange and dissemination of information;</li> <li>▪ Transparency is sought from local authorities in communicating their approach, data and results (e.g. Flood Areas Atlas, "AZI").</li> </ul>	<ul style="list-style-type: none"> <li>▪ Low level of consultation of local actors in risk planning (which is still an exclusively State domain);</li> <li>▪ Limited opportunities for local stakeholders to challenge and appeal against decisions made by the State;</li> <li>▪ Public participation just downstream of the decision-making process (through public enquiries).</li> </ul>
<b>Efficiency</b>	<ul style="list-style-type: none"> <li>▪ €1,000,000 for the EGRIAN study and €20,000 for assessment studies on dykes;</li> <li>▪ Difficult to assess considering the experimental dimension of these studies</li> </ul>	<ul style="list-style-type: none"> <li>▪ The budget allocated to communications in the EGRIAN study is excessive considering its limited impact.</li> </ul>

### 3.5.1 Resilience

To what extent does flood risk governance enhance society's resilience to flooding in Nevers?

Concerning the capacity to resist, social resilience appears to be enhanced by the diversification of measures and institutions. The aim of the Nevers Flood Risk Assessment Study (EGRIAN) is to enable the development and implementation of a multi-layered strategy in which defence, mitigation and preparation are dominant. Coordination among strategies is enhanced by the Action Programme for Flood Prevention (PAPI), which includes all measures and defines the associations and investments of all actors. However, prevention measures are under-represented as they are traditionally the State's domain and are not well integrated into local flood risk management. Recovery is almost completely absent. Similarly, actions remain fragmented: there is a lack of coordination among local services, despite the fact that dialogue among institutions has shown a tendency to increase. An overall lack of integration of the FRGA with other significant policy areas – in to land planning – is noticeable.

Regarding the capacity to absorb and recover, improvements have been made to the water and sewage systems following lessons learnt from past flooding. In particular, measures have been introduced to improve the drainage systems and to ensure that there will be drinking water even in the event of major floods. In the emergency sector, the capacity to resist and governance coordination have been enhanced.

Social resilience is weakened by low effectiveness in several issues. European and national policies are implemented, but there are some disconnections between European requirements and local strategies that require better appropriation at a local level. In addition, most of the works planned in the context of EGRIAN have not yet been implemented, and therefore cannot be evaluated. Funding of dike maintenance works remains the main problem, and limits the effectiveness of measures planned for the long term.

As for the capacity to adapt (including the capacity to learn, innovate and improve), Nevers has demonstrated a good capacity to reorganise as regards flood problems from a future perspective; knowledge development, the coordination of actors and the diversification of interventions are valuable processes that can contribute to the definition of a resilient flood system.

In the absence of recent major flood events, it is difficult to discuss the "lessons learned". However, the EGRIAN study and the Regional DREAL (the Regional Directorate for the Environment, Land Planning and Housing) show that a range of knowledge and expertise is being sought and developed. Innovation has especially been developed in the protection area: the uncertainties regarding the capacity to ensure maintenance of dikes have encouraged innovative solutions that might be viewed as a means of adapting to changing social and economic conditions. The proactive nature of the planning still appears to be limited, however.

Activities conducted within the FRGA encourage innovative practices involving environmental associations and enterprises. Nonetheless, private individuals remain insufficiently involved in implementation of the policy (involvement is limited to building modification works).

In Nevers, climate change is not an issue as yet; however, disengagement by the State will encourage the development of a locally-based adaptive capacity. Financial partnership is both a fragility and a



strength factor: it makes the continuation of funding more uncertain, but allows a sharing of responsibilities.

As flooding is not an issue in election campaigns, it benefits from a certain stability in political and administrative agendas.

### 3.5.2 Legitimacy

From an institutional point of view, the degree of stakeholder representation and involvement in the decision-making process is high. However, consultation with local authorities and associations is deemed to be insufficient when it comes to State planning (Flood Risk Prevention Plan – PPRI and Flood Risk Management Plan- FRMP). The opportunities for local stakeholders to challenge and appeal against decisions made by the State are limited to legal proceedings. Representativeness could also be enhanced by widening the circle of involved actors to services outside the risk area.

FRGA can be seen as increasing access to and the dissemination of information on flooding. The efforts to increase transparency are visible to all public actors, who communicate data, methodologies and results. The degree of communication has been improved by the EGRIAN study, but the content of documents is extremely technical and is not easily accessible to everyone. Furthermore, the public is not involved in the decision-making process, except as a part of public enquiry procedures.

### 3.5.3 Efficiency

One can only evaluate the costs of the technical studies: €one million for the EGRIAN study and €20,000 for the assessment studies on the dikes. The measures and projects proposed by the EGRIAN strategy have been evaluated using a cost-benefit analysis, but this analysis is based on criteria that is not possible to evaluate, and the decision to actually start using the budget has not yet been taken. Moreover, considering the experimental dimension of these studies, it is difficult to say if it is being used efficiently. The precise objective is to determine the degree of efficiency of the studies and measures and whether they can be reproduced in other territories. The only limitation that we can see concerns the excessive budget allocated to communications in the EGRIAN study, considering its limited impact.

## 3.6 Conclusion

### *Relationship between the case study and national FRGA*

To what extent does the national arrangement enable or constrain governance and innovation in this particular case study? The example of Nevers fits into the national FRGA very well. The extent to which the national FRGA enables or constrains innovation and governance depends on the decentralisation process. First, it is important to note that governance in Nevers is constrained by the national framework due to the fact that the State has historically had strong powers when it comes to flood management. As we will see, when compared to the other case studies, Nevers does not provide the same capacity and resources for mobilisation vis-à-vis the State (in terms of expertise, economic and political force). This explains the top-down approach that is a feature of this case. Indeed, the centralised policy has led to two main effects. On the one hand, Nevers is constrained by

---

the defence-mitigation policy conducted in the Loire River basin, which shows strong path dependency, and on the other, as regards prevention, local actors do not take initiatives in the field of urban planning. Secondly, the process of decentralisation and the simultaneous economic withdrawal of the State have opened up new perspectives in terms of local policy, and in fact, Nevers has set up its own flood management strategy (especially on crisis management and defence-mitigation) based on inter-municipal cooperation.

### ***Best Practices and lessons learnt emerging from the case study analysis***

The EGRIAN study shows how local authorities can take flood management initiatives (through inter-municipal cooperation). Through EGRIAN, Nevers is actually anticipating the decentralisation process. Rather than suffering from withdrawal by the State, Nevers is attempting to implement its own flood management strategy. It can be observed that this is a significant indication of local resilience.

In the case of Nevers, it is important to note that even in the absence of land pressures, a local authority can undertake a flood management strategy, even though this commitment is largely based on expertise, and is somewhat limited from a more political viewpoint. This limited political significance is reflected in the lack of integration of flood risk issues into land planning. The State flood prevention plan (PPR) is independent of local planning documents; however, local actors tackle flood issues from an expert's point of view, and the results are used as a resource to negotiate with the State administration regarding technical options and financial aspects (draft PAPI). The difficulties encountered while implementing the local strategy (funding) highlight the paradoxes of decentralisation: is it a true empowerment of local authorities or is it merely economic disengagement on the part of the State?



---

## 4. Le Havre, diversification through technical responses

### 4.1 Introduction and scope of the analysis

This chapter provides an analysis, explanation and evaluation of flood risk governance in Le Havre. It offers insights into governance specificities linked to a multi-risk environment context, a shrinking economic and demographic situation and a powerful public actor weighing on the balance of power, with the harbour of Le Havre. The Le Havre case study then seeks to gain an understanding of whether local flood policy is more active than others on a national scale. In Le Havre, risk represents an historic landmark. Does Le Havre have a specific local approach to this risk based on the main characteristics of the case study area (4.2), which lead to two main flood governance sub-arrangements (4.3)? Finally, we explain the dynamics of each sub-arrangement in Le Havre in general (4.4) and evaluate the case study (4.5), before providing some conclusions.

### 4.2 Main characteristics of the case study: a shrinking industrial city facing floods

#### 4.2.1 Introduction

The Le Havre urban area is located in the north-eastern part of France on the shore of the Channel (see figure 4.1). It has 174,155 inhabitants (INSEE, 2011<sup>9</sup>), and is considered to be a medium-sized city on the national scale.

---

<sup>9</sup> City of le Havre, Demographic summary, National Census Institute, 2011 (Institut National de la Statistique et des Etudes Economiques, INSEE, [www.insee.fr](http://www.insee.fr))

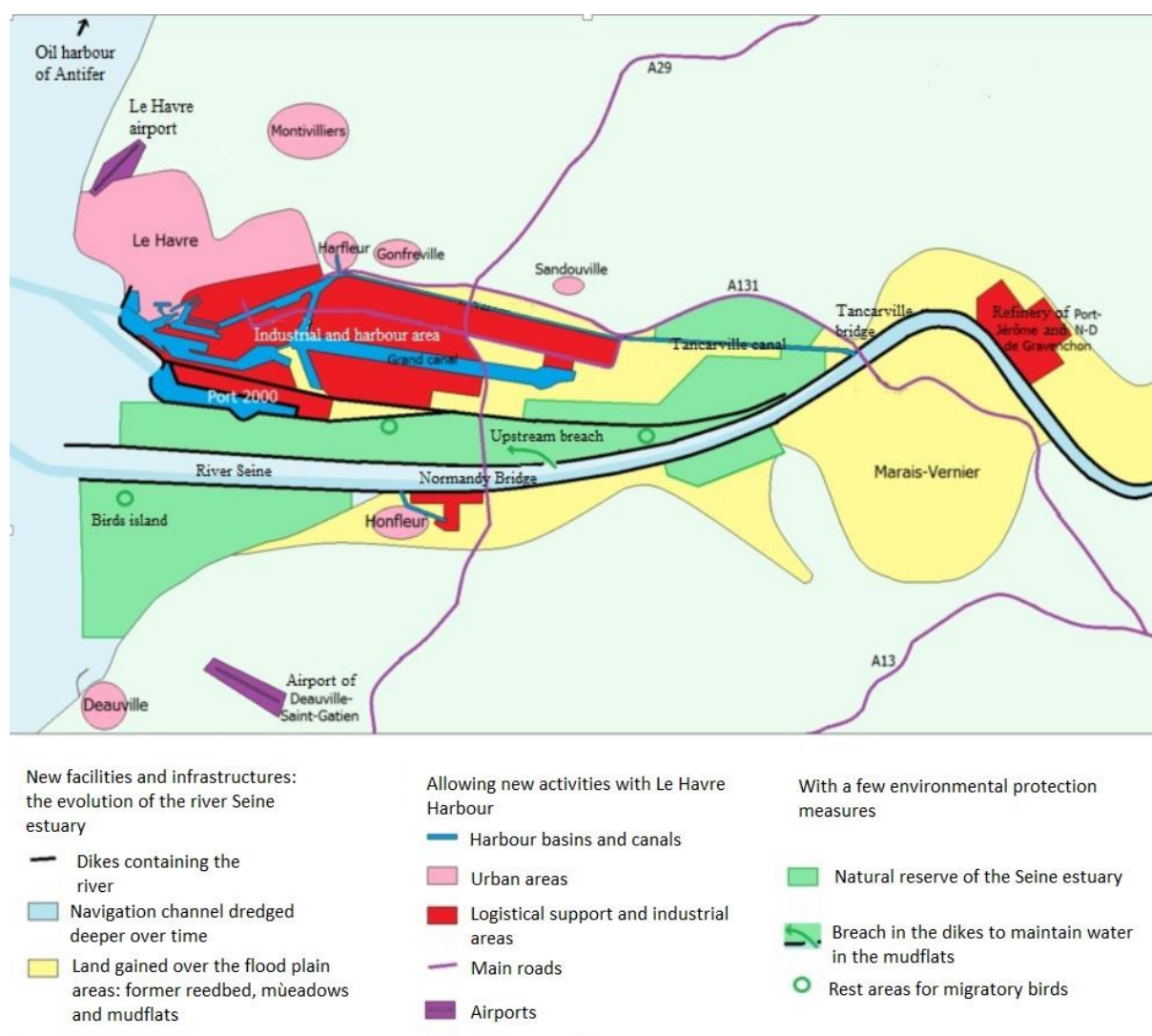


**Figure 4.1 Location of Le Havre in the northern part of France**

*Source: MarCom-Carto – Faculty of Geoscience – Utrecht Univeristy*

The aim of this case study is to identify the interaction between risk prevention and local stakes. The challenge for Le Havre is to integrate four main objectives: the agricultural economy, industrial development, preservation of the environment and flood prevention (see figure 4.2). Le Havre is a multi-risk city with an industrial background based on the harbour<sup>10</sup>. The harbour is located in a fragile environment, and its development entails dealing with the preservation of the Seine estuary. Both the harbour and the Seine River are State owned.

<sup>10</sup> 32,000 jobs for harbour-related activities, Revue AVAL Haute-Normandie, no. 12, 2013.



**Figure 4.2 Le Havre, a balance between development and flood prevention?**

Source: Tremorin, 2014

**Table 4.1 Key characteristics of the city of Le Havre**

Key facts and figures	
Region and county	Normandy, North-West France
City population	174,155 inhabitants (INSEE, 2011)
Population density (1999-2009)	3,738 inhabitants per km <sup>2</sup> (INSEE, 2011)
Population growth	- 0,9 % (INSEE, 2011)
Elevation	4 to 68 metres
River basin	The Lézarde basin is 212 km <sup>2</sup> and the Seine Estuary is approximately 100 km <sup>2</sup>
Types of flooding	Fluvial, tidal and surface water
Local businesses	Agriculture, Industry and harbour activities: it is the 6 <sup>th</sup> largest harbour in Europe and the largest in terms of container traffic: 60% of French container traffic in 2011
Household income (INSEE 2012)	18 716 € (2012)

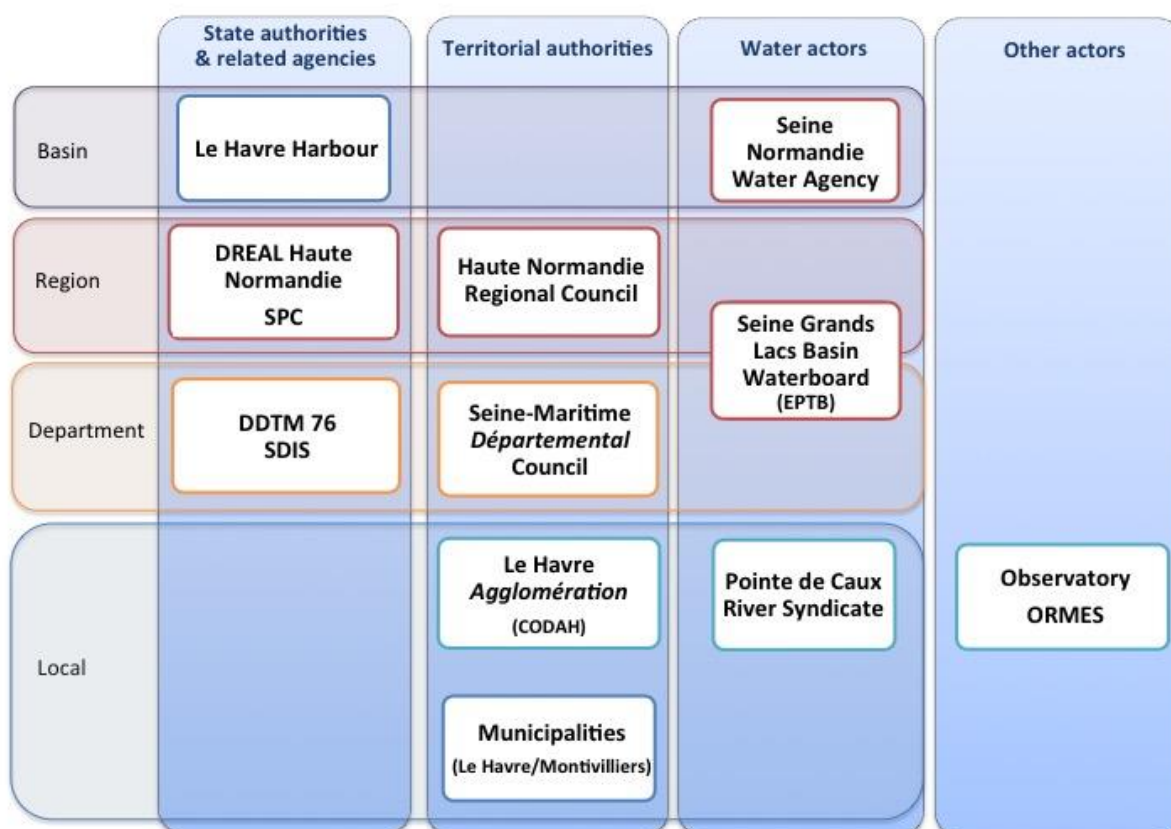


Figure 4.3 Actor system in Le Havre

**Legend**

CG: *Département* Council  
 CODAH: Inter-municipality of Le Havre  
 DDTM: *Départemental* Directorate for the Territories and the Sea  
 DREAL: Regional Directorate for the Environment, Land Planning and Housing  
 ORMES: Seine Estuary Major Risk Office  
 SDIS: *Département* Fire and Rescue Service

**4.2.2 A preserved natural geomorphological area**

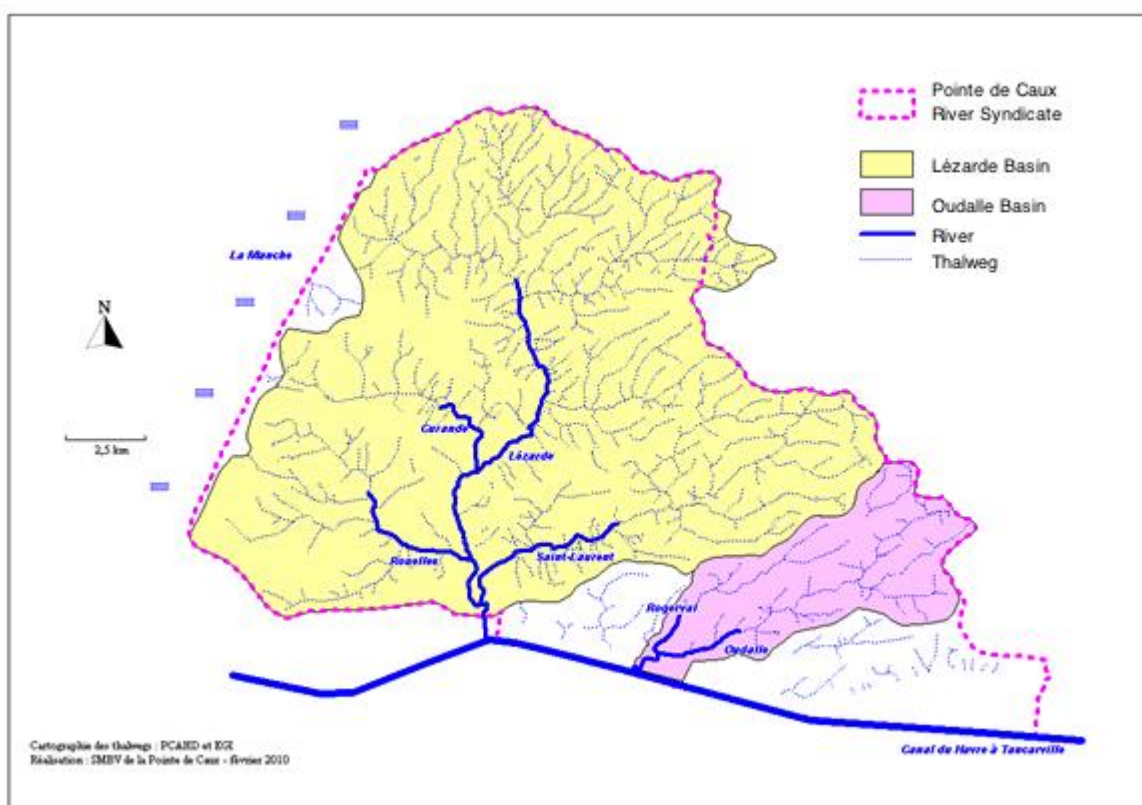
The geomorphology of Le Havre provides natural boundaries for urban development (see figure 4.2). The first of these is the estuary to the south. Le Havre is located at the border between the English Channel and the end of the Seine Estuary, which is a natural area<sup>11</sup> (Natura 2000). Despite the fact that local industries pay compensatory funds, conflicts do exist (Dauvin *et al.*, 2010). The second boundary is the clay cliffs on the western and central sides. A high chalk cliff forms a natural promontory of 60 to 100 metres and presents a risk of coastal erosion. The cliff is eroding at the rate of one metre a year, the highest level of erosion on the entire Normandy coast. In July 2013, 30,000 tons of cliff fell on to the beach during the peak tourist season. The third boundary is the chalk plateau on the northern side of Le Havre, which is dedicated to intensive agriculture. These natural characteristics are valuable for the environment, but restrict development.

<sup>11</sup> The Seine Estuary is a Natura 2000 site. For further reading, see: Inventaire National du Patrimoine Naturel, «Estuaire de la Seine», <http://inpn.mnhn.fr/site/natura2000/FR2300121>

### 4.2.3 Multiple flood risks in Le Havre

Rainfall and stormy weather are the climatic features that frame the flooding context. Owing to its location on the Channel coast, Le Havre's climate is temperate oceanic. Days without wind are rare. Constant rainfall provides a significant amount of water that the chalk plateau can discharge only to a limited extent. The meteorological context is marked by stormy episodes, mainly in winter, and mostly from the sea.

Four types of flooding are present in the area. First, marine submersion is the most important type of flooding, not in terms of occurrences but of potential damage. It is the result of a correlation of factors that include high winds, low atmospheric pressure and a high tidal range. The highest level known in Le Havre is 4 m 68 at level zero of French General Levelling. Run-offs are the second type of flooding. These are caused by a high level of rainfall over a long period of time together with high-intensity rainfall, especially in winter. The third type of flood is a consequence of run-offs. Gully erosion speeds the flow of rainwater. Overflows appear very rapidly and generate flash floods. When rainwater runs through the upstream section of the Chalk Plateau, the lack of a complex hydraulic system and soil degradation aggravate flooding (s4.4).



**Figure 4.4 The Lézarde river basin, a bottleneck for the catchment**

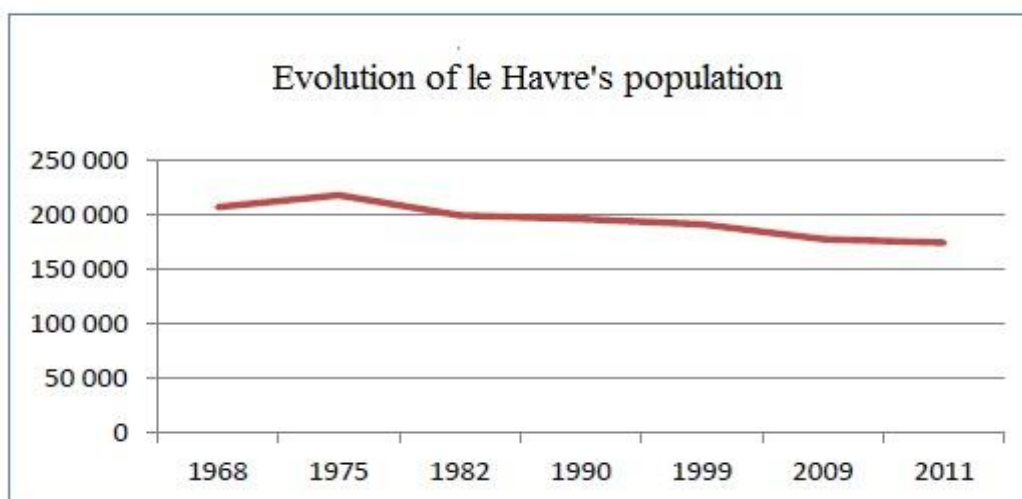
Source: SMBV Pointe de Caux, 2010

The fourth type is overflows of the rainwater and sewage systems. In the historic centre of Le Havre, sewage and rainwater share the same network. When rain falls for a long period, the network rapidly overloads, especially where the water table is close to the surface. Finally, in a context of climate change, different types of floods can occur simultaneously in combination with weather events.



#### 4.2.4 A densely-populated city centre in a shrinking demographic context

Le Havre's urban features have created a concentration of the population in the lower city. The city's housing sector consists mainly of flats: 71.8% flats and 27.4 % houses (INSEE, 2011). The density of the inner city is 3,738 inhabitants per km<sup>2</sup> (INSEE, 2010), but the population has been declining since the 1970s (see figure 4.5). "Most shrinking cities are located in declining regions, with the exception of a few industrial and harbour cities which are located in growing regions (such as Saint-Étienne, Le Havre, Genoa, Palermo or Aberdeen)" (Wolff, *et al.*, 2013). The birth rate is positive, and so the loss is due to inhabitants leaving the city. One main reason for this is a decrease in industrial employment.



**Figure 4.5 A constant decrease since the 1970s**

Source: Tremorin, with INSEE 2011

#### 4.2.5 The industrial and working-class economic context

The harbour in Le Havre is a key actor in the local economy, providing 32,000 jobs and € 3.7 billion of added value, which amounts to 42% of the value added in Le Havre. It is the 6<sup>th</sup> largest harbour in Europe and the 1<sup>st</sup> in terms of container traffic: it received 60% of French container traffic in 2011. Indirect jobs in the industrial, logistics and transport sectors represent a large part of the labour market; however, Le Havre is made up of low-wage inhabitants. In 2006, the average income was ranked 22,251<sup>st</sup> among the 30,687 *Communes* in France. Few high-ranking jobs at international groups in the harbour sector are based in Le Havre, and its economic stability depends on the harbour and its activities.

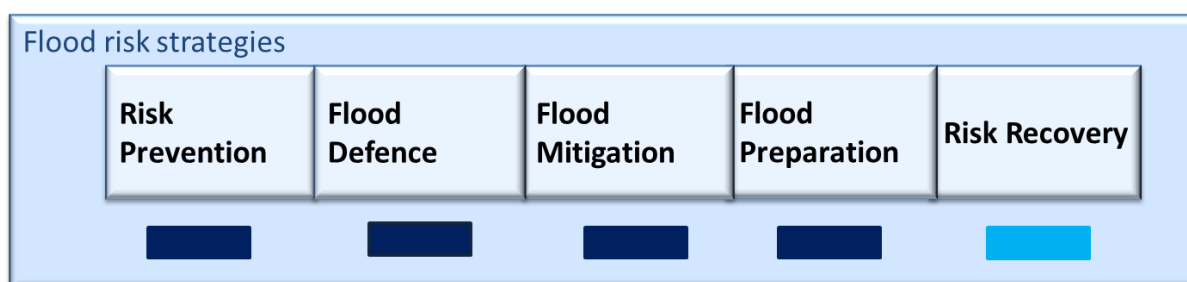
#### 4.2.6 The local flood policy: active involvement in risk management

The local public authorities have built a strong risk management policy since the 1970s, even though industrial risk is more integrated than flood risk (Gralepois, 2008). In 1986, a styrene emission created a toxic cloud over the estuary. The warning system sounded, but the staff at several schools wrongly evacuated the children outside. Following this episode, the local authorities decided to strengthen their preparation level as regards communication and crisis exercises. In the 1980s, a flood management policy appeared on the local agenda, especially to deal with flash floods from the Chalk Plateau. The skills and good practices that had been capitalised for industrial risks were transferred to flood policy. Two main actors are involved in local flood policies. A body known as the Seine Estuary Major Risk Office (ORMES) is behind a powerful communications campaign devoted to risk emergencies. The inter-municipal body of Le Havre (CODAH) groups Le Havre with sixteen other *Communes*. This is a cooperative institution in charge of a number of competences, such as local economic development, spatial planning, housing and water facilities, as well as risk management.

To conclude with the main characteristics of the area, Le Havre is “natural”, because of its preserved context, “rainy”, because of its northern marine climate, “risky” in terms of hazard exposure, “shrinking” due to the decrease in the population, “industrial” with the port and the refinery, “conflicted” with regard to the different interests involved (in particular environmental ones and development), and “innovative”, thanks to its proactive risk management.

**Table 4.2 Flood risk management strategies in Le Havre**

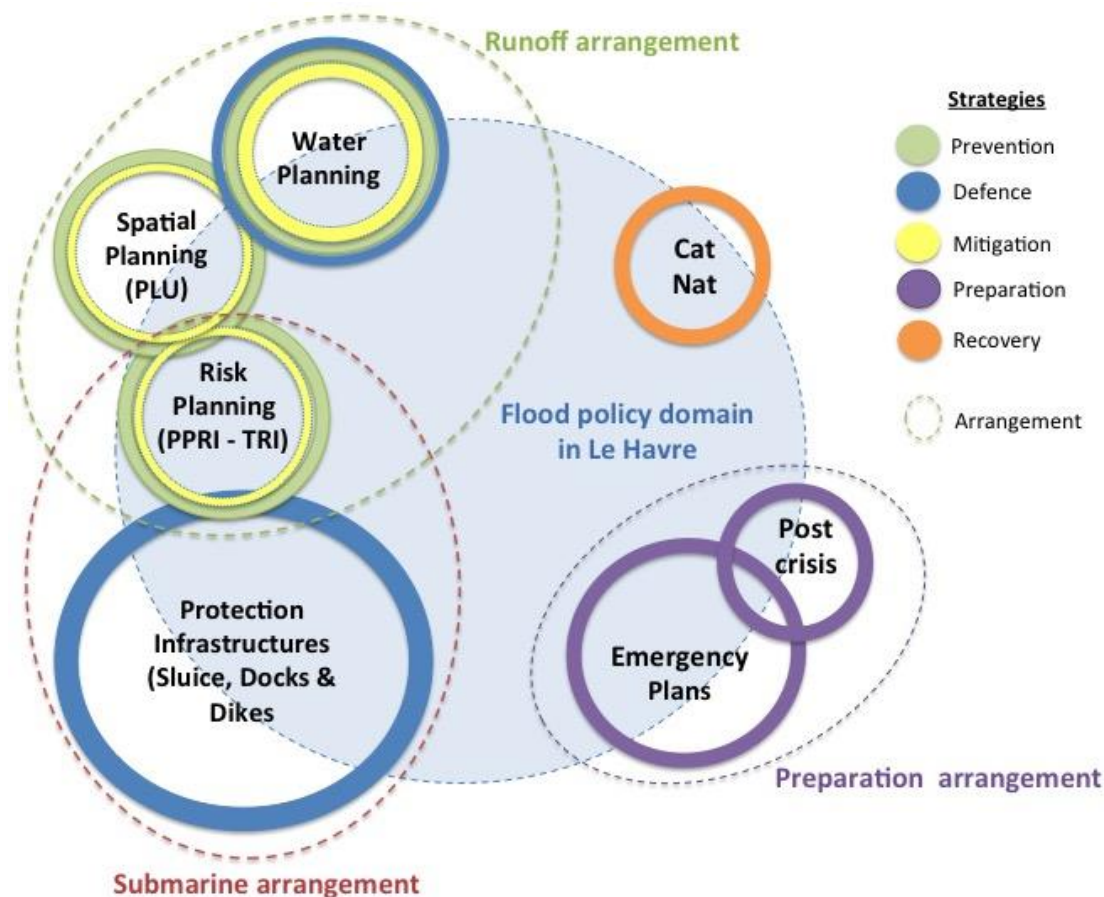
Flood prevention	Flood defence	Flood mitigation	Flood preparation	Flood recovery
<ul style="list-style-type: none"> <li>• Spatial plans (Flood Risk Prevention Plan - PPRI);</li> <li>• Prohibition of construction after flood (Lézarde basin);</li> <li>• Prohibition and regulation of construction through planning (Lézarde basin);</li> <li>• Risk paragraph in purchase deeds;</li> <li>• General information on flooding (e.g. flood maps);</li> <li>• Active communication with schools, forums.</li> </ul>	<ul style="list-style-type: none"> <li>• Harbour wall;</li> <li>• Docks and basins;</li> <li>• Retention basins outside area to be protected;</li> <li>• Water course maintenance;</li> <li>• Quay walls;</li> <li>• Compartment dikes.</li> </ul>	<ul style="list-style-type: none"> <li>• Urban and rural Retention basins;</li> <li>• Environmental measures for flood attenuation (ponds, drainage ditches);</li> <li>• Rainwater reservoirs.</li> </ul>	<ul style="list-style-type: none"> <li>• Weather and rain forecasting (24-hour monitoring and intervention teams);</li> <li>• Flood warning systems;</li> <li>• Intervention and evacuation plans;</li> <li>• Crisis communication and exercises.</li> </ul>	<ul style="list-style-type: none"> <li>• Insurance systems;</li> <li>• Solidarity fund;</li> <li>• Repair works.</li> </ul>



**Figure 4.6 Overview of strategies present in the case study Le Havre.** Dark blue indicates the most dominant strategies, and medium blue establishing strategies, light blue minor strategies, grey-blue strategies do not play a role.

### 4.3 Analysis of flood risk governance in Le Havre

Le Havre is characterised by two flood governance sub-arrangements. The first one is the runoff sub-arrangement which combines prevention, mitigation and preparation strategies. The second sub-arrangement, regarding marine submersion, is based on an opposition between defence and prevention. As for the two other case studies, it is important to note that recovery is not managed at the local level. Catastrophic events are reported by victims and then managed in the national system CAT-NAT.



**Figure 4.7 Three sub-arrangements in Le Havre**

*Source: Gralepois, 2015*

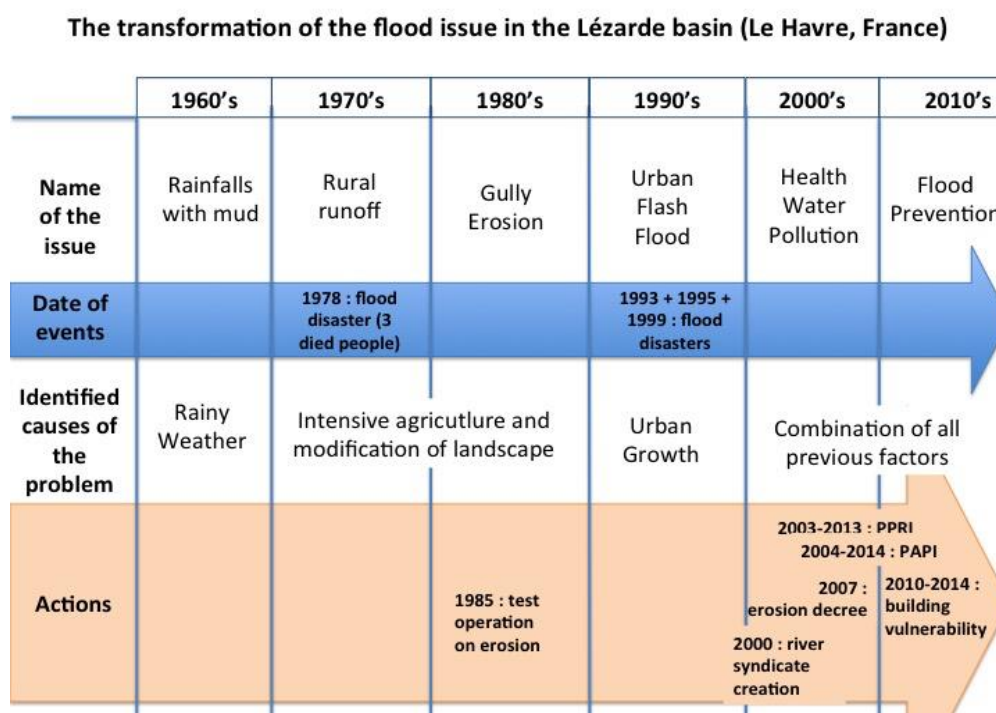
#### 4.3.1 Runoff flood sub-arrangement: benefits and limits of diversification of strategies

This sub-arrangement results from the combination of prevention, mitigation and preparation. Floods in the northern area of Le Havre are characterised by rapid flooding from run-offs on the clay plateau. If the amount of precipitation exceeds the infiltration capacity of the soil, however, flooding can occur. At the beginning of the 1970s, environmental NGOs and experts from the National Agronomy Research Institute (INRA) claimed that floods were related to transformations in the landscape. During the 20<sup>th</sup> century, industrial development increased the impermeability of the soil<sup>12</sup>. The experts demonstrated that intensive agriculture limits infiltration and aggravates gully erosion.

<sup>12</sup> Grass plains made up 66% of the Chalk Plateau in 1955, and 48% in 1988 (Hauchard 1994). Between 1970 and 1988, 36% of wet grasslands were turned over to agricultural crops for soil-less cultivation (corn for cattle).

Run-offs are also linked to cost-effectiveness issues leading to larger surface areas and the urbanisation of the Lézarde basin (Cartier, 2002a).

At the end of the 1970s, huge floods struck the new population. In 1978, three people died as a result of flooding. In addition, run-offs with mudslides led to water pollution. The conjunction of floods and epidemics became an important issue for the public authorities. Farming activities remain designated as potential causes. Many institutions rapidly emerged to promote cooperation on identifying local solutions, but successive flood crises in 1993, 1995 and 1999 burnt out local solidarity (Cartier 2002b). This is especially the case with the flooding of December 1999, which was considered exceptional. Many municipalities were completely flooded, mainly as a consequence of run-offs, and drinking water was unavailable for several weeks.



**Figure 4.8 Transformation of flood issues in Le Havre (France)**

Source: Gralepois, 2015



The *Préfecture*, in its capacity as representative of the State, launched a Risk Prevention Plan for the Lézarde Basin (the Lézarde PPRI) in June 2003. It took ten years of negotiations to reach agreement on the definition of flood hazard in the context. Divergences persisted among the main interests involved: agricultural interests (soil erosion); environmental interests working for the protection of the landscape and biodiversity; and flood policy interests in charge of the defence of the Lézarde PPR represented by the State services.

**Figure 4.9 The urban retention basin in the city of Le Havre**

Source: The Jenner flood retention basin, *Journal Paris Normandie*, [www.parisnormandie.fr](http://www.parisnormandie.fr)

In order to speed up the PPR process, two resources were mobilised: a national decree especially drafted for local run-offs and a global Action Programme for Flood Prevention (PAPI), funded with large amounts of money. The PAPI led to a diversification in the strategies. Important hydraulic works are planned (see figure 4.9 and 4.10), based on local technological resources (GIS, measurement tool, flood warning system). Retention basins form a network together with smaller open air retention basins in the rural area of Le Havre. These retention basins were built in order to prevent gully erosion and thus to protect agricultural lands (*i.e.* mitigation measure). This objective was transformed afterward towards the protection of Le Havre urban area (*i.e.* a defence measure) (figure 4.8). The total amount covers approximately 840,000 m<sup>3</sup>. The objective is to increase global capacity to 1.2 million m<sup>3</sup>. Other “soft rules” have been adopted, such as hydraulic plans at a municipal level to implement adaptive works (ponds, banks, grass and wetlands). Practical guidelines to reduce flood vulnerability at a housing level have also been disseminated. The River Basin Syndicate (SMBV) carried out an inventory of architecture and buildings in flood-prone areas. All these measures make up the mitigation strategy adopted by the local authorities, which also organised a forum for inhabitants and enterprises to raise awareness on flood prevention.

Despite the diversification of the strategies, special pride is taken in the technical and engineering innovations, such as the 170 hydraulic infrastructures. The retention ponds offer a solution to one million cubic metres of rainfall flooding. This is a visible and acceptable solution for all parties to the conflict (farmers, experts, inhabitants and local institutions). Besides the main expert-based discourse, the mediation role played by the River Syndicate has largely been under-estimated.

In conclusion, run-off sub-arrangement mix up three strategies: prevention, with land planning led by



the State; hydraulic works built by the inter-municipal institution; and public information organised by the River Syndicate. Mitigation is coordinated by the River Syndicate with soft rules in hydraulic plans on-site rural retention basins. Finally, preparation, using the special local forecasting and warning system, has been developed by the inter-municipal institution.

**Figure 4.10 Rural basins in the upstream section for mitigation strategy**

*Source: The on-site rural retention basin, CODAH*

### 4.3.2 The defence versus the prevention sub-arrangement. The marine submersion sub-arrangement, a new deal driven by the Floods Directive?

The marine submersion sub-arrangement concerns the lower districts of Le Havre and the industrial harbour areas. The harbour is an atypical actor, as it owns the marine dike, which is a defence infrastructure for the harbour and the city (see figure 4.11). Besides the dike, the harbour is involved in the implementation of the Floods Directive, defining flood hazards and mapping risk.



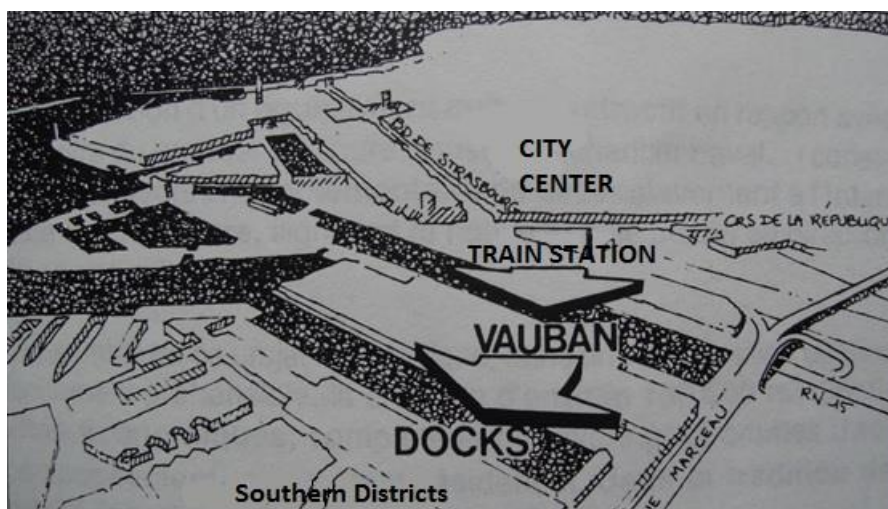
**Figure 4.11 The marine wall, protection for both the harbour and the city**

Source: *Le Havre Patrimonial, Port 2000*, <https://imagesduhavre.wordpress.com>

Before the Floods Directive (2007), marine submersion was never discussed as a political issue. In the early 2000s, a map was included in the Le Havre local urban plan (PLU) which anticipated the consequences of submersion in a proactive initiative of the municipal authority. It requires compliance with upper-elevation for urban development in the southern part of Le Havre, even though the area had already been promoted by the Municipality in the 1990s when it pushed forward an urbanisation scheme close to the sea and the dock areas (see figure 4.12).

The Le Havre Inter-Municipality Services (CODAH) and the Seine Estuary Major Risk Office in the (ORMES) – recently created to organise risk management at an estuary level<sup>13</sup> – intend to carry out a precise evaluation of the marine submersion risk. The local authorities want “*to be one step ahead of the State*”. As they fear that State services might restrain urban and industrial development, they are developing local expert-based data and methods. State actors and local actors are constantly challenging each other on risk definition.

<sup>13</sup> The Seine Estuary Major Risk Office (ORMES) was created to help local authorities on technological risk aspects. But as it began to acquire more legitimacy in the field of flood risk management, it started to issue communications on public awareness, and to develop substantial know-how on modelling and mapping.



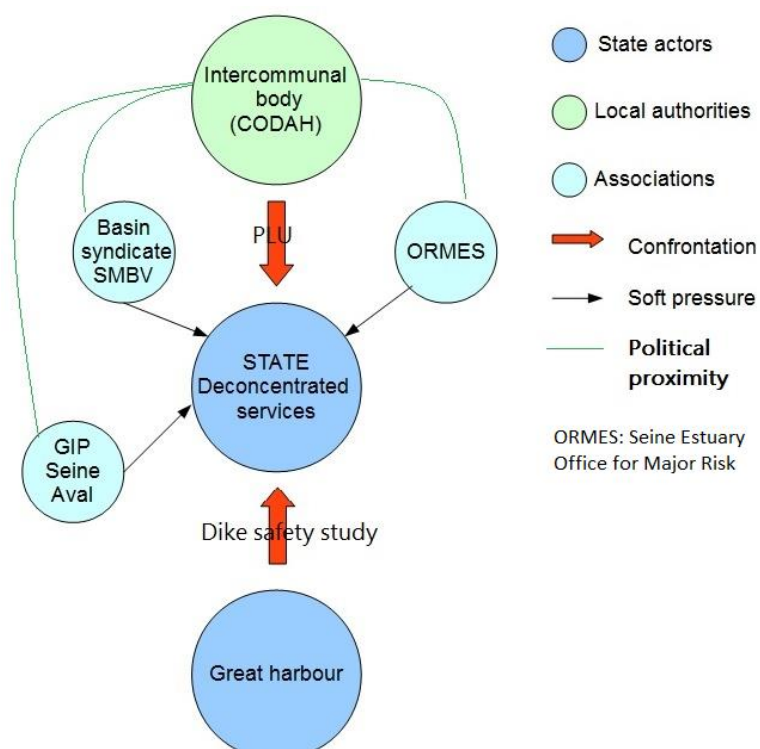
**Figure 4.12 New urban development in the harbour area of the city**

*Source: Schéma d'Aménagement Directeur, Division Aménagement et Urbanisme de la Ville du Havre, 1991*

Until the Floods Directive entered into force, marine overflow was practically absent from the agenda. Le Havre had not experienced marine submersion of any great magnitude since 1984. Between 2007 and 2014, national works were initiated to transpose the Floods Directive, but the local authority was not involved in the early stages (Preliminary Flood Risk Assessment - EPRI). With the development of maps of High Flood Risk Areas (TRI) and the Flood Risk Management Plan (PGRI), the State services began to involve other actors in order to identify local support for implementation.

The local authorities were vaguely aware of this process, but did not anticipate any important outcomes from these first documents. The first hazard definition maps looked at the marine submersion risk on a two-dimensional grid, with these documents potentially being legally binding. The documents opened up a debate on the definition of the level of risk (see figure 4.13).

However, definition of risk levels is a prerogative of the State, and the marine submersion scenario is considered by the local authorities and the harbour authorities to be “simplistic” and “maximalist” i.e. to take the most pessimistic probabilities without giving any nuances.



**Figure 4.13 Negotiations for definition of risk: a battle for scientific legitimacy**

Source: Trémorin, 2015

It was therefore rejected and countered by the main local actors: the inter-municipal body of Le Havre (CODAH), the Seine Estuary Major Risk Office (ORMES) and the harbour of Le Havre. These institutions used scientific knowledge, political legitimacy and legal expertise as resources for influencing the debate. For instance, ORMES and CODAH used hydraulic studies they had produced previously. CODAH used a flood risk assessment conducted during development of the local urban plan (PLU). The harbour used a study it had conducted previously on infrastructure safety protocols regarding the dikes owned by the harbour. In addition, another actor entered the game: the Common Interest Group (GIP Seine Aval) gathers together local authorities, harbour management, industrial stakeholders, associations and other advocacy groups, and even though it defines itself as a “non-political actor”, it provides knowledge resources to local authorities.

In the course of 2014, the State services continued to produce data and mapping on marine submersion, and invited local partners to join a steering committee. The local authorities continued to question the methodology, the outcomes relating to urban planning and the lack of a mitigation strategy. The State services still stood as driver of the prevention strategy and ultimate decision-maker, although at the beginning of 2015, the State services changed their mind and declares that its prevention maps are not binding, but merely raw materials for assisting with discussions with local actors.

From the actors’ perspective, although the State services have poor financial and manpower resources<sup>14</sup>, they maintain a position of control, and as a result, the schedule for implementing the

<sup>14</sup> For Le Havre, only one person is employed full time on development of the TRI in the State administration dealing with flooding at a Département Level (the Département Directorate for Territories and the Sea - DDTM).



Floods Directive has been delayed<sup>15</sup>. The State does not have the capacity to carry out the political, financial and technical work related to implementation of the Directive, and local support is needed to carry on. Although local institutions (CODAH, ORMES) have invested in flood management, no one has given a positive response up to now. The main argument is that they were not involved in the first phase of transposition of the Directive, and that it is now too late for cooperation.

In conclusion, the marine submersion sub-arrangement is in conflict with defence and prevention strategies as promoted at the national scale. On the one hand, local authorities and harbour management claim that the harbour’s defence infrastructures, such as docks and sluices, but especially the marine dike, provide protection. From their point of view, a defence strategy allows a balance between flood risk safety measures, urban development and economic activities. On the other hand, State services are pushing a restrictive interpretation of the flood policy through a prevention strategy. The doctrine here is to keep the risk at a distance so as to safeguard the population.

### 4.3.3 Preparation sub-arrangements, replications from the national scale

Preparation sub-arrangements in Le Havre replicate the national arrangement. Even though recovery is regulated by a public decision-making process, the sub-arrangement is based on private resources: the Natural Disaster Scheme (CAT-NAT) is financed through insurance premiums. Le Havre has often applied on the CAT-NAT system (Table 4.3), but there is nothing especially local about this sub-arrangement.

Preparation sub-arrangement is an autonomous one that is essentially developed and led by the State services. The State representative is the *Préfecture*, the main actor, which gathers together resources and discourses. Documents such as emergency plans are coordinated by the *Préfecture*, and cooperation with municipal authorities is limited to data collection. Nevertheless, the laws are increasingly transferring responsibilities to municipalities, especially through the municipal Crisis Management Plan (in French: *Plan Communal de Sauvegarde - PCS*). The case of Le Havre offers a good illustration of this evolution, and the city is actively involved in the development of flood management. Crisis Management Plans allow stimulating the cooperation among the municipal services, but it does not change the balance of powers.

### 4.3.4 Recovery

As for the two other case studies, recovery is outside the local FRMGA. At the local scale, flood victims report the damage they have suffered (insurance claim). However, the CAT-NAT system is fully managed nationally, and recovery is then applied directly to the local level, with no specific local arrangement. The table below shows the floods covered by the CAT-NAT system in Le Havre.

**Table 4.3 List of floods covered as “natural disasters” by the CAT-NAT system in Le Havre**

Type of risk	Date
Flood and mudflow	05-06/06/1983
Flood and mudflow	05-06/06/1983

<sup>15</sup> The Département’s State services are under a great deal of direct pressure from their hierarchy at a Regional level, from the Ministry of the Environment and from the European Union. The national actors, such as the Ministry of the Environment, are held accountable for the process at a local level.

Flood and mudflow	23-24/01/1984
Marine submersion	22-25/11/1984
Flood and mudflow	22-25/11/1984
Flood and mudflow	21/06/1986
Marine submersion	26/02 to 01/03/1990
Flood and mudflow	09-14/06/1993
Flood and mudflow	01-02/07/1994
Flood and mudflow	27-29/07/1994
Flood and mudflow	17-31/01/1995
Flood and mudflow	24/12/1999
Marine submersion	25-29/12/1999
Flood and mudflow	04/07/2000
Flood and mudflow	01/06/2003

### **Conclusion**

To conclude, it is not possible to establish any connections among the three sub-arrangements. The only link between the runoff and marine submersion sub-arrangements might have been risk planning, but each sub-arrangement is subject to a different legal document (the Flood Risk Prevention Plan (PPRI) for Run-off and High Flooding Risk Areas (TRI) for marine submersion). Although this separation is a problem for flood management the new tools provided by the Floods Directive (PGRI, local strategies) could provide more consistency in the Le Havre FRGA.

Each is related to a geographical and morphological specificity. The preparation sub-arrangement is a replication of the national scale, whereas the runoff sub-arrangement is linked to localisation on the upstream portion of the river catchment, the rural landscape and agricultural economy and the morphology of the basin catchment, with its very limited exits for its hydraulic system. The marine submersion sub-arrangement is associated with the oceanic, rainy, stormy geomorphologic climate and the economic role of the harbour, which is potentially affected by marine submersion through the docks basin system.

Nevertheless, the sub-arrangements share three common characteristics. First, the Le Havre case relies on local expertise in flood management. Since the 1970s, industrial risk has been more integrated than flood risk (Gralepois, 2008). The skills and good practices developed for the industrial risk area have been transferred to flood policy. Second, local expertise is based on a range of resources (human resources, technical skills, engineering response and financial power) that provide local institutions with a capacity to counterbalance the power of the State. In the context of the Floods Directive, local authorities gathered to negotiate the scenario proposed by the State, not only to discuss implementation but also to define the occurrences of flooding. Third, the local flood policy shows a diversification of strategies, from defence and prevention to a combination of mitigation, preparation, defence and prevention.

## 4.4 Explaining the dynamics of flood governance in Le Havre

**Table 4.4 Stability and change factors of in Le Havre**

	Drivers of stability	Drivers of change
<b>Factors internal to the FRGA</b>	<ul style="list-style-type: none"> <li>- <b>Shock events</b> (in 1993, 1995 and 1999): reinforcement of the security principle, triggering of launch of flood prevention plan;</li> <li>- <b>Path dependency:</b> high level of investment in defence for two centuries (for example, the harbour dike);</li> <li>- <b>Powerful lobbying by engineering companies and corporations:</b> (conservative actor groups that also strive for pride in innovation).</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Empowerment of the inter-municipal body:</b> The Le Havre Agglomeration (local warning system) and citizens (information forums);</li> <li>- <b>Constitution of local coalition</b> (CODAH/ORMES/GIP/SMBV);</li> <li>- <b>Implementation gap</b> between legislation and practice: <b>Erosion Decree.</b></li> </ul>
<b>Factors external of the FRGA</b>	<ul style="list-style-type: none"> <li>- Existing institutional and legal design: <b>centralisation, fragmentation</b> (preparation isolation);</li> <li>- Existing systems of liability and compensation measures: <b>State/Mayor complementarity;</b></li> <li>- <b>Path dependency:</b> powerful political legitimacy of the defence strategy.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Decentralisation process:</b> transfer of competences to the inter-municipal body;</li> <li>- <b>Reduction in public investments</b> and development of partnership tools (prevention of run-offs);</li> <li>- <b>EU Flood Directive:</b> emergence of marine submersion issue and its appropriation by the Le Havre Agglomeration);</li> <li>- <b>Convergence of several discourses on diversification:</b> complementarity between mitigation and defence for run-offs (hydraulic plans, guidelines for vulnerability reduction), discourse on integration and the development of expertise.</li> </ul>

### 4.4.1 Explaining changes in Le Havre: Towards more local flood policies

Main dynamics and changes in Le Havre involve the empowerment of the inter-municipal body. Decentralisation processes are advancing further, with the devolution of traditional State competences such as risk management and planning. Le Havre and CODAH are increasingly willing to secure these competences in their fields, and have adopted a proactive attitude towards this evolution. The decrease in the powers and resources of deconcentrated State services is confirmed in the Le Havre case study; when providing accounts to the Ministry of the Environment, the *Départementale* Directorate for Territories and the Sea (DDTM) and the Regional Directorate for Environment, Land Planning and Housing (DREAL), are regularly late, and have to ask for extensions of time because the services have budget and manpower shortfalls.

Beyond the global decentralisation process, Le Havre is the perfect embodiment of the rise of inter-municipal power. Indeed, Le Havre's inter-municipal institution (CODAH) is the most dominant actor in the field of flood management. With more powers and resources and a powerful discourse, it plans to make the State bend to its own interests in the regulatory dimension. Although the Flood

Risk Prevention Plan (PPRI) is entirely controlled by the State, CODAH is acquiring more influence in the balance, especially through the implementation of the Floods Directive, with its planning documents, and the contractualisation process between the State and local authorities in the context of PAPIs. Furthermore, inter-municipal bodies seem to have gained power over preparation strategy and emergency planning. By controlling the risk management competence, CODAH is also seeking to obtain more freedom to manage its own decisions in terms of economic development and urban growth. Traditionally a joint competence shared with the State, emergency planning is moving towards inter-municipal bodies, as is happening in Le Havre.

### **Empowerment of the inter-municipal body making flash flood a local and political issue (Run-off sub-arrangement)**

#### *Definition of the run-off issue as an "urban matter"*

In order to be a priority on the public agenda, the flood issue must cover several topics, which are usually environment, health and security (Gralepois, 2008). In a runoff sub-arrangement, the discourse shifts from "this is a rural matter" to "this is a public concern" (in which floods are defined as urban flash floods). When flood strategy is linked to water pollution – that is, to the protection of drinking water – it becomes a matter of importance. The re-framing of this issue is a constant source of discussion that is profoundly grounded at the discourse level of the Policy Arrangement Approach. The first reason for this is that flood management is not prioritised in local public policies; the question is under-estimated in comparison with sustainable development or climate change policies.

In this context, **catastrophic events (floods in the 1990s) and legislative reforms** (PPRI 2003; the Erosion Decree of 2007) have been both used as windows of opportunity (Kingdon, 1984). Local actors have used them to reinforce their resources rapidly and secure a higher position in the decision-making process.

#### *Diversification of strategies: The need to share responsibilities and funding*

The second major shift is the progressive diversification of the strategies. The overall Action Programme for Flood Prevention (PAPI) allows plans to be developed for defence infrastructures, adaptive hydraulic works, the reduction of vulnerability of housing, communication campaigns in public forums and local warning systems (see figure 4.14). The first explanatory factor for this is the need to build a local consensus on the necessity to find a balance between development and security. This might be viewed as a factor that enhances resilience in the Le Havre territory, but it might also relate to the necessity to share responsibility rather than concentrate measures and the responsibilities on one specific type of actor. In other words, diversification is predominantly associated with a sharing of responsibilities.



**Figure 4.14 The diversification of strategies in flood management: the result of consensus?**  
*Source: Gralepois, 2015*

The second explanatory factor is the economic crisis. Diversification represents one way of putting forward public measures with fewer available funds. After a short period of abundance during which large infrastructures were built, there is now no more money available. The common discourse can be transcribed as: “Make do with what you have. There will be no more financial resources”.

### **The Floods Directive as a window of opportunity (marine submersion sub-arrangement)**

#### ***The integration of marine submersion***

The Le Havre flood policy was not really concerned with marine submersion before the Floods Directive (2007), but it has now risen to the top of the local political agenda. The first change factor is the enhancement of the new legislative environment. The Floods Directive has pushed the State services to integrate an extreme scenario. The greenhouse effect and global warming are now taken into account in the definition of what a marine submersion hazard is. New legal documents are going to be produced. The definition of risk, and especially the definition of hazard are currently at stake between the State services and the local authorities. The second change factor is the challenge for power: the legally binding nature of these documents gives the actors the impetus to reach a common decision, and the stakeholders are all pushing their interpretation of what the proper level of risk occurrence is.

#### ***The integration of local authorities***

The sheer amount of work required for implementation of the documents to be produced following the Floods Directive, which is being coordinated by Ministries (the Flood Risk Management Plan - PGRI, High Flooding Risk Areas - TRI, the Local Strategy for Flood Risk Management - SLGRI), has driven the State services to involve the local authorities; because budgets have been tightened, the State services cannot manage the implementation of the Floods Directive at a local level. The Floods Directive has clearly revealed the emerging power of local authorities in the field of flood management and reinforced the national analysis of the empowerment of inter-municipal bodies.

### ***More extensive prevention strategies***

Implementation of the Floods Directive is significant for another shift, towards more prevention. Although the defence strategy is still over on the harbour and industrial areas, awareness of global warming has caused a shift towards more prevention. Calibrating an infrastructure as a dike at the Le Havre harbour without knowing whether the rise in the sea level is going to be twenty centimetres or one metre is complicated, and very costly. This mind-set seems to be helping the adoption of some action towards more prevention than defence solutions. Although there is a minimum national requirement to take global warming into account in the definition of the marine submersion hazard, local authorities have pushed this aspect forward, and Le Havre has taken the initiative to be proactive on this matter, compared with the national level.

#### **4.4.2 Explaining stability in Le Havre: existing institutional and expert frame**

##### ***The weight of institutions in framing the flood issue***

The conflicts of interest among rural perspectives (the agricultural economy), environmental concerns (such as the landscape and biodiversity) and urbanisation (housing and public infrastructures) have been institutionalised: that is, they have been carried on in institutions more than through media controversies or private discussion at a neighbourhood level. All local authorities have been mobilised: municipalities, the *départementale* council, the regional council and State services (agriculture and the environment).

The first explanation of this is the need for public actors to have legitimacy and accountability in the field of risk management. With the rise of the water pollution problem, the public authorities must assume their responsibilities and be accountable for controlling the situation to prevent the territory from risk, even in a context of conflict. The explanatory factors are mostly shocks events, therefore: “Revealing the vulnerability and the danger of agricultural practices, risk has driven a reorganisation of social activities” (Cartier, 1999, p15).

##### ***Path dependency linked to an expert-oriented frame and the lack of a political debate***

Institutionalisation very often does not entail cooperation (Decrop and Galland, 1998, Dourlens, 2003; Martinais 2007 ; Gralepois 2012). Local authorities, which play a mediating role – especially in the case of the River Basin Syndicate (SMBV) and the inter-municipality (CODAH) – are underestimated. There are places where discussions are held, but the debate is kept inside the institutions, and is not transparent. The results of institutional discussions are a consensus of powers rather than political decisions. The technical staff are much more deeply involved than are the elected representatives.

This can be explained by the fact that the River Basin Syndicate (SMBV) is a cooperative institution that specialises in linking water management and flood management. It drives public information, organises forums between inhabitants and enterprises and deals with preventive actions such as school presentations. In particular, the River Basin Syndicate has actively worked towards the involvement of private local actors such as farmers, and uses its social network as a tool for implement flood policy more efficiently. Although the mediation role is an essential one, it is totally underestimated in this context, which is marked by conflicts of interest.

Furthermore, each municipality has its own Hydraulic Plan and its own local plan (PLU), and acts individually. When a municipality is recalcitrant, or where a building permit is allowed without any recommendations, the River Basin Syndicate contacts the municipality and attempts to explain, using arguments based on the water impact, but it can do no more than that.

### *Path dependency on the defence strategy in marine submersion sub-arrangement*

Although the marine submersion sub-arrangement has emerged only recently, it has not appeared *ex-nihilo*, a new risk arriving from out of nowhere. In terms of flood risk management strategies, the marine submersion sub-arrangement can be explained by the dominance of the defence strategy. The main explanation behind this state of affairs is that most harbour activities relied on high expectations for its defence system. Over-investment in infrastructures such as dikes and docks has planted the idea in the minds of policy makers that a marine submersion event is very unlikely to occur, or even impossible. A little like in the Netherlands, faith in the capacity of engineering to face a hazard has led to a partial denial of the possibility of such an event taking place. A second stability factor is the lack of major event in the recent past (for over thirty years).

## 4.5 Evaluating flood risk governance in Le Havre

**Table 4.5 Evaluation criteria in Le Havre**

Evaluation	Enabling	Constraining
<b>Resilience</b>	<ul style="list-style-type: none"> <li>▪ Capacity to resist The governance arrangement enables the delivery of diverse and multi-layered strategies and measures.</li> <li>▪ Capacity to absorb and recover The FRGA are linked to other relevant policies (for example, drinkable water and environmental policies); Effectiveness: some behavioural changes have been observed in flood policy-making process (especially agricultural practices); Knowledge is sought at all levels and through the integration of all main (public) actors; Effective integration and implementation of international laws and policies into the domestic regime.</li> <li>▪ Adaptive capacity The FRGA are clearly forward-thinking and proactive: studies are promoted to develop long-term policies (on climate change, agricultural developments, etc.); Strong capacity for innovation and knowledge production capable of competing with State services.</li> </ul>	<ul style="list-style-type: none"> <li>▪ The FRGA are moving towards a broadening of strategies, but these are not thought out in a coordinated and consistent manner;</li> <li>▪ Reduced capacity for learning from past mistakes.</li> </ul>
<b>Legitimacy</b>	<ul style="list-style-type: none"> <li>▪ Dissemination and communication of flood Information Integration of the main economic stakeholders (such as farmers' lobbies) is widely sought.</li> </ul>	<ul style="list-style-type: none"> <li>▪ The participation of civil society in decision-making is not sought;</li> <li>▪ Lack of transparency in decision-making and policy implementation.</li> </ul>

Efficiency	<ul style="list-style-type: none"> <li>▪ Cost-benefit analyses not systematically carried out or communicated.</li> </ul>
------------	---

### 4.5.1 Resilience

To what extent does flood risk governance enhance society’s resilience to flooding in Le Havre? Concerning the **capacity to resist**, social resilience appears to be enhanced by the diversification of measures and institutions. Le Havre also shows a significant innovative capacity but expertise, initiatives and decision-making rely on very few actors (inter-municipal body). In the long term, this lack of coordination with a broader network of actors and resources may hinder these capacities and performances to anticipate or assess flood risk. This is why they can only be found to be barely reliable in terms of resilience.

The governance arrangement enables the delivery of diverse and multi-layered strategies and measures:

- The run-off sub-arrangement clearly enables a multi-layered FRMS as a mixture of measures is implemented between mitigation, defence and prevention;
- This is also the case with marine submersion, although it may not be as obvious. There is a shift from a mono-centred strategy around defence towards mitigation and prevention. The sub-arrangements are based on a blend of strategies.

Governance sub-arrangements relating to both run-off and marine submersion are moving towards a broadening of strategies, but this is unconscious rather than a deliberate policy choice. The various measures are not being thought out in a coordinated manner; it is more an accumulation of measures than it is purposely consistent coordination. Both sub-arrangements are related to other policy domains, such as the sewage system and drinking water networks. In addition, the urban planning and urban development policy is linked to the flood risk management domain, with some districts having been built in flood areas that take the flood risk into account by being resilient. Some environmental policies are also directly associated with flood risk management, such as certain Natura 2000 areas that are used as flood plains through a spillway system.

#### Floods Directive

Regarding the **capacity to absorb and recover**, both governance sub-arrangements are clearly forward-thinking and proactive:

- The marine submersion sub-arrangement is implementing the Floods Directive and is asked to consider a return period of 100 to 1000 years. Climate change is also taken into account in studies. The body regulating the harbour of Le Havre (GPMH) is working on studies on the economic aspects in order to develop its activities in long-term patterns.
- As far as the run-off sub-arrangement is concerned, some proactive thinking is also being done, although maybe less on a long-term scale. The change in the agricultural model and practices is in a certain sense a prospective measure. The Inter-Municipality of Le Havre (CODAH) is also a proactive actor through its use of studies on long-term flood forecasting as a basis for its political and technical legitimacy.



As regards **adaptive capacity**, there is scope for learning, innovate and improve in Le Havre. Real experience has been applied to the services of CODAH, for instance. The way the Floods Directive has been tackled and the interest shown by the Le Havre local authorities in preparing for it is very significant. This is also the case with crisis management. In reality, there has been feedback at many levels on all five strategies. For instance, the mapping carried out by the State to assess the risk was discussed by CODAH's based on what they had been doing for the past ten years and all the studies that had been conducted previously. There is room for an innovative approach, although lessons may not have been clearly learnt from prior mistakes.

Nonetheless, some behavioural change have been observed in the policy-making process of the run-off sub-arrangement, especially as farmers have been replanting hedges and shown increasing responsibility in the use of their agricultural land to prevent further damage due to run-off and soil erosion.

Research for knowledge and expertise:

A great deal of knowledge is being sought at all levels: many actors are involved in studies and scientific and technological knowledge. The Inter-Municipal body of Le Havre (CODAH), the River Basin Syndicate (SMBV) Point de Caux, the GIP Seine Aval and the body regulating the harbour of Le Havre (GPMH) – all the main actors are involved in some kind of knowledge and expertise. A number of social science studies are also being conducted.

To conclude with our overview of resilience, it is clear that there is a solid place for innovative practices in Le Havre and in both Flood Risk Governance Arrangements (FRGA), run-off and marine submersion. Proactive thinking and long-term studies show a real capacity to adapt and buffer. Lessons have been learnt and the process is still ongoing. On the other hand, it is very difficult to evaluate clearly if the case is becoming more resilient in truly concrete ways.

#### 4.5.2 Legitimacy

From a point of view of legitimacy, the Le Havre case study is quite revealing about what is taking place at national level.

Participation is not thought to be for the general public. While information and communication are present in the field of flood management, it is clearly not a joint decision-making or participation process. Most of the stakeholders are present in the marine submersion sub-arrangement with the harbour and the companies involved (which are represented through a consortium), but neither citizens nor civil society in general are present. With regard to the Lézarde basin arrangement, most of stakeholders are again present, but the general public is not. There is a certain degree of participation, but it is organised and managed for the benefit of the flood risk actors and not civil society. Nevertheless, the involvement of farmers as a lobbying group and the entire agricultural sphere in general has allowed a broad-based spread of knowledge regarding flood risk prevention and mitigation throughout the decision-making process. Public participation (which is restricted to farmers) has been developed, and has served the purpose of obtaining wider legitimacy in the attainment of goals, and has provided a form of knowledge to public policy and decision-makers.

As far as transparency is concerned, there is very little transparency in the Le Havre case study in the policy-making process. In the case of the Lézarde arrangement, there is a clear separation in the

flood management policy between CODAH and the River Basin Syndicate (SMBV). On the one hand, the SMBV uses as the image, the showcase, through communications, pedagogical tools and participatory action, while on the other, CODAH, does all the major work, (such as dikes, levees and retention basins) with no communications on matters such as costs or benefits. With regard to the marine submersion sub-arrangement, the State is still at the centre and lacks transparency in many ways. The State only communicated its policy after it had been opened to other institutional actors, and the local authorities were not involved in the implementation of the Floods Directive at the outset. To conclude, it can be said that there is no intention to hide information but no one has requested it. In a sense, the policy is transparent only after other actors have begun to be involved.

Public information: public information workshops are organised by the SMBV Pointe de Caux to give the public advice on how to reduce the vulnerability of their homes. Some educational activities in schools have been led by the SMBV. There is a very strong political desire in Le Havre to have public information on the preparation of the strategies. The ORMES has led many actions to create pedagogical tools to make people aware of the risks and to let them know how to react to them. This is in part connected to Le Havre's tradition of industrial risk management (table 4.5).

#### 4.5.3 Efficiency

Integration and implementation of international laws/policies into the domestic regime: As regards the Floods Directive, there is clearly implementation in the field, and it is very present in most of the interviews carried out in Le Havre among the institutional actors. In relation to the run-off sub-arrangement, it can be said that implementation of national rules at a local level has been exemplary, as with the Erosion Decree, for instance. In the case of the submersion sub-arrangement, there has been a normal transposition of the law, which has been well integrated.

### 4.6 Conclusion

Le Havre is a textbook example for local pro-active governance; it uses scientific knowledge on flood hazards, techniques (such as GIS, mapping and data modelling) and engineering infrastructure to challenge the State's routines and procedures on flood policy. There is no one local arrangement because local stakeholders are re-arranging themselves into networks depending on the flood issue (run-offs or marine submersion) or flood strategy (different sub-arrangements for defence and prevention, for example). It should be noted that there is no local sub-arrangements relating to recovery and preparation, which replicate the national arrangement.

A pro-active sense of flood governance does not come from nowhere. There is a story behind it. In Le Havre, local governance is has been involved in concerns about industrial pollution since the 19<sup>th</sup> Century and about technological risk policy since the end of the 1980s. Local stakeholders are used to working with – or, shall we say, in place of – the State in the area of risks.

A burning challenge remains in the area of the legitimacy of data in risk modelling and techniques for infrastructure. All the stakeholders say that flood policy needs more education, information, work on social perceptions and crisis exercises, and science and engineering matters.



---

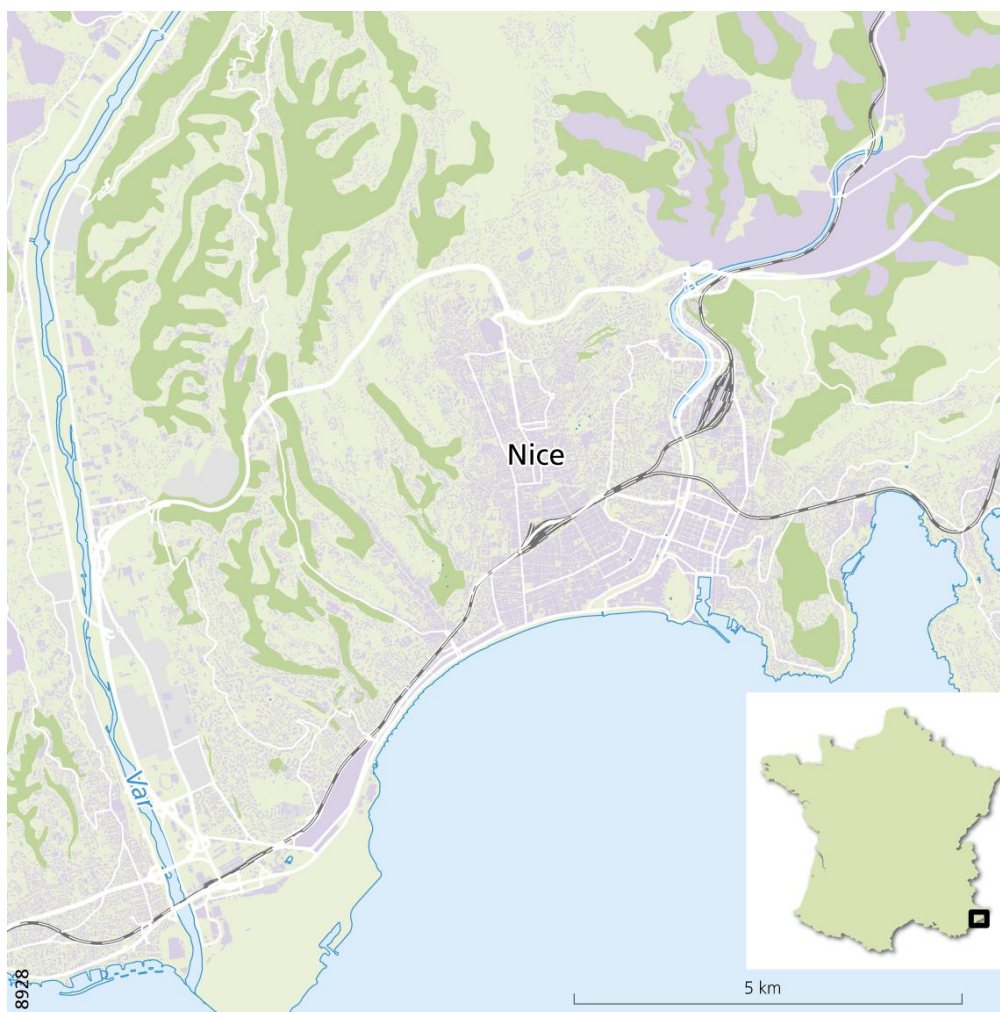
## 5. Nice: a national-local coalition to integrate the risk in development projects

### 5.1 Introduction and scope of the analysis

As previously mentioned (Chapter 2), the choice of Nice has been motivated by its geographical position, which offers specific traits in terms of risk exposure, urban pressures and governance configurations. Nice is the southernmost case study in the STAR-FLOOD project. It is located in the extreme south-east of France in the Region of Provence-Alpes-Côte-d'Azur. This location gives the city typically Mediterranean geographical and climatic features. Nice belongs to the "Rhône Méditerranée" basin district. Its main river is the Var. The city is very exposed to the risk of flooding, and has a typical Mediterranean flooding profile, characterised by flash floods, river floods and marine submersion. It is also affected by a multiplicity of natural risks: forest fires, landslides, earthquakes, and flooding.

This high level of exposure to a multiplicity of risks – in particular flooding – is accompanied by extremely high urban pressures. Its agglomeration is the fifth-largest in the country, and its airport is the fourth-largest. Nice has the typical dynamics of Mediterranean cities: high urban density and an economy highly dependent on tourism and housing, business and important transport systems.

This case study illustrates the forms of integration between flood management and urban development. In this regard Nice, represents a crucial test of what we have seen at a national level. Although in fact the trend is towards increased disengagement on the part of the State at a local level, in this case the State has intervened with a national operation – the Var Plain Operation of National Interest (OIN) – the aim of which is to support flood management and its development. In the meantime, as we will see, the strategy developed in this context challenges the national rules on zoning, and is likely to show other cities how a combination of risk and urbanisation can be viable at local level. We will see under what conditions this is made possible, and the potential limits.



**Figure 5.1. Location of Nice**  
 Source: Marcom-Carto, Faculty of Geoscience, Utrecht University.



**Figure 5.2 The city of Nice and its water courses**

A further characterising element of this case is the fact that the history of Nice and its urban development is closely connected to its main rivers, the Paillon and the Var, which will be the focus of our attention. These rivers represent two different eras in the development of the city: the old city of Nice built on the banks of the Paillon and the city of tomorrow rising along the Var. Flooding represents a problematic structural issue in both cases, but one with two different solutions in terms of governance approach and answers.

The Paillon and the Var provide two types of approach to flooding and governance frameworks. Flooding is associated with different problems in the two cases; in one, water quality and sustainability, and in the other, principally urban development. To what extent are these configurations and flood management systems separate, or conversely, to what extent can we talk about a global approach to flood risk management? How far are FRMs integrated at the level of this case study? These are the main questions that will guide our analysis.

**Table 5.1 Key characteristics of Nice**

Key facts and figures	
Region and county	Provence-Alpes-Côte d’Azur, South-East France
City population	City: 343,629 inhabitants (2012) Metropolitan area: 1,003,947 inhabitants (2011)
Population density (99-2009)	4 778 inhabitants per km <sup>2</sup>
Population growth (city)	-0,1%
Elevation	Minimum 0 m – Maximum 520 m
River basin	River Var, approximately 2822 km <sup>2</sup>
Types of flooding	Fluvial, tidal and surface water
Local business	Agriculture, ports and energy sector (offshore)
Household income (INSEE 2012)	€ 20,184

## 5.2 Contextual background of the case study

The Nice coastline is characterised by a Mediterranean climate which represents a specificity of this case study compared with the other French studies. It has dry summers, mild winters and very irregular rainfall (which may produce violent, heavy episodes known as “cévenol episodes”) from one year to another.

The natural function of both the Paillon and Var is heavily affected by these climatic features and they are subjected to sudden, violent flash flooding with intense movement of sediment and solid materials. Urban run-offs and marine submersion are also present.

The critical issue relates to two main areas (see figure 5.2): the first is the Var, which is the main river of the Alpes-Maritimes *département* and is located in the western part of the city. This river has the typical characteristics of Mediterranean rivers, which are subject to sudden, violent torrential flooding.

The second area, which we will call the “Old Town”, lies in the Paillon Valley. Although the Paillon is viewed as a small water course, it is characterised by abrupt dynamics that produce rare but devastating flash floods that mainly affect the city centre.

The floods of 1994 are the most important episode of the last twenty years. Significant damage, especially in the Var area, led to a redesign of the approach to flooding (see figure 5.3). This date is taken as the baseline for this case study.

The synergy between flooding and landslides risks must be stressed. The area of Nice area is very hilly, and the outlying districts of the city are built on hills that can have very steep slopes (the so-called “hill zones”). Soil sealing in these areas favours urban run-off and causes an acceleration of rainwater flows.

**Table 5.2 The Var: the main river of the département**

Characteristics of the Var	
Basin	2,822 km <sup>2</sup> (67% of which are in the Alpes Maritimes) 110 km
Infrastructure works	Banks along the final 11 km Tunnel for the last 3 km
Population	116 000 inhabitants
Urbanisation	Upstream: on the hills Downstream: along the river
Environmental aspects	Flora and Fauna Protected Area (ZNIEFF des Gorges du Paillon)
Recent important flood events	1910, 1940, 1951, 1957, 1979, <b>1994 (reference floods)</b> , 2002, 2011 and 2012



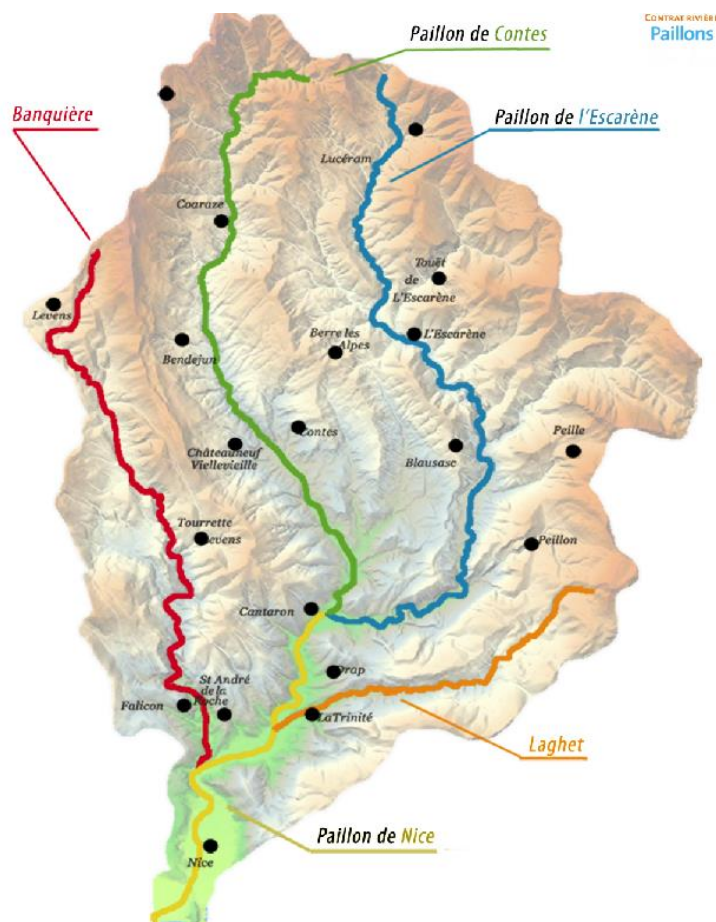
**Figure 5.3 The range of the great flood of 5 November 1994**

*Source: Dagherne et al. 1998*

The Var River is State-owned, and is located in the western part of the city. Since the 19<sup>th</sup> Century, the need to protect the surrounding agricultural areas from flooding has forced the city governments to intervene with extensive protection infrastructures, but in the high-risk zone, these old protection infrastructures represent a possible source of flooding as they accelerate the flow of the river. This is a specific matter for concern as it is in this area that the new city developments are planned. A national operation was launched in 2009 following chaotic and flood risk unaware development in the Var area,. This project, which is called “Eco-Valley”, is the new framework within which significant development projects (a business centre and multimodal transport hub, a high-tech manufacturing centre, a food and horticultural platform and an eco-residential quarter) are being planned for the city of tomorrow. The prefix “eco”, which evokes the dual nature (or ambiguity?) of this master plan, is worth noting: it can mean “economic” or “ecological” (sustainable). This project is intended to provide a consistent new development framework in which the risk of flooding is a part of the development strategy.



## The Paillon River<sup>16</sup>



**Figure 5.4 The "Paillons" catchment area**  
Source: *Communauté de Communes des Paillons*

**Table 5.3 Characteristics of the Paillon**

Characteristics of the Paillon	
Basin	250 km <sup>2</sup> (20 municipalities) 4 tributaries (80 km): Contes, Escarenes, Banquiers, Laghet
Infrastructural works	Banks along the final 11 km Tunnel for the last 3 km
Population	393,000 inhabitants (of which 340, 700 inhabitants live in Nice)
Population exposure to flooding	76,600 inhabitant (45% of the basin population), more than 11,000 firms and 43,000 employees (source: Insee, 2009)
Urbanisation	Upstream: on the hills Downstream: on the river
Risk of flooding	High-speed flow with extensive erosive power, urban run-offs, obsolete and vulnerable protection infrastructures,
Recent important flood events	2000, 2014

Dry for most of the year, but capable of sudden, violent flooding with extensive erosive power, this river course has marked the history of the City of Nice to a considerable degree (Pietri 1954; de Saint-Seine, 1995): in fact, the medieval city developed along this river. Successive interventions along the river to satisfy the city's tourist vocation have greatly modified its morphology and increased the risk of flooding and erosion. This is particularly true of the downstream area, where urbanisation has

<sup>16</sup> Etymology: Paillon = "the River of Stones" (de Saint-Seine, 1995)

---

increasingly taken up space over the wide riverbed and contributed to reducing its width. Even in the upper part of the catchment area, urbanisation has progressively colonised the floodplain (and sometimes the riverbed), and very limited viable access to the river remains.

The final 11 km of the riverbed are completely banked, and in order to gain room for development, the last 4 km have been progressively covered, and are now protected by an underground tunnel (built in 1983) to alleviate traffic congestion.

Lastly, unlike the Var, the Paillon is a private river: riverside ownership reaches as far as the middle of the riverbed, which means that riparian owners must guarantee maintenance of the riverbed but brings with it a risk of great fragmentation. This problem will trigger new initiatives to provide more rational management and will identify a specific governance arrangement in our analysis.

In addition to the river's characteristics, it is necessary to acknowledge the specific context of the Paillon Valley and its future development. It is worth noting that it is a highly constrained environment consisting mostly of hills and narrow slopes. Most of the surface area of the twelve municipalities in the Paillon Community consists of a natural environment, the protection of which is stated in local development documents (Directive Territoriale d'Aménagement - DTA and the Master Development Plan – SCOT).

While urban pressures are indeed great, therefore – because of its proximity to the centre of Nice – any further urbanisation of these impervious areas will encounter severe restrictions: the lack of space – the main aim of the Master Development Plan (SCOT) is a more effective organisation and densification of the current urbanised areas rather than the urbanisation of new ones, the desire of the local administrations to protect the environmental areas and the presence of major natural risks, including floods, landslides and forest fires.

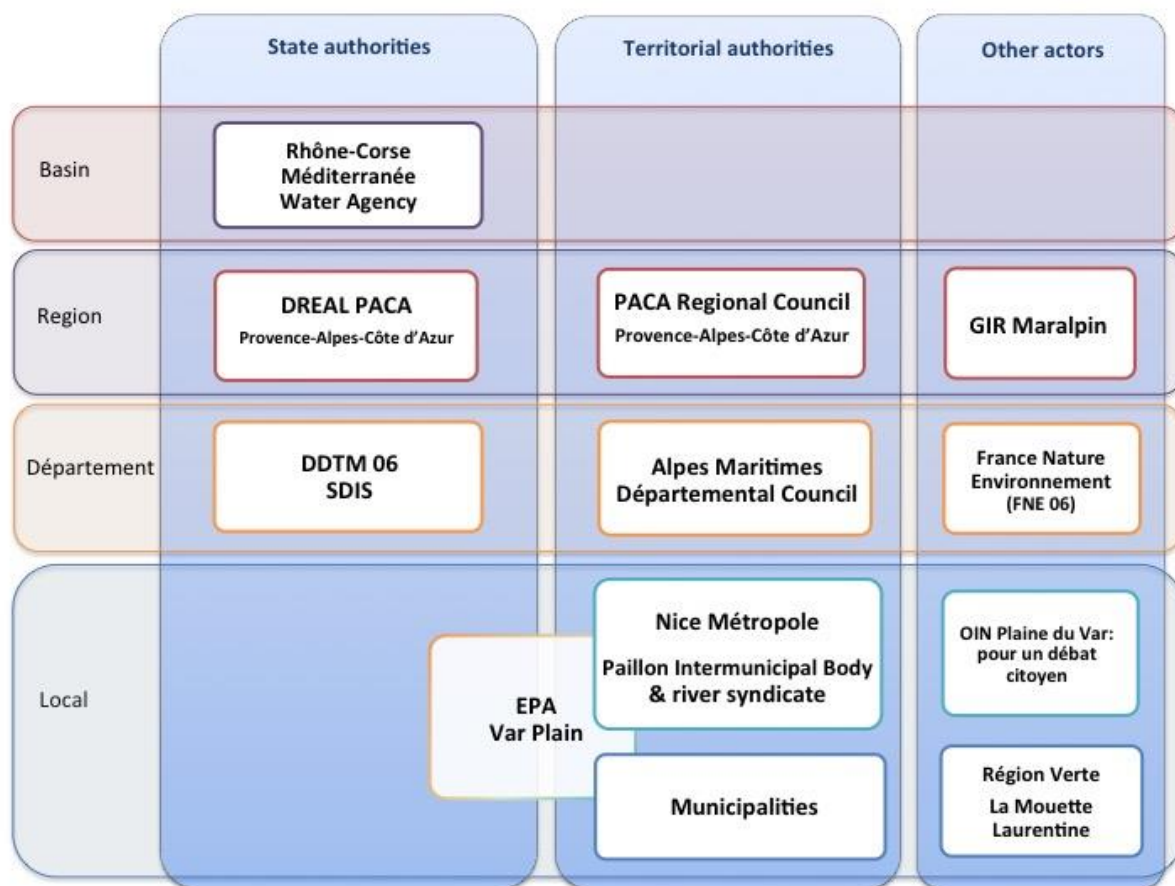


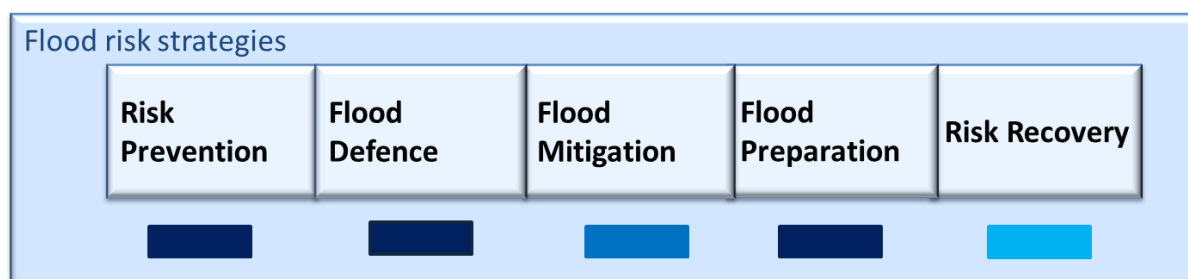
Figure 5.5 The Nice actor system

**Legend**

- CG: *Départemental* Council
- DDTM: *Départemental* Directorate for the Territories and the Sea
- DREAL: *Regional* Directorate for Environment, Land Planning and Housing
- EPA: Public Organisation of Development
- GIR Maralpin: Maralpin Interdisciplinary Research Group
- OIN: Operation of National Interest
- PACA: Region Provence-Alpes-Côte d'Azur
- SDIS: *Départemental* Fire and Rescue Service
- SPC: Regional Flood Forecasting Service

**Table 5.4 Flood risk management strategies in Nice**

Flood prevention	Flood defence	Flood mitigation	Flood preparation	Flood recovery
<ul style="list-style-type: none"> <li>• Spatial plans;</li> <li>• Prohibition and regulation of construction through planning (Flood Risk Prevention Plan – PPRI, Var and Paillon);</li> <li>• Risk paragraph in purchase deed;</li> <li>• General information on flooding (e.g. flood maps).</li> </ul>	<ul style="list-style-type: none"> <li>• Dikes;</li> <li>• Water course maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>• Flood-safe buildings.</li> </ul>	<ul style="list-style-type: none"> <li>• Forecasting (24-hour monitoring and intervention teams) and Flood warning system;</li> <li>• Crisis communication;</li> <li>• Intervention and evacuation plans (ORSEC and Municipal Crisis Management Plan – PCS);</li> <li>• Community awareness-raising activities (training, Municipal Civil Protection Reserve);</li> <li>• General information on flooding (e.g. flood maps).</li> </ul>	<ul style="list-style-type: none"> <li>• Insurance systems;</li> <li>• Solidarity fund;</li> <li>• Repair works.</li> </ul>



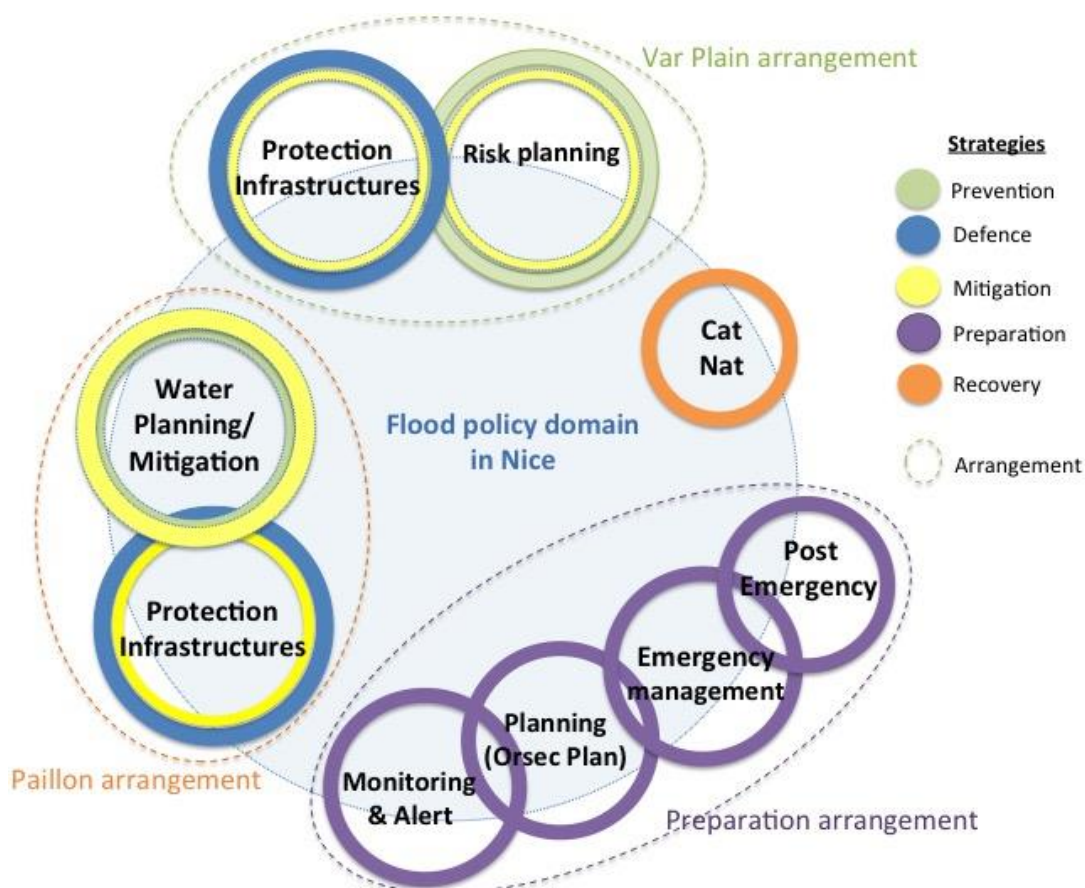
**Figure 5.6 Overview of strategies present in the case study Nice.** Dark blue indicates the most dominant strategies, and medium blue establishing strategies, light blue minor strategies, grey-blue strategies do not play a role.

### 5.3 Analysis of flood risk governance in Nice

At a national level, we have identified a plurality of sub-arrangements based on each of the flood management strategies. At a local level, the strategies are far more intertwined, and sub-arrangements take shape where they interconnect.

Three main sub-arrangements have been identified in the case of Nice:

- Prevention-defence, which characterises the governance arrangement on the Var;
- Mitigation-defence on the Paillon;
- Emergency management.



**Figure 5.7 Flood risk governance sub-arrangements in Nice**

*Source: Bruzzone and Levy, 2015*

#### 5.3.1 The prevention-defence sub-arrangement on the River Var

At national level, we gave an account of the relationship that sets the State against local authorities, with particular regard to urbanisation rules in flood-prone areas, whereas at a local level, this opposition needs to be nuanced in some way. In particular, this sub-arrangement illustrates the bargaining process that leads to a softening of the restrictive flood legislation and makes local development viable. The case of the Var River challenges the national approach and framework by tracing a number of elements of a potential evolution in the relationship between the State and the local authorities on flood policy. The result of this is that bargaining between the State and the local authorities becomes the new unspoken rule, with the ultimate aim of integrating the risk into

development projects. This bargaining takes place in a specific legal framework: the Operation of National Interest (OIN) (box 5.1).

**Box 5.1 The Operation of National interest (OIN): a specific framework**

Through the OIN, the State strengthens its powers over the conduct of urbanisation operations with the aim of preserving public interest nationally. In principle, an OIN is a counterweight that permits the State to thwart decentralised planning by giving precedence to large operations of public interest over local town planning and construction regulations. In order to facilitate performance of these operations, derogation to the ordinary law governing development transactions has been established by Articles L. 421-2-1 c) and L. 111-1-2 of the Town Planning Code. On the contrary, in the case of Nice, the OIN does not represent at all a constraint for local authorities. Instead, local development is strengthened by the OIN, as it is a tool of high legal effect that has a great legitimacy. In fact, the OIN is used pragmatically to establish a specific development framework where the state and local authorities are closely associated.

The topic here consists in dealing with the problem of defence infrastructures within the framework of restrictive legislation on building in flood-prone areas; this is why we speak of a prevention-defence sub-arrangement.

The history of this sub-arrangement is built on the mobilisation of specific instruments (the Flood Risk Prevention Plan - PPRI, the Rhône doctrine, the OIN, the Hydraulic Consistency and Global Development Scheme – SCHAE and the Action Programmes for Flood Prevention -PAPIs). It is a process that has taken place over fifteen years, from the first proposal of an extremely restrictive flood zoning plan (Flood Risk Prevention Plan -PPRI) in 1999 to its final approval in 2013, which includes a softening of the zoning regulations. It is important to note that these tools allow to overcome legal barriers (*e.g.* the PPRI) and to enhance legal flexibility. For instance, in the framework of an OIN, it is easier to build behind dikes. The prevention-defence sub-arrangement travels through a progressive convergence and harmonisation of these tools into a consensual understanding of the future development of the area and the consolidation of a risk-development coalition. At the end of the process, a new configuration of actors, a new discourse and a new doctrine for flood management and development are shaped.

This process took place within the framework of a National Interest Operation (OIN) (box 5.1) launched in 2008 to promote the Eco-Valley project, and relates to a master plan in which the State and local authorities intervene and derogate to local land use plans. The aim of the plan is to launch four major projects (a business centre and multimodal transport hub called Grand Arenas, a technological centre called Nice Méridia, a food and horticultural platform called La Baronne, and an eco-quarter in Saint-Martin-du-Var). The Var Plain OIN represents an original framework within which to deal with urban planning and flood risk. The Public Development Organisation (*Etablissement Public d'Aménagement* – EPA) becomes the operating body for the new pro-development coalition, and is an association of various public partners and funders: the State (33.3%), Nice Metropole and the City of Nice (33.3%), the *Départemental Council* (16.7%) and the Regional Council (16.7%). Data evidencing the powerful urban pressures on this area follow:

**Table 5.5 Development perspectives in the Var Valley**

The Var Plain today	The Eco-Valley tomorrow
116,000 inhabitants 10,000 hectares (23 km from South to North) 60,000 jobs 10,120 enterprises 15 municipalities	450 hectares available for development projects 3 million m <sup>2</sup> of building capacity 50,000 new jobs € 2.5 billion of investment (80 % private).

Source: <http://www.ecovallee-plaineduvar.fr>

The elaboration of a specific study for the planning of the Grand Arenas sector, in 2012 constitutes an important step of this negotiation process. It shows the central role of the EPA, which conducts the study called Hydraulic Consistency and Global Development Scheme (SCHAE). With this study centred on the Arenas district, the EPA proves the possibility to build without increasing the level of risk exposure on the sector but also on the adjacent district.

At the same time, two Actions Plans for Flood Prevention (PAPI 1 2009-2014 and PAPI 2 2012-2018) have been put in place, principally to guarantee the funding of the major protection works (see figure 5.6). They represent the central element for stating the principle of “resistant dikes”, thus opening the way to development projects (in derogation of the national doctrine, which prohibits construction behind dikes).

**Table 5.6 Current Action Programme for Flood Protection (PAPI II Var) 2012-2018: distribution of measures among funding partners**

Source	Measures and priority	Amount (€)
City of Nice/Département	<b>Improvement of risk knowledge and raising of risk awareness</b> (Objective 1)	200,000
Département	<b>Flood forecasting system</b> (Objective 2)	400,000
Département (+ City of Nice)	<b>Alert and crisis management</b> (Objective 3)	450,000
Nice Metropole (+ EPA)	<b>Study to take risk into account in urban planning</b> (Objective 4)	260,000
Département (+ Nice Metropole, EPA)	<b>Actions of reduction of vulnerability on people and goods</b> (Objective 5)	3,290,000
Nice Metropole	<b>Slowing of flows</b> (Objective 6)	400,000
Département (+ Nice Metropole)	<b>Maintenance of hydraulic infrastructures</b> (Objective 7)	60,582,280
		65,582,280* [*about 38% Barnier Fund]

The table shows the main local sources of funding. Secondary sources are indicated in brackets. It should be noted that the State provides approximately 38% of the total amount through the Barnier Fund (as an ex-post refund) Source: Bruzzone 2015 (PAPI Var data, 2012-2018)

---

At the end of this process, the role of the State changes from a provider of regulations and controller to an actor involved, *inter alia*, in the bargaining game to attempt to combine development and flood prevention.

### 5.3.2 Mitigation-defence sub-arrangement on the Paillon River

Compared to the Var River, the sub-arrangement on the Paillon is structured on different issues and on a different scale, and mobilises a configuration of actors, discourses and resources, mainly from the water sector.

The history of this sub-arrangement is based on an intention to provide a cohesive framework of flood management along this water course. This is achieved through the adoption of a River Contract, which proposes two main objectives: the fight against flooding and the preservation of the water resource. With regard to flooding, it consists mainly of protection measures and interventions to reduce vulnerability.

On the frontline we find a local coalition of actors from the water sector: namely, the Water Agency, the Basin committee and the *ad hoc* Inter-Municipal Association known as the *Syndicat Intercommunal des Paillons* (SIP).

The lengthy genesis of this instrument – from 2001-2010 – reveals a low level of interest in the river on the part of both citizens and local representatives: as we have mentioned above, the geomorphological characteristics of the area hinder any further development<sup>17</sup>. Moreover, the decision to enter into a river contract<sup>18</sup> without applying a Local Water Management Plan (SAGE) underlines the will of the local actors to commit to a fairly flexible and non-constraining tool. This is why flood prevention measures that were designed years ago have not yet been fully implemented, and the contract is approaching its termination date. The river contract is ultimately viewed as an instrument for funding specific measures and satisfying the obligation of the national legislature on flood prevention, but not as a cohesive flood programme.

As far as strategies are concerned, the river contract – at least in its stated objectives – has represented the framework for combining defence and mitigation, but in practice its accent was on reducing vulnerability. Defence was left on the side due to a lack of funds. It is likely that in the coming years the weight given to the defence strategy will be somewhat increased as the river contract arrives at its expiry date, and the Action Programme for Flood Prevention (PAPI), which is mainly viewed as a tool for financing protection works, will become the main funding framework. . This case draws our attention to the fact that in presence of strict limits on development – as in the Paillon Valley, because the area is already over-urbanised and the geographical conditions greatly

---

<sup>17</sup> Grass plains made up 66% of the Chalk Plateau in 1955, and 48% in 1988 (Hauchard 1994). Between 1970 and 1988, 36% of wet grasslands were turned over to agricultural crops for soil-less cultivation (corn for cattle area for council housing). The vacancy rate is very low at 6.3% (724 accommodations) (2006 data); this is even lower than the average for the Département, where the vacancy rate is already low (7.4%) (Master Development and Town Planning Scheme, SCOT, 2011)

<sup>18</sup>A river contract is a policy instrument at the watershed level. It brings together various partners – the Prefect of the *département*, the Water Agency and other local authorities (such as the General Council, the Regional Council, municipalities and municipal associations) in the pursuit of common objectives: water quality, the enhancement of the aquatic environment and a balanced management of water resources.



limit any capacity for development – the flood issue might be treated “*a minima*” and merely to comply with formal obligations. It might be said that the flood issue is ultimately somewhat disconnected from development policies. In this regard, the Paillon case is the opposite of the Var case to a certain extent in terms of the powerful interests connected to the development of the Var Valley.

**Table 5.7 Current Action Programme for Flood Prevention (PAPI) Paillons 2013-2019: distribution of measures among funding partners**

Source	Measures and priority	Amount (€)
Paillon Inter-municipal Assos. (SIP) (+ others)	<b>PAPI organization and management</b> (Governance)	280,000
Nice Metropole (+ Nice Ville + SIP)	<b>Improvement of Risk Knowledge and awareness</b> (objective 4)	975,000
Nice Metropole (+SIP)	<b>Flood warning and forecasting</b> (objective 2)	290,000
Nice Metropole, SIP and State Services	<b>Actions of reduction of vulnerability on people and goods</b> (Objective 3)	645,500
Nice Metropole	<b>Slowing of flows</b> (Objective 6)	400,000
SIP (+ Département)	<b>Maintenance of hydraulic infrastructures</b> (Objective 7)	4,141, 051
		6, 731, 552 (about 38% of the « Barnier Fund »)

The table shows the main local sources of financing. Secondary sources are indicated in brackets. It should be noted that the State provides about 38% of the total amount through the Barnier Fund (in the form of an ex-post refund) Source: Bruzzone 2015 (data: PAPI Paillon 2013-2019)

### 5.3.3 Preparation sub-arrangement

Our analysis of the local emergency management sub-arrangement permits us to develop two issues: on the one hand, in comparison with the national arrangement, our analysis of the case study confirms that crisis management is a somewhat independent sub-arrangement that is mainly driven by the State services and coordinated by the Prefect. At the same time, however, this picture must be nuanced, because at a local level, the preparation mission is becoming increasingly shared among a plurality of actors whose mission is not a mono-strategy. Municipalities (which are in charge of the Municipal Crisis Management Plan (PCS) and the Municipal Information Document on Major Hazards (DICRIM)), inter-municipal bodies and voluntary groups are playing an increasingly important role in this regard.

On the other hand, with regard to the specific case of the two rivers, preparation represents the main meeting point for the two river managements systems, which tend to be separate as far as preventive and defence actions are concerned. This connection is ensured by the State civil security services and inter-municipal bodies. In this regard, the role of the Metropole is particularly interesting, as it lies at the point where State services and individual municipalities meet. It

increasingly extends its tasks and missions even beyond its formal prerogatives, in particular as regards information to the public.

Other connections may be found in specific technical solutions, such as advance forecasting systems (X-Band Radar), which will be developed and will integrate the different river basins.

### Conclusion

The flood governance configuration in Nice is mainly structured on the basis of the differences between the Var and Paillon governance systems and projects. It is worth noting in particular how differently the flood issue is taken into account depending on whether or not developments are planned in each valley. In other words, the socio-economic strategic importance of the river affects the way in which the risk of flooding is approached and handled: where urban pressures are high, as in the Var Valley, the flood issue is at the forefront of the political agenda and is integrated into the urban development project. Conversely, in the case of the Paillon, the flood issue leads an independent life from the planning of development, and is mainly associated with water issues (such as pollution and services connected to drinking water) (see figure 5.8).

**Table 5.8 Differences between the Paillon and the Var river systems**

	Var	Paillon
Level of governance	Nationally based	Locally based
Type of coalition	Planning	Water management
Strategic importance	Strong urban pressure, strategic economic development	No specific socio-economic interests
Ownership	State-owned	Private owned
Urban-rural framework	Urban	Rural
Right-left wing cleavage	Right wing	Left wing
Integration of flood policy	Flood management integrated in development projects	Risk management detached from other issues

For this reason, it is not possible to refer to a general approach to flood risk.

However, this picture of opposing positions must be nuanced by the homogenising role of preparation. As a State-driven strategy (through the local *Préfecture*), it reduces the distance between the two river management contexts. Innovations in forecasting technology have triggered an overall monitoring of the two waterways.

Other issues are also likely to make the two river management systems draw closer in the near future.

- the attractive power of Nice Métropole. Because of the increasing responsibilities of small municipalities in the flood and planning sectors, they may integrate into Nice Métropole to profit from its cognitive, technical and material resources
- local strategy. The six different Action Programmes for Flood Prevention (PAPI) in the *département* will be coordinated within the framework of the local strategy. This is already under way, thanks to the work of an informal group of stakeholders known as “Groupe PAPI 06” on specific intra-PAPI topics such as marine submersion.

- national reforms (“GEMAPI<sup>19</sup> competence” and the possible suppression of *Départemental* Councils will likely lead to the creation of a comprehensive river management structure (River Basin Water Board - EPTB) that includes both the Var and the Paillon

Ultimately, therefore, even though integrated flood risk governance may not have arrived yet, there are signs of a more integrated framework. This is the principal result of the rising role of the Metropole and other local authorities, which are increasingly focusing political power and technical expertise on reconfiguring local governance of risks.

### 5.3.4 Recovery

As for the two other case studies, recovery is outside the local FRMGA. At the local scale, flood victims report the damage they have suffered (insurance claim). However, the CAT-NAT system is fully managed nationally, and recovery is then applied directly to the local level, with no specific local arrangement. The table below shows the floods covered by the CAT-NAT system in Nice.

**Table 5.9 List of floods covered as “natural disasters” by the CAT-NAT system in Le Havre**

Type of risk	Date
Flood and mudflow	24/08/1983
Marine submersion	25-26/02/1989
Flood and mudflow	25-26/02/1989
Marine submersion	28-30/09/1991
Flood and mudflow	28-30/09/1991
Flood and mudflow	19/06/1992
Flood and mudflow	24/06/1992
Flood and mudflow	10/09/1992
Flood and mudflow	06-10/10/1992
Flood and mudflow	05-10/10/1993
Flood and mudflow	06-13/01/1994
Flood and mudflow	04-06/11/1994
Flood and mudflow	11-12/01/1996
Flood and mudflow	30/09/1998
Flood and mudflow	18-19/09/1999
Flood and mudflow	23-24/10/1999
Flood and mudflow	06/06/2000
Flood and mudflow	11/10/2000
Type of risk	Date
Marine submersion	05-06/11/2000
Flood and mudflow	05/11/2000
Flood and mudflow	23-24/11/2000
Flood and mudflow	25-26/08/2002
Marine submersion	31/10/2003
Flood and mudflow	03/12/2005

Marine submersion	30/11/2008
Marine submersion	22/12/2009
Marine submersion	01-02/01/2010
Marine submersion	19/02/2010
Marine submersion	04/05/2010
Flood and mudflow	15/11/2010
Marine submersion	08/11/2011
Flood and mudflow	24/09/2012
Flood and mudflow	30/09/2012
Flood and mudflow	16-18/01/2014
Flood and mudflow	04-05/11/2014
Flood and mudflow	09-11/11/2014

## 5.4 Explaining change and stability in flood risk governance in Nice

The baseline for our analysis is 1994, which corresponds to significant flooding in the Nice area, but the decentralisation process of the 1980s and the 1990 flood zoning policy are other influential periods that are taken into account in the timeline.

**Table 5.10 Stability and change factors in Nice**

	Drivers of stability	Drivers of change
<b>Factors internal to the FRGA</b>	<ul style="list-style-type: none"> <li>• <b>Shock events</b> (1994, 2000 and 2014): reinforcement of the security principle, triggering of launch of flood prevention plan;</li> <li>• <b>Path dependency effect:</b> high level of investment in defence for two centuries: embankments and weirs on the Var and embankments on and covering of the Paillon;</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Coalition of State and local authorities within the Var Plain Public Development Organisation (EPA);</b></li> <li>• <b>Implementation gap between legislation and practice:</b> Rhône Doctrine (prevention-defence);</li> <li>• <b>Reforms of legislative frameworks</b> empowers intermunicipal bodies (Nice Métropole).</li> </ul>
<b>Factors external of the FRGA</b>	<ul style="list-style-type: none"> <li>• Existing institutional and legal design: <b>Centralisation, Fragmentation</b> (preparation isolation);</li> <li>• Existing systems of liability and compensation measures: <b>State/Mayor complementarity;</b></li> <li>• <b>Path dependency effect:</b> powerful political legitimacy of the defence strategy.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Decentralisation process:</b> empowerment of inter-municipal bodies (local warning system) and citizens (information campaigns);</li> <li>• <b>Technical innovations</b> allow to connect defence and preparation;</li> <li>• <b>Reduction in public investments</b> leads to partnerships.</li> </ul>

### 5.4.1 Explaining changes in Nice: The rising role of the *Métropole* and its new coalition

#### *Prevention-defence on the Var: institutionalised binomial in favour of development*

On the river Var, the governance sub-arrangement is mainly structured around the role played by urban pressures in this area, and ultimately the integration of flood risk into urban projects. Nice Métropole obviously supports this development. Although the decentralisation process gives it new

competences and negotiating powers with local authorities, this is not enough to explain its weight on the urban development policies. Our analysis has also illustrated the process by which a new configuration of actors is established to identify win-win solutions that combine flood protection and development. In other words there is a changing situation: a new coalition of actors is built (around the OIN), and a new doctrine is developed (modelled on the Rhone doctrine) through the mobilisation of original tools (Hydraulic Consistency and Global Development Scheme -SCHAE) and a reconfiguration of the role of the State in this area.

The emergence of this coalition relies on other sub-factors explaining this dynamic:

- flood events as driving factor
- the changing approach of the State in this area from a provider of regulations and controller to a bargaining actor that joins “local games” that are no longer under its control. Some local stakeholders even claim that the State is being “instrumentalised” in order to act in local transactions (for example in the case of the OIN)
- path dependency processes

#### ***Preparation: the local evolution of a national policy***

The preparation sub-arrangement is structured around the central role of the safety service provided by the State. AS for the other case studies, stability in this area is linked to:

- the legitimacy of the preparation provisions (and first of all the Civil security response organisation plan - ORSEC) ; and
- more generally, an acknowledgement of civil security as a part of the welfare system guaranteed by the central State

Nonetheless, changes have to be highlighted, as local authorities take an increasing role in this area. Factors explaining this tendency are:

- national reforms in this area:
  - o the obligation for municipalities to adopt Communal Safety Plans (PCS) and have risk information documents at the population’s disposal;
  - o the 2004 Law on the reform of civil security: civil security is all a matter for citizens, and is their responsibility and
- cuts in State funds to the Fire Brigade, which is now solely financed by local authorities technical innovations in preparation (forecasting measures, population risk awareness provisions) mainly designed and funded at a local level (the *Départemental* Council, Nice Metropole, CETE Méditerranée)

A further element of change is the increased role of preparation measures in development projects located in flood-prone areas. In this regard, our hypothesis is that preparation measures could increasingly be used to soften the restrictive rules on planning in flood-prone areas.

#### **5.4.2 Explaining stability in Nice**

##### ***Stability in changes: go on with development and urbanisation***

---

Despite the new dynamic boosted by the new actors' coalition on the Var, we claim that all these changes speak to certain stability in the Var sub-arrangement: urbanisation and development remain the driving factor behind local policy. At the end of the process, the risk factor has indeed been integrated into the planning policy, but it is not an objective in and of itself; rather, it is the condition for continuing development. We could sum the situation up as follows: “everything needs to change so everything can stay the same” (De Lampedusa, 1959). Development is not called into question, even by groups (environmental associations) that oppose the Eco-Valley project.

This stability is tightly linked to:

- A powerful continuity in the right-wing political tradition that dominates the entire metropolitan territory
- Traditionally weak opposition from civil society (although this is changing)

In conclusion, although evolutions are visible in the means of actions, the prevention-defence sub-arrangement does not vary in its ‘strategic approach’. Within this framework, the changes that do occur can even be seen as conditions for stability.

### ***Defence-mitigation on the Paillon: long tradition of water management***

Stability prevails in the defence-mitigation sub-arrangement. The defence-mitigation sub-arrangement on the Paillon is structured on very slow changes consisting in the development of a cohesive flood management programme. Changes have been undermined by a variety of factors:

- a lack of political initiative on the river and the risks connected to it;
- a lack of cognitive and material means on the part of the programme’s coordinating actor;
- the legally non-constraining nature of the river contract does not encourage compliance with or implementation of scheduled interventions;
- a lack of knowledge of river dynamics hinder interventions; and
- the decentralisation process moves an increasing number of responsibilities to municipal authorities without providing them with the appropriate technical and material resources.

In this context, flood events in 1994 and 2000 have had an impact to raise awareness on the still existing risk. A lack of knowledge of river dynamics represents a driving factor behind the promotion of studies and new approaches to river management. Local actors gather themselves to create a new organisation (Paillon Inter-municipal syndicate – SIP) and now begin to consider (new) means at their disposal to engage reflexion and action: a River Contract, (first imposed by the Water Agency) and more recently an Action Programme for Flood Prevention (PAPI).

## 5.5 Evaluating flood risk governance at the case study level

Despite the differences described in the previous paragraphs, flood risk governance will be evaluated here on the Nice area as a whole, combining the Var and Paillon Basins.

**Table 5.11 FRGA Evaluation in Nice**

Evaluation	Enabling	Constraining
<b>Resilience</b>	<ul style="list-style-type: none"> <li>▪ Capacity to resist</li> </ul> Diversity of FRMS on both basins (mainly via the PAPIs) Efforts to create a partnership approach among the various basins (through coordination of PAPIs: PAPI 06 Group); <ul style="list-style-type: none"> <li>▪ Capacity to respond and recover</li> </ul> On both basins, events have stimulated the adoption of specific flood risk management programmes (River Contract and SAGE Var); Community involvement in emergencies (civil protection reserve group); Information campaign on flood risk; <ul style="list-style-type: none"> <li>▪ Adaptive capacity</li> </ul> Adaptation: the Var Valley provides examples of adaptation measures, especially in the building and emergency sectors; Capacity to learn and innovate: technical solutions (forecasting systems), emergency training, <i>etc.</i> )	<ul style="list-style-type: none"> <li>▪ Non-transparent derogation to local regulations to push development;</li> <li>▪ Lack of effectiveness of implemented tools and rules (River Contract, development of PCS);</li> <li>▪ Low level of risk awareness among the population</li> </ul>
<b>Legitimacy</b>	<ul style="list-style-type: none"> <li>▪ Participation of stakeholders sought;</li> <li>▪ Comparatively consensual system</li> </ul>	<ul style="list-style-type: none"> <li>▪ Consensus sought, but only among dominant (public and private) interest groups. Hard for other actors (for example, environmental associations) to count in decision-making process;</li> <li>▪ Lack of transparency in decision-making and policy implementation;</li> <li>▪ Participation of opposing interests sought formally but neutralised in practice.</li> </ul>
<b>Efficiency</b>	<ul style="list-style-type: none"> <li>▪ Knowledge resources are constantly improved and allow more appropriate interventions by both river basins;</li> <li>▪ High level of knowledge production and expertise capacity of local authorities (<i>Conseil General</i> and Nice Metropole).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Cost-benefit analysis not systematically carried out: project legitimacy sought on political basis rather than based on economic efficiency.</li> </ul>

### 5.5.1 Resilience

Nice relies on a complex set of actors at different levels of governance, but the pressures imposed by important economic and political interests linked to development relegate the flood issue to second ranking in the hierarchy of the priorities of local governance. Of course, this has a profound effect on the capacity of the local system's resilience to face flooding in the long term.

On a general level, the fact that the flood issue is not a priority of local governance either in the Var Valley, where development projects are the priority, or in the Paillon Valley, due to the low level of interest shown by local actors in this river, is in itself a hindrance to resilience. Technical innovations are being developed, but they may not be sufficient to create a resilient system.

Assessing the **capacity to resist**, it can be said that all strategies are present (except for recovery). Although a fragmentation of strategies is also present at local level, it is less pronounced compared with what we have observed at a national level. In Nice, in fact, forms of coordination between strategies are present and give shape to a binomial type of sub-arrangements (prevention-defence, mitigation-defence).

**Ability to absorb and recover from flood events:** each important flood event has represented an input for change, especially on the part of the *Préfecture* and metropolitan services. This is particularly the case with preparation: greater attention is now being paid to training and communications not only during emergencies but also at "normal" times. Conversely, flood events – especially if they are rare, in the case of the Paillon – do not encourage small municipalities to be proactive in developing Crisis Management Plans; a number of municipalities still do not have a Municipal Safety Plan (PCS).

**Adaptive capacity:** the Metropole is fairly active in promoting innovative provisions for raising risk awareness among the population.

### 5.5.2 Legitimacy

The political legitimacy of the projects is built upon strong political coalitions of actors from the public sector. In the Var Valley, an association of the State and local authorities in a master development plan provides the project with a broad consensus. In the Paillon area, legitimacy is based on a broad coalition of local actors in the water sector.

Generally speaking, we note a certain gap between the adoption of specific tools and their effectiveness.

With regard to the Eco-Valley project, lack of transparency represents a critical point that has been highlighted by environmental associations. Even though the decision-making processes are formally intended to be as inclusive and consensus-based as possible, in practice, specific conditions – such as limited access to information or information that is delivered too late – may actually hinder the real opportunities for critical "voices" to enter the process.

The OIN was facilitated by a particular political configuration which can be criticized in terms of transparency. Indeed, at the time of the creation of the OIN, the mayor of Nice, Christian Estrosi, was



not only a member of the French government but was also President of the *Départemental* Council of the Alpes-Maritimes. The *Plaine du Var OIN* was therefore established at a time when one of its key political supporters had a role in the national executive and was also the head of two local executive bodies. Today, Estrosi is President of the Metropole Nice Côte d'Azur, and all these territorial levels of power are now stakeholders in the Eco-valley project. In addition, the legal framework for the establishment of an OIN is not especially transparent. Indeed, the Town Planning Code provides no legal definition of the type of operation that may qualify, and so there are no legal criteria for characterizing "national interest" or allowing controls through a court judgment. In addition, the various OINs in France are listed by decree (Article R. 121-4-1 of the Town Planning Code); they are not determined by Parliament, because a law is not necessary. Because OINs lack legal criteria for defining them and are at the mere discretion of the Executive, their creation therefore only offers a fragile legal framework in terms of transparency and democratic expression. In addition, it should be noted that no consultation of the public or municipalities is required by the Town Planning Code for designation of an OIN.

A lack of transparency is also acknowledged at another level, namely the uncertain legal basis of the Rhône Doctrine, which frames the procedures for revising the Flood Risk Prevention Plan (PPRI) on the River Var, and which derogates to the stated principle of not building behind dikes.

In the Paillon area, the actions commenced in the context of the River Contract are fairly consensual so long as the provision provides sufficient resources to pursue the programme's objectives. This confirms that the River Contract is an ensemble of measures rather than a cohesive programme of actions.

Attention is given to rising awareness among the population to the risk of flooding especially through the development of innovative technological support (smart phones, websites). Nonetheless we acknowledged a weak level of diversification of the information according to the different category of persons (young/elderly, habitant/tourist,) and situations, of reflection on the gap between being informed and adapting one's behavior.

### 5.5.3 Efficiency

Efficiency is difficult to evaluate, as the policies have not been implemented in accordance with a systematic cost-benefits analysis.

The actors opposing the Eco-valley Project have denounced the lack of transparency in the cost-benefit assessments.

In the Paillon area, the River Contract, which was designed to prevent flooding, has not succeeded in implementing the main scheduled actions.

From the point of view of cognitive and scientific resources, concrete efforts have been made to improve awareness of the river's dynamics, but no systematic benchmarking has been undertaken.

The following conclusion is possible: FRGA in Nice is based on potentially very interesting tools in terms of resilience, legitimacy and efficiency, but these tools however are strongly hampered by a

lack of transparency and effectiveness, due to a context of strong land pressure. In the Var Valley in particular, the lack of transparency, especially in terms of consensus-seeking and building is another important issue.

## 5.6 Conclusion

The Nice case provides an interesting case for “testing” some of the hypothesis that emerged from the national framework. Some lessons can be learnt from this case study:

- compared with the national level, risk and planning policies are far more intertwined, and risk is better integrated into development projects; however, the flood risk does not represent a driving force in this binomial, and local development is the integrating factor. Our conclusion is that wherever urban pressures are strong, risk becomes an issue on the political agenda to the extent that it might hinder development. Conversely, where development is not a driving factor, for example in already over-urbanised areas, as in the case of Paillon, the risk of flooding becomes a less important issue. It is integrated into planning documents, but only formally in order to meet the requirement of the legislation in this area. This is because, unlike the Var Valley, there are no powerful economic interests in the Paillon Valley, as there is no further room for development. In this case, risk does not represent an “organising (or management) category”, but merely a mandatory regulatory requirement to be satisfied.

- compared with the national level, where the flood policy is built on the basis of a somewhat conflicting relationship that sets the State in opposition to the local authorities, the Nice case – and in particular the Var River – proposes a far more nuanced vision, and shows to what extent the State and local authorities can converge in bargaining configurations and win-win solutions: the State is guaranteed that the risk will be taken into account in development projects, and local authorities and developers is ensured that risk will not hinder development, but will rather be integrated into urban planning.

- with regard to multi-strategies, a trend can be seen in Nice towards progressive diversification of flood risk strategies, but this has not been achieved through the development of an integrated approach to flood risk. The Action Programmes for Flood Prevention (PAPs) play a specific role in this regard. In addition to its multi-strategic structure (all strategies must be included in the application for funding), this tool is mainly mobilised to finance defence infrastructures, as it is the only instrument for applying for State funding. In practice, therefore, it turns out to be an instrument of for coordinating actions rather than a cohesive multi-strategic (integrated) programme.

In accordance with what we have seen in chapter 2.4, *agglomérations* are playing an increasingly central role, especially in preparation: they provide fundamental technical support for small municipalities in the development of Municipal Safety plans and for triggering risk awareness among the population. Last but not least, they demonstrate powerful negotiating powers and legitimacy in their relations with State services.



## 6. Explanations for stability and change in French flood risk governance

### 6.1 Introduction

At a national level, two main dynamics are noticeable that characterise the evolution of FRGA towards:

- a diversification of strategies, giving a prevailing role to prevention (associated with mitigation) rather than defence and preparation,
- a redistribution of power and competences, leading to a broadening of the set of actors (especially through the rise of urban *agglomérations*).

Local FRGA globally follow a common dynamic and confirm those identified at a national level.

Defence and preparation are mostly related to the path dependencies relating to their financial and organisational characteristics. Despite the fact that significant amounts are still allocated to the maintenance of protection infrastructures, a diversification in funded measures and the origins of loans can be seen. Furthermore, co-financing tools (PAPI) and bridging mechanisms (for example, the Barnier Fund) are developing rapidly.

An overall common dynamic may be seen in the direction of the affirmation of prevention and mitigation, but its stage of progress depends on the weight of the discourses and the coalitions that promote them. They offer wide variations based on the degree of empowerment of the local authorities and the pressure applied by local development issues.

The broadening of strategies is closely linked to the move from a centralised to a decentralised approach to FRM. The State is repositioning itself, and is soliciting the involvement of new actors, some of whom are entrusted with new responsibilities, while others take them over without waiting to be obliged to do so. Expertise and knowledge are also becoming central resources that are well invested in by inter-municipal bodies.

**Table 6.1 Summary of stability and change drivers**

	Drivers of stability	Drivers of change
<b>Factors internal to the FRGA common to all cases</b>	<ul style="list-style-type: none"> <li>• <b>Shock events</b> : reinforce the security principle, trigger launch of flood prevention plans or legitimise them Le Havre: 1993-1995-99 Nice: 1994-2000-2014 Nevers: 1846-56-66 - 1907-2003-2008;</li> <li>• <b>Path dependency effect:</b> high level of investment in defense since two centuries Le Havre: harbor dikes Nevers: Left and right bank levees Nice: embankment and weirs on Var and embankment and covering of Paillon;</li> <li>• <b>Strong lobbying of engineering companies and corporation:</b> Le Havre: Conservative actor groups who also strive for innovation pride.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Empowerment of the intermunicipal body:</b> Le Havre Agglomeration: local warning system and information forums; Nice Métropole: local warning system and information campaigns; Nevers agglomeration: technical support to municipalities, involvement in crisis exercises, information campaigns.</li> <li>• <b>Shock events;</b> Nice: 1994: Département engagement; Nevers: (2003-2008): initiate and legitimise the Agglomeration engagement Le Havre (1993-95-99).</li> </ul>
<b>Distinctive</b>	<b>Nevers</b>	<b>Nice and Le Havre:</b>

<p><b>factors (valid only for one or two factors specific to a case).</b></p>	<ul style="list-style-type: none"> <li>• <b>Traditional centralised approach in a rural context</b> (no strong local power and reliance on the State action and legitimacy);</li> <li>• <b>Lack of urban dvt issues:</b> lack integration risk/urban development;</li> <li>• <b>Discourse on defence/mitigation combination</b> supported by historical Bassin actors since '90s (Pluridisciplinary Team and Loire Basin Waterboard).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Implementation gap</b> between legislation and practice: Le Havre : Erosion decree (marine submersion) Nice: Rhône Doctrine (prevention-defence);</li> <li>• <b>Constitution of local coalition</b> Le Havre: CODAH/ORMES/GIP/SMBV Nice: State/local authorities within the EPA Var Plain;</li> <li>• <b>Technical innovations</b> Le Havre: Nice: defence-preparation (SCHAE)</li> </ul> <p><b>Nevers:</b></p> <ul style="list-style-type: none"> <li>• <b>Water legislation (water police)</b></li> </ul>
<p><b>Factors from outside the FRGA common to all cases</b></p>	<ul style="list-style-type: none"> <li>• <b>Existing institutional/legal design:Centralisation, Fragmentation</b> (preparation isolated sub-arrangement);</li> <li>• <b>Existing systems of liability and compensation measures:</b> Complementarity State/Mayor;</li> <li>• <b>Path dependency effect:</b> Strong political legitimacy of the defense strategy.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Decentralisation process:</b> Transfer of competences to intermunicipal body (MAPAM Act) Transfer of roads and dikes management;</li> <li>• <b>Reduction of public investments and dvt of partnership tools</b> Le Havre: prevention for run off.</li> </ul>
<p><b>Distinctive factors</b></p>		<p><b>Le Havre and Nevers</b></p> <ul style="list-style-type: none"> <li>• <b>EU Floods Directive</b> Le Havre: Emergence of marine submersion issue and appropriation by the Agglomeration Nevers: EGRIAN Study as a basis to be completed to develop a more integrated strategy</li> <li>• <b>Convergence of several discourses on diversification and mitigation</b> Le Havre: complementarity between mitigation and defence for run off (Hydraulic plans, guidelines for vulnerability reduction) / discourse on integration and dvt of expertise Nevers: Discourses supported by several actors: State, local, flood directive</li> </ul>

## 6.2 Explanations for stability in flood risk governance

### 6.2.1 Stability traits

The main features of stability can be summarised as follows:

- the domination of protection, as defence still prevails in funding and technical developments;
- a top-down approach: prevention and preparation are notable for their significant stability, despite the decentralisation process; and
- risk as a public order issue: no private actors, lack of participation, lack of local responsabilisation.

### 6.2.2 Stability factors

The case studies confirm the explanatory factors for stability, which are mainly linked to national factors:

- path dependency;
- the institutional features associated with a risk management approach, in particular centralisation and fragmentation; and
- shock events.

---

### ***Strong path dependency***

Defence and preparation constitute the historic core of French flood risk management. They are marked by a strong path dependency that tends to make any radical change very unlikely.

The case studies confirm the existence of a path dependency effect towards protection systems at a local level. First, for several centuries, the high level of defence investment was justified by development needs, and it consequently became necessary to protect the developments they had permitted. Despite the absence of an obligation on the part of the State to guarantee protection against flood, it took responsibility for this along the main rivers, thereby giving defence strategy a powerful political legitimacy. Nevers is highly representative of this phenomenon: the first levees, which were built in the 12<sup>th</sup> century, were raised after the floods of the 19<sup>th</sup> century, marking the first massive State investment in this field. Indeed, the three major floods of 1846, 1856 and 1866 raised the flood issue as a priority during the Napoleonic Era, and invested the flooding issue with a political, socio-economic and safety dimension. The dikes protecting the harbour in Le Havre, the embankments and weirs on the River Var and the embankments and covering of the Paillon River in Nice have also generated a high level of dependency on the part of these cities on the protection system.

Until now, the engineering companies and corporations lobby, which has close associations with the State administration, have contributed to the importance granted to this sector (for example, Le Havre).

### ***Centralisation and fragmentation: the weight of risk as a general interest issue***

As previously analysed in Chapter 2, the stability of preparation, prevention and recovery sub-arrangements at a national level is explained by powerful institutional features. All our cases tend to confirm these factors, which are linked to a vision of risk as a general interest issue.

Recovery is obviously the most affected by centralisation: it is so centralised that it is absent from the local arrangement.

The centralised approach of risk management also explains the stability of the preventive approach, and limits its ability to be a driver for change. This approach relies on a vision of risk as a general public order issue and contributes to its persistence.

Preparation is marked by a combination of a high degree of centralisation and fragmentation. Moreover, the implementation of the subsidiarity principle (through the division of responsibilities between Prefects and Mayors) has allowed a better balance to be achieved between centralised and local powers than is the case in the other sub-arrangements. Decentralisation only strengthens the existing sharing of responsibilities.

### ***Shock events***

On a national scale, one can see some relationship between dramatic, but still local, events, such as the Vaison-la-Romaine disaster of 1992 and the strengthening of building restrictions through planning tools (PPR) in 1995. The three case study tend to confirm this: local shock events have triggered either the launch of flood prevention plans or their legitimisation, and have more impact

than national disasters. The floods in Le Havre and Nice in the 1990s can be correlated with the launch of PPRIs.

In Nevers, local shock events may have contributed to a strengthening of building restrictions in flood plain areas. After the flood of 2003, towns located in the outlying areas of the *agglomération*, such as Sermoize and Fourchambault, established building restrictions that are stricter than those imposed in the PPRs.

## 6.3 Explanations for changes in flood risk governance

### 6.3.1 Main trends

Two main dynamics of change have been identified at a national level:

- the diversification and integration of strategies; and
- the localisation of flood risk management, that is the tendency of local actors to handle the risk.

Despite this, the extent of changes varies locally, depending on the local appropriation of the flood issue and the specific sub-arrangements of the actors involved. Although the investment of local resources in the development of knowledge, expertise and technical management skills is noticeable in all cases, the extent to which they deviate from national trends by developing local doctrines and tools varies significantly from one case to another. We will now highlight the main factors that explain these differences.

### 6.3.2 Main factors for change

The case studies confirm the explanatory factors for the changes identified at a national level (which although they are from outside the FRGA still directly impact it). **The decentralisation process** globally involves a shift of competences and responsibilities in urban planning, and **budget restrictions** strengthen the need for partnership tools.

However, the case studies have also shown a varying degree of involvement in the flood issue on the part of local actors and distinct ways of becoming involved. This territorial diversity can be explained by:

- the urban development context, which influences the integration of risk prevention into other policies such as defence, preparation, planning and water; and
- the specific influence of the Floods Directive, which is linked to the marine submersion issue in Le Havre.

### *Mobilisation of the flood risk as an opportunity for agglomerations to assert themselves (the degree of political and technical affirmation by inter-municipal bodies)*

Inter-municipal bodies are fundamentally looking for ways to increase their political legitimacy, and flood risk management can be seen to be a strategic area from this perspective. If we look at our three cases more closely, we see that long before the formal attribution of local responsibility in the flood domain, each urban *agglomération* had already taken the lead in action programmes on the subject. The degree of involvement varies significantly depending on the territory, however, and our cross-analysis reveals three different patterns of appropriation of the flood problem, which go:

- 
- from a technical approach, mainly on dikes and preparation (Nevers)
  - to the development of local expertise in opposition to the State services (Le Havre)
  - and to the development a local flood policy in derogation from the national laws and with the support of the State (Nice).

The engagement of inter-municipal bodies is also visible from the resources granted to this specific field of competence, especially through the development of expertise. Their increasing size provides them with new technical capacities **by the pooling of resources and powers**. For these comparatively new institutional actors, the flood issue is likely to become an opportunity to affirm their competence and legitimacy and to challenge State domination. This is achieved by developing new flood modelling tools and hydraulic expertise, learning good mitigation practices from international examples and integrating adaptive or multi-use architectures. In this way, local authorities lead the State services away from their well-established practices. This is a deliberate strategy for challenging the State's expertise, practices and standardised solutions.

Local actors affirm themselves as a source of innovation. Mitigation is of particular interest, as it represents the only bottom-up strategy. The links to central government have always been mostly informal and visible through the creation of coalitions made up of associations and the Ministry of the Environment (Bayet, 2005). The Water Directorate has sought to identify allies to support its position (mitigation approach) against the traditional technocratic approach. At a local level, the mitigation discourse and actions were strengthened by the development of the River Basin Water Board (EPTB) and water instruments. European discourses and Directives now reinforce the dynamics engaged by local actors.

It can be noted here that **shock events** can be used as a means to justify this inter-municipal involvement. The floods in Nevers in 2003 and 2008 motivated the Agglomeration to set up EGRIAN (Nevers Flood Risk Assessment Study), and the damage caused by the 1994 flood in Nice allowed the *Départementale* Council to obtain funding and create a service to take over from the Low-Var River Syndicate.

### *Local actor coalitions*

The presence of particular actor coalitions supports inter-municipal empowerment. In Le Havre, the association between the various inter-municipal bodies (CODAH and the River Basin Syndicate of Pays de Caux), the observatory (ORMES) and the public grouping (GIP) has created a strong coalition made up of local public actors. In Nice, the coalition is more complex and distinctive: the State and local authorities have joined together in the Var Plain Public Development Organisation (EPA) to move ahead with a shared vision of the Var Plain development. Where they exist, these coalitions **increase the capacity of their members to use the flexibility offered by national laws and regulations, and to develop discourses and tools that derive from the national doctrine**. The Erosion Decree in Le Havre (marine submersion sub-arrangement) and the Rhône Doctrine in Nice allow local actors to create a gap between national laws and their implementation in practice.

**The development of multi-partner financing tools** can be linked to the development of these coalitions. They illustrate a national trend for the sharing of responsibilities, budget reductions and diversification of actions, but they also indicate the degree of coordination of each local coalition by



testing their internal consistency and efficiency. In Nice, for instance, the efficiency of the Action Programme for Flood Prevention (PAPI) will depend on the ability *Départementale* Council to lead the programme and associate the State and local authorities at all levels. The existence of river contracts and State-Region contracting programmes often illustrates an effective level of coordination, while the difficulties involved in building a financial partnership for the PAPI in Nevers show the limitations of collaboration .

### *The impact of urban pressures*

The land pressure context is a determining factor for explaining the involvement of local authorities, especially inter-municipal bodies, and their efforts to oppose this vision and promote their own (see below); in fact, the level of land pressure seems to be directly related to the political appropriation of the flood issue. We claim that where urban pressures are high, as in the Var Valley and to an extent in Le Havre, the flood issue is integrated into development policies and risk becomes a crucial factor to be taken into account in development policies. Conversely, where urban pressures are low, as in Nevers or the Paillon Valley, the flood issue is tackled as an independent issue mostly relating to water management.

In Nevers, a city with low urban pressures, the risk of flooding has pushed the *agglomération* to develop a research programme on technical solutions that focus mainly on the renewal or reinforcement of protection infrastructures. It is on this basis that negotiations with the State have been carried out. In this case, the flood issue remains framed as strictly a “water issue” and a “security problem”. The question of urban planning remains outside the programme, and State doctrine (Flood Risk Prevention Plan - PPRI) is largely implemented in the form of an unquestioned, independent policy. The approach that guides the EGRIAN study is very significant. It is marked by a hydraulic vision, and shows a local appropriation of the flooding issue from a technical point of view. Despite the awareness raised by the study, the development issue is not sufficiently pressing to justify bringing it into the political agenda. The absence of real estate pressures in Nevers (which is characterised by its rural context) goes a long way towards explaining this situation; indeed, there is no pressing need at all to become politically involved in this issue. The flood risk is simply an unaffordable electoral danger, and the preference is to rely on the State’s legitimacy when it comes to prohibiting construction in certain areas, and yet it only has a small impact on urban development strategy, and does not lead to the promotion of the integration of risk into the planning tools, serving only to reinforce and endorse strict controls on building in flood plain areas, as supported by the State.

In Le Havre, the flood problem represents “another” risk over and above the industrial risk. The flood issue interferes with important issues associated with agricultural development and the dynamisation of the city centre. In this regard, the city relies on strong local expertise that challenges the State’s expertise and authority: the skills and good practices that have been capitalised in the industrial risk management sector are transferred to the flood area. The broad consensus on the combination between development projects and risk prevention leads to a diversification of the strategies to be adopted against flooding, which are concentrated in the hands of the Urban Agglomeration Authority.

---

Lastly, in the case of Nice, we have yet another configuration, in which significant urban and economic pressures and high levels of exposure to the risk of flooding in the Var Valley have led local and national actors to design an *ad hoc* master plan that derogates to the national policy in the area of flooding and combines risk and development. In this case, one can speak of the development of a comprehensive local policy that is the product of a broad consensus among local actors and the State.

### ***The Floods Directive as tool for local involvement***

The FD may act as a driver for change, as it aims to:

- give a more central role to local authorities in the development of risk management strategies; and
- reinforce the actors and the basin level (Flood Risk Management Plan - PGRI).

In Le Havre, the FD has been identified as the main trigger for the emergence of the marine submersion issue and its appropriation by the Agglomeration. The Le Havre case shows that implementation of the FD restores State legitimacy (because it is accountable to the EU) without giving it the resources to use it.

Looking more into the future, the EGRIAN Study in Nevers is scheduled to be used as the basis for the drafting of a local strategy. In order to achieve this, local actors may be pressed to complete the first study by transforming it into a more integrated strategy (including such issues as mitigation, environmental aspects and urban development).

## **6.4 Conclusions**

To conclude, flood risk management appears to be in transition, but the process is still in mid-stream.

While the State continues to provide the foundations of the national policy, the capacity of local actors – and in particular urban *agglomérations* – to appropriate the issue has been striking. The case of Nice and Le Havre illustrate the inter-municipal capacity to integrate the risk of flooding to their policy and to use it to develop both their political and technical legitimacy and its capacity. Here, spatial development issues seem to be a necessary condition for motivating political appropriation.



---

## 7. Evaluation of flood risk governance

### 7.1 Introduction

In this chapter we provide a general overview of evaluation of the FRGA in the French context. These conclusive remarks are based on the work done in the previous chapters concerning the evaluation of flood risk governance at national level (chapter 2.5) and then at the level for each case studies (chapters 3.5, 4.5, 5.5).

In order to assess the appropriateness of FRGA in each country, STAR-FLOOD has defined and mobilized some evaluation criteria: resilience, legitimacy and efficiency (for in depth description of each criteria, see WP2, Chapter 5). Resilience is a central criterion and conceptualised in terms of the capacity to resist, respond and recover from a flood event (“buffer capacity”), and the capacity to learn, innovate and improve responses to flood risk (“adaptive capacity”). This cannot be assessed in isolation and considerations of legitimacy and efficiency are also required. In turn, each criterion must satisfy the condition of appropriateness and assessed within the normative, cultural and socio-political context of a place at a given point in time.

In the following session you will find an analysis of each of these criteria regarding the overall French FRGA. Before going into details of each of them three remarks are necessary to frame the specificity of the evaluation process in the French case. First of all not all criteria seem appropriate to evaluate the French FRGA: efficiency, through cost-benefit analysis, is not systematically sought. This is in itself quite a remarkable result compared to other countries of STAR-FLOOD consortium and signifies that the legitimacy of projects and policy programs is built rather on other (political) criteria. Secondly the analysis of the French FGRA has brought us to put in question one of fundamental assumption of the STAR-FLOOD project by arguing that integration of FRMS is not necessary the condition *sine qua non* for the development of societal resilience. Better connections between single FRMs and other urban policy sectors (water management, urban planning, transports system) are rather desirable. Thirdly, a last element concerns the fact the French FRGA is structured and develops on the more or less peaceful and coordinated interaction between the central government and local authorities. This means that the evaluation of the overall FGRA cannot avoid considerations regarding the entanglements among these different levels. It is on this basis that improvements will be provided in chapter 8.

**Table 7.1 Overview of evaluation of Flood Risk Governance Arrangement in France**

	Characteristics of flood risk governance	
RESILIENCE	Enhancing	Constraining
<b>Resistance</b>	<ul style="list-style-type: none"> <li>- Diversification of strategies and measures is noticeable: : long tradition of defence infrastructures, national flood forecasting system, flood zoning system;</li> <li>- Partnership funding ensures the sustainability of measures (less dependent on one single actor).</li> </ul>	<ul style="list-style-type: none"> <li>- Defense domain is still highly fragmented especially in terms of liability and knowledge. The ageing of infrastructures comprises resilience;</li> <li>- Low level of coordination among strategies. The PAPI is more an instrument for coordination of funds than be a bridging tool.</li> </ul>
<b>Buffer capacity</b>	<ul style="list-style-type: none"> <li>- Good capacity of response. Civil security services and tools are considered rather efficient and innovative.</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation and recovery are rather isolated from the others FRMS;</li> <li>- Low level of awareness and involvement of the public;</li> <li>- Climate change still represents a minor issue on the political agenda and in programmatic actions.</li> </ul>
<b>Adaptive capacity</b>	<ul style="list-style-type: none"> <li>- Flood represents a rather lively policy sector: increasing knowledge/technical development, legal production, participation to European and nation research programs, <i>etc.</i>;</li> <li>- High level of technological innovation (forecasting, alerting, etc);</li> <li>- Mitigation strategy in particular appears a rather innovative strategy especially at local level (for instance development of multi-task tools integrating ecological objectives and the reduction of flood risk).</li> </ul>	<ul style="list-style-type: none"> <li>- Innovation seems to be framed in old policy trends and configurations: despite changes, the State still keeps the control of risk planning and little is done for a better integration of risk in urban planning documents;</li> <li>- National legislations in the flood domain is considered hindering innovation;</li> <li>- Limited diversification of actors in the implementation of the strategies: public sector still dominant.</li> </ul>
<b>LEGITIMACY</b>	<ul style="list-style-type: none"> <li>- Some of the pillars of the French FRGA (in particular the insurance solidarity system CAT-NAT and the civil security organisation) are highly institutionalised and legitimised among stakeholders;</li> <li>- Broad involvement of stakeholders in decision-making;</li> <li>- Information is largely provided to the public through different communication networks.</li> </ul>	<ul style="list-style-type: none"> <li>- Low level of public participation: current instruments intervene too late in the decision-making process or have just a consultative impact;</li> <li>- Low level of reflection on the quality and consequences of the information. In particular in these domains: <ul style="list-style-type: none"> <li>• diversification of the information according to the different publics;</li> <li>• how to pass from informing to adapting one’s behavior;</li> <li>• liability aspects (should an informed citizen considered liable for his/her non appropriate behavior?);</li> </ul> </li> <li>- Judicialisation processes displace the flood issue from the political arena to the judicial arena without appropriate political debate on this changing framework;</li> <li>- Transparency on decision-making, resources allocation and negotiation process is not systematically pursued.</li> </ul>
<b>EFFICIENCY</b>	<ul style="list-style-type: none"> <li>- Knowledge resources are increasingly improved and allow more appropriate interventions to prevent and protect from flooding.</li> </ul>	<ul style="list-style-type: none"> <li>- Economic efficiency is hard to evaluate as cost-benefit analysis is not systematically done: project legitimacy sought on political basis rather than on economic efficiency.</li> </ul>

## 7.2 Resilience

As a general rule, the national and local levels do not contribute to resilience in the same way. It could be said that even though the system may be seen as forward-thinking – especially as far as the diversification of strategies is concerned – the fragmentation of actions and a persisting level of centralisation and rigidity of the legal and institutional system represent the main obstacles to a resilient system. At a local level, a certain degree of coordination may be seen as the result of binomial sub-arrangements (defence-prevention, mitigation-defence, *etc.*) and the mobilisation of funding programmes (Action Programmes for Flood Prevention, River Contracts, *etc.*) that favour the development of partnerships among actors from different sectors at a local level.

Concerning the buffer capacity, one may say that the current FRGA provides a good capacity of response especially at local level. This thanks to the civil security services and tools which are considered rather efficient and innovative. In the absence of a recent catastrophe of national magnitude, we are not able to evaluate the buffer capacity in such circumstances.

Both national and local levels contribute to the adaptive capacity. On this point, one may say that the tendency of the national government is to provide legal (MAPAM-GEMAPI, PPRI), programmatic and financial tools which should enable local authorities to put in place appropriate local flood risk policies. At the same time the local level is increasingly able to produce its own expertise and to propose locally tailored solutions.

A further comment relates to a basic assumption of STAR-FLOOD: societal resilience would be better off developing in a context in which FRMs are integrated. In this regard, some stakeholders, such as the European Center for Flood Prevention (CEPRI 2015, source: interview) have questioned whether better societal resilience should not be pursued through an enhanced integration of strategies:

- in France, integration is formally sought neither at a national nor at a local level. The French system is organised into different sectors, and each works rather well. Their independence does not prevent them from working in an efficient manner (the preparation strategy in itself is very efficient, so why we should integrate into others?);
- by attempting to integrate them, there is the risk that their operation may be adversely affected. In other words, the pursuit of integration as a goal in and of itself might complicate matters unnecessarily; and
- in France, the various FRMS have historically developed independently of one another. This is what guarantees their dynamism. Some observers (CEPRI, 2015, source: interview) claim that integration might prejudice this dynamism.

In other words, fragmentation should not be automatically considered to hinder resilience. The basic assumption of STAR-FLOOD should at least be nuanced: integration of strategies should be given a relative weight in the evaluation of FRGA, while other factors, for example the level of interconnectedness with other policies, might be taken into account.

---

## 7.3 Legitimacy

### *Participation*

The participation of the main stakeholders in decision-making at both a national and local level is acknowledged, but it is often limited to actors from the public sector. There are a number of contractual mechanisms that ensure that different interests are represented at all levels of government, in particular in the water sector (such as River Contracts, Local Water Committees – CLEs and Local Water Management Plans - SAGEs).

Private actors may be associated with a particular action programme (as in Nevers, where forms of coordination in the case of emergency have been developed with the electricity companies) but they are not necessarily integrated into the development of interventions. Public action is still dominated by the public sector – whether it be the State or local public authorities – which also represents the main source of legitimacy.

As for public participation, compared with other countries, France has developed specific tools of participatory democracy such as public debate, “*conferences citoyennes*”. Nonetheless, some observers (Fourniau, *et al.*, 2007, Bétaille, 2012) have highlighted their limited impact on public decisions. Sometimes, for example in the case of Nice, negotiations with organisations from civil society (mainly environmental associations) are formally provided for, but in practice they are initiated by promoters in order to reinforce the democratic image of the project. Some observers (Fournier, 2010) have even claimed that whenever the economic impact of a project is high, the possibility that the public may have an impact on the decision-making process is particularly small.

The provision of information on the risk of flooding to the public is a rising area of concern at both a national and local level. It is also a formal obligation of local authorities.

Nonetheless, a number of important issues are still underestimated in implementation of this obligation in all the case studies:

Citizens are encouraged to become “competent” and (to a certain extent) “autonomous” actors, capable of adapting their conduct in the case of an emergency. The passage from “being informed” to “adapting one’s conduct” cannot be taken for granted, however. Little attention is paid to the difference between communication, information and changes in practices and behaviours. Most of the “information work” concentrates on providing the most accurate “technical” information on the risk by using innovative supports (such as smartphones). In addition, there is little diversification of the information according to the type of public receiving it (young people, the elderly, the most at-risk public, tourists, *etc.*).

The second problem concerns the relationship between information and responsibility. The public authorities can be held liable for damage caused by flooding, but the victims’ conduct may exempt the public authorities from responsibility in case of their negligence. In particular, a victim can be held liable base on the information on the risks that has been made available. For example, a Court may find for a “partial liability” of the public authorities if the victims do not check whether their land is exposed to possible flooding from a nearby river. Is it sufficient to inform the public in order to

make it liable in the case of damage caused by flooding? To what extent does the responsabilisation of the public entail de-responsibilisation of the public authorities?

### *Judicialisation: from the political to the judicial arena*

When discussing legitimacy processes, it is necessary to consider the specific role that the law plays in France (and in other countries, too: for example, the U.S. and Canada).

The trend towards a judicialisation of political decision-making processes in France is well known in the literature (Kaluszynski, 2006, Rouvillois, 2008), and indicates the increasing role played by the Courts in the settlement of “public problems”. This phenomenon, which is a constitutive trait of the American system, is fairly new in France, but it is gaining strength. It consists in removing the handling of “public matters” from the political arena to the judicial sphere, which also means making judges an alternative to the social and political authorities (and therefore in competition with the political sphere).

There are various reasons behind this process, such as the differing roles of law and of justice in society and the individualisation of society, and in particular the delegitimisation of the traditional political arena and methods of solving disputes (Kaluszynski, 2006).

While this process affects all policy domains, it is interesting to see how it works in the flood sector. Our hypothesis is as follows. We can see that Courts have an important role to play in the resolution of disputes, especially when it comes to liability and legal compliance (Calderaro, 2001). Local authorities, interest groups and citizens are increasingly going to court to challenge the flood zoning tool (Flood Risk Prevention Plan – PPRI), usually because it is restricting local development projects. The weaknesses of formal negotiation procedures in risk definition and the development of flood plans (upstream of the decision-making process) only leaves judges with the possibility of resolving conflicts (downstream of the decision-making process). In other words, judges assume a political role as *arbitrators* among conflicting interests because these interests cannot identify an opportunity for confrontation or resolution through the traditional channels for political disputes.

In addition, some observers believe that urban projects are not sufficiently negotiated during the development phase, and this is what explains the too-frequent appeals to the Courts.

The case of Nice and the National Interest Operation (OIN) is an exception in this regard. Here, in fact, a coalition of negotiating actors (the State and local actors) has been formed upstream of the negotiation process in order to create a consensus on the Eco-Valley project and to implement all possible actions (such as a revision of the PPRI, the preparation of a PAPI and mobilisation of the Rhone Doctrine) in order to avoid ending up in court. That said, the lack of transparency of this process and the neutralisation of opposition groups has had a powerful effect on the legitimacy of the FGRA in the Var Valley.

## **7.4 Efficiency**

National and local level analysis confirm the difficulty of evaluating the FRGA according to this criteria and this represents the peculiarity of the French context compared to other countries of the consortium: if improvements are sought and achieved in the attainment of knowledge and technical efficiency, the analysis acknowledges that the financial efficiency of flood policy initiatives is not a



driving factors of the FRGA. Cost and benefit analysis is not systematically conducted. The necessity of reinforcing the financial efficiency of policy measures is evoked by stakeholders.

## 7.5 Conclusions

Our evaluation of the national and case study levels reveals a number of common general trends in flood risk governance, including the fragmentation of strategies, a low level of public participation and a legitimacy that is mainly rooted in the public sector.

Nonetheless, some important differences remain. A certain level of coordination among strategies is, in fact, achieved at local level through the strengthening of inter-municipal bodies (not without the support of the State through the PAPI). Even though these authorities have not been entitled to intervene in the flood sector until now<sup>20</sup>, inter-municipal bodies have brought dynamism to the table in each of the three case studies.

Long before the introduction of a "GEMAPI<sup>21</sup> competence" dictated by the State, Nice Metropole, Le Havre and the Nevers Agglomeration had already voluntarily engaged in flood management policies. This new *ante litteram* "flood competence" can be applied through various mechanisms and opportunities: by a strong expertise in flood management that is capable of competing with State services (Le Havre); by the promotion of a study-action programme that places the *agglomération* at the head of a relatively innovative policy (Nevers); or by the integration of flood risk into a master project of national interest for economic and social development (Nice). These initiatives have mainly been developed as a reaction to shock events.

However, an enhanced level of coordination among strategies is not explicitly sought; rather, it might be viewed as a "side effect" of partnership funding mechanisms.

In some cases (Nice and Nevers), development of the local strategy for the implementation of the Floods Directive has meant reinforcing the level of coordination among the plurality of initiatives (especially PAPIs) in the same territory.

Having said this, the initiatives undertaken by inter-municipal bodies in the flood domain cannot be automatically considered as having promoted resilience, especially in terms of the connection of the flood policy with other policies. For example, the effectiveness of consideration of a risk in urban planning is closely connected with the role played by urban pressures in local contexts. Wherever these are high, as in the case of the Var Valley or the Lézarde Basin, the risk becomes a "managing" or "organisational" factor in urban planning. Conversely, wherever these pressures are less significant, as in the case of Nevers and the Paillon Valley, risks and urban planning continue to be separate domains.

---

<sup>20</sup> This situation will change with the introduction of the MAPAM (Modernisation of Territorial Public Action and the Affirmation of the Metropolis) Law, 2014.

<sup>21</sup> Acronym for "Management of the Aquatic Environment and Flood Prevention"

---

## 8. Moving forward – suggestions for strengthening and redesigning flood risk governance in France

The aim of the STAR-FLOOD Project is to provide recommendations and suggestions for improving flood governance in Europe. The aim of the project is to assess the extent to which FRGA encourage the implementation of multiple strategies and their alignment, which are assumed to be pre-conditions for urban resilience to flooding.

In this chapter, we will first offer some conclusions on our overall empirical analysis, starting from the main research questions. We will then go through our analysis of the strengths and weaknesses of FRGA, followed by a presentation of some of the opportunities and barriers for going forward. We will conclude with some suggestions on how to reconfigure flood risk governance in France.

### 8.1 Main outcomes of the FRM analysis in France

First of all, it is worth returning to the fundamental research questions and the main findings of our empirical work. By means of a dual-level study of national and local FRGA, our aim was first of all to assess the extent to which the local level differs from the national level, and in what way the two levels participate in the definition of flood risk governance.

This research objective has specific connotations in the case of France, because the State has been undergoing a major process of decentralisation of missions and responsibilities since the 1980s, and just recently – in 2014 – a “flood competence” has been created under the responsibility of local authorities.

#### *A local definition of the risk: the rising role of agglomerations in the reconfiguration of flood policy and management*

First of all, the local level cannot be considered to be a mere implementation context for the national doctrine. The decentralised organisation of the State leaves enough room for a local appropriation of the flood issue and a certain margin of action (within a framework of growing responsibilities). At the same time, the decentralisation process has not been fully achieved: the State still retains control over crucial missions such as the calculation of risk in flood-prone areas, preparation strategy and recovery. Indeed, these issues are considered to be of national interest, and State intervention would be justified for reasons of solidarity (natural disaster compensation), neutrality (definition of risk) or scale of action (serious crisis management). In some respects, however, we believe that the French tradition of centralisation is counterproductive in terms of resilience and the empowerment of local actors.

While the State still provides the foundations of national policy, the capacity of local actors – and in particular urban agglomerations – to appropriate the issue is striking. This has been achieved through the mobilisation of a variety of tools, and based on a local definition of the problem. If we look at our three cases more closely, we see that long before the formal attribution of local responsibility in the flood domain, each urban agglomeration had already taken the lead in action programmes in the area. In this regard, the differences in their approaches are worth noting; they depend not only on

the type and level of risk, but also on other factors such as urban development. Locally, this last factor plays a crucial role in the definition of the flood problem and frames the power relationship between the State services and the local authorities. The level of involvement varies significantly from one territory to another, however.

It seems that local authorities – especially powerful municipalities and inter-municipalities – create new forms of local governance to challenge State routines and use FRM as an opportunity to affirm themselves as competent, legitimate and powerful actors for public action.

### *The reconfiguration of flooding as an urban issue*

The flood issue is being increasingly defined as an urban matter – and the responsibility of cities – while water actors, although still involved, are less frequently in the forefront, but play an important role in peri-urban and rural areas. Water actors such as Water Boards are not the competent actors as regards flooding issues, which hinders the opportunity to apply a flood approach at a basin level (and thereby to solve the issue of solidarity both upstream and downstream). It is the urban level, and not the basin level, that has become the legitimate flood risk management framework, and when considering flood risk governance in France, it is important to bear this progressive “urbanisation” of the flood issue in mind. It is an effect of the decentralisation process, which attributes a central position to urban agglomerations in the administrative landscape. This process has important consequences in terms of resilience; it is at the urban level, in fact, that an enhanced integrated approach to flooding is acknowledged compared to the national level.

That said, as we have shown, the integration of strategies at the urban level cannot be taken for granted, and is not even sought most of the time. Rather, it is a result of funding mechanisms, the proximity of policy sectors within the city administration (urban planning, the Mayors’ police power, the management of protection infrastructures and mitigation initiatives) and lastly, of the affirmation of cities as a pivot of local governance.

Through our analysis of the case studies we have seen here that the urban level permits another type of integration: the city government may allow the necessary integration of the flood issue with other relevant urban policies such as sewage, transport, urban planning, waste and health. As we have argued in the previous chapter, this form of integration may be the most valuable for the development of flood resilience in urban agglomerations (compared to that connecting the various FRMS).

Lastly, while urbanisation of flood policy has undoubted benefits in relation to an enhanced integrated approach, some crucial issues in the flood domain may go beyond the area of competence of cities, and therefore remain untouched; solidarity upstream and downstream is a typical example of where an upper level of flood risk management – namely the basin level – is still needed.

## 8.2 Identifying the strengths and limitations of current flood risk governance sub-arrangements

In this section, we identify the strengths and weaknesses of each sub-arrangement (where each sub-arrangement corresponds to a strategy). Here, we will focus on the prominent aspects worthy of mention.

### 8.2.1 Strengths

The French FRGA enables society to face the risk of flooding. In France, flood risk is regarded as a real public issue for which public actors are involved at multiple levels. While FRM was traditionally considered from a technical perspective, it has gradually become a social and political issue. Within the French FRGA, the strong legitimacy of public actors is recognised by private stakeholder. The following three aspects show more precisely the forces of French FRGA.

#### *Strength of the compensation system*

The Natural Disaster Scheme “CAT-NAT” is the core of the French recovery strategy. It is based on a constitutional principle (national solidarity and equality), and is therefore extremely stable. In terms of efficiency, the compensation regime is very powerful and ensures a high level of solidarity between citizens and territories, but the sustainability of a system such as this in the event of major disasters remains unpredictable. The level of legitimacy of the system is also high, but critics have pointed out that it might not encourage the development of risk awareness and active prevention.

In order to allow this system to remain a strong cornerstone of the entire flood risk policy, evolutions such as those proposed to Parliament in the reform project should be examined further.

#### *Strength of planning: a tradition of prevention*

France has a long tradition of flood plain preservation that can be linked to its low-density context (urban development is possible outside the floodplain). The first intervention dates back to 1935, with the creation of the submersible surface plans, which were renewed in 1982 and strengthened in 1995 with the Risk Prevention Plans (PPR). The objective here has always been to achieve administrative controls of land use in floodplain areas, and yet it is possible to conclude that these controls were insufficient for a long period and can still prove difficult to enforce due to the fragmentation of public action (a large number of very small municipalities, and problems experienced by State services to impose controls).

From a legal perspective, the value of planning lies in the temporal and spatial dimension of the flood management rules. From a temporal perspective, the plans have an anticipatory function, while from a spatial perspective, the rules can be clarified and adapted to local territories while still preserving the general guidelines. In a legal sense, the rules in the plans are expected to be stable and adaptive.

#### *Strength of preparation*

The preparation sub-arrangement is highly autonomous (at both a national and local level), due to its particular history and development, linked to civil security, with the specificity that it must be multi-risk. In this regard, we note the traditional role played by the State in guaranteeing national security.

This important mission of the State is considered to be efficient and capable of effective coordination of personnel and resources.

The subsidiarity principle, according to which local authorities are determined to be best positioned to manage crises that occur at their scale, while the State only deals with crises that go beyond the local scale, can also be viewed as a strength. At the local level, the mission of civil security is shared between Prefects (as a representative of the State) and Mayors, depending on the level of the emergency. The coordination of these two actors is considered to be reasonably efficient.

### 8.2.2 Limitations

The resilience of the French FRGA is significantly reduced by several limitations. Although local authorities are gradually involved in FRM, decentralisation in France is still in midstream. This leads to overly complex relationships between public authorities which result in inefficiency or wait-and-see attitudes. In addition, FRMSs suffer from a lack of coordination which prevents the implementation of consistent policies. Finally, in particular, the lack of information on the defence system makes the FRGA less resilient.

#### *An unaccomplished decentralisation: uncertain roles and powers.*

The Flood Prevention Plans (PPRIs) are dedicated to flood risk, but they are also totally disconnected from local planning. Through these plans, the State imposes public easements (such as building restrictions) on local authorities, while the local authorities are responsible for local planning (for example, building permits). The main problem we have identified here is that municipalities do not feel responsible (or liable) for flood prevention although they are the primary public authorities at the local level. Urban planning and flood prevention are clearly separated, and this can lead to inconsistent policies. The Flood Risk Prevention Plan (PPRI) is therefore questionable in terms of efficiency (is the PPRI's level of action appropriate?), effectiveness (is the PPRI locally implemented?) and legitimacy (does the State have the right to manage flood risks at a local level?).

The current system is still based on the concept that the State is ultimately the only guarantor of public safety and that local authorities are short-sighted and only represent specific or particular interests. The result is that local authorities do not feel that they have responsibility for risk planning, and therefore no integration between urban and risk planning documents is triggered. We observed two types of cases. On the one hand, in cases where land pressure is strong (for example in the Var Valley in Nice and in Le Havre), significant negotiations take place between the State and the municipalities. Indeed, the law leaves a certain amount of discretion, and allows (and sometimes requires) dialogue between the State and municipalities, which generates trading. This leads to questionable situations, however, in which municipalities can develop in flood-prone areas while denying their political (unpopular building restrictions) and legal (limited liability in the event of a wrong decision) accountability. On the other hand, in cases where land pressure is low (in Nevers) or where further urbanisation is no more possible (in the Paillon Valley), municipalities tend not to become involved in flood prevention; only the State is active, and it therefore imposes the PPRI directly at a local level, without the involvement of the authorities responsible for land planning (the municipalities). This maintains complete separation between risk management and urban planning,

and under these conditions the local authorities are totally disempowered, because there is nothing to impel them to think of planning and flood prevention at the same time.

### ***Weak coordination between FRMSs: the heterogeneity of the French FRGA***

The links between prevention and recovery are largely missing. The challenge of the Natural Disaster Scheme CAT-NAT is to strengthen the links between compensation and prevention in the field. Indeed, it is very striking that compensation measures have consistently been absent from our case study analysis at a local level. Compensation data is an element that should be taken much more into account in local public flood management policies in order to create improved links with local prevention policies. In this regard, public authorities are also facing difficulties in obtaining accurate data on losses and their localisation, as insurance companies do not wish to communicate strategic elements concerning profits and losses for their own account.

In practice, as we have explained previously, some legal bridging mechanisms have been introduced in order to make compensation conditional on compliance and the completion of prevention works, and yet it appears that these mechanisms are difficult to implement, not only from a political standpoint and economic viewpoint (as well as for insurers, who tend to think that it is not up to them to punish their clients for the purposes of public image), but also from a practical one, as it is hard to check whether and when works have been carried out).

Finally, the overall lack of transparency is problematic. It is difficult to say if the system is particularly expensive because the data that would allow a comparison with other countries are missing. We can, however, at least point out that costs are not visible because of the unique contribution imposed by insurance contracts as well as the benefits realised by insurers.

Regarding mitigation, there is a lack of cohesiveness and visibility. Mitigation does not actually represent a sub-arrangement in and of itself: it works more as a bridging process between the four other strategies. It is more a question of heterogeneous measures, from reducing the vulnerability of housing to actions falling under the “making room for water” principle (managed retreat, dynamic flood retention basins and the so-called “horizontal” measures (to distinguish them from “vertical” ones), namely dams and dikes). The main features of this domain are a lack of a strategic and cohesive programme and specific legal and technical requirements, which are left to local initiatives. For this reason, the strategy is affected by a lack of cohesiveness and visibility compared with other, more “centralised” strategies.

While the “isolated” nature of the preparation strategy has allowed the development of a cohesive and professional civil security organisation, coordination with other strategies is still needed in order to develop a more comprehensive approach to flood management. Prevention and crisis management in particular are still too separate: a gap exists both at a national level (in the definition of policies at the level of the Joint Flood Commission, for example) and at a local level. The case of Nice confirms this “rule”, although a certain alignment of the two strategies has begun to appear at the practice level with the development of specific rescue protocols for activities developed in flood-prone areas. In addition, preparation tends to focus on population rescue and leaves other aspects, such as network vulnerability, on the sidelines. A capacity for maintaining continuity of service during

a flood event and for recovery still needs to be developed (as shown by Gralepois, 2010 and confirmed by the most recent floods in Nevers).

Another limitation of the preparation strategy relates to the role that can be played by private citizens. Although they are now considered to be responsible for their own safety (Law, 2004), it is not yet clear what exactly is expected of them during and after a crisis, and what the legal consequences of their new responsibilities are. For example, in certain cases, the public authorities' liability may be reduced where the inhabitants can be found to have been sufficiently well-informed to avoid the risk. For the moment, however, all this is left to the Courts and does not make the object of a political debate and positioning.

### ***Lack of knowledge in the defence sub-arrangement***

The defence sub-arrangement is mostly composed of infrastructures of all sorts, sizes and uses. This has been inherited from a heavy network system, which can be considered to be both a strength and a weakness. As a whole, the defence sub-arrangement can be defined by its heterogeneity, mostly due to the fact that both owners and managers are numerous, and sometimes unknown. "Orphan dikes" are a problem due to the lack of legal liability in the event of failure. Even more problematic, however, is the general lack of technical knowledge on these infrastructures. Hence, the efforts being made to improve knowledge of the existing flood infrastructure represent an important step towards a better understanding of defence strategy. For now, a clear view of the whole network of French flood infrastructures, as regards classification and maintenance obligations, is still lacking.

In addition, the benefit of this network compared to its cost remains difficult to evaluate properly. Even though new projects include a cost-benefit analysis, we have very few studies available to determine the condition of existing infrastructures. The new legislation imposing cost-benefit analyses for infrastructures costing over €2,000,000 supports the development of expertise in this domain. This is even more important if we take account of the budget shortfalls that public authorities are facing at all levels. Locally, maintenance of the defence infrastructure has a heavy cost. An increase in the responsibility of local authorities in this domain will make improved cooperation between central and local services even more necessary, in terms of both co-funding and expertise and management.

## **8.3 Opportunities for progress, and the barriers that hinder it**

The opportunities and barriers are numerous, but we have selected some that are specific to France but can also be linked to tendencies that are shared with other countries. We should note also that it can be hard to isolate opportunities and barriers from each other: some opportunities also contain some kind of barrier.

### **8.3.1 The Action Programmes for Flood Prevention (PAPI): the potential and limitations of this integration tool**

#### ***Opportunities***

Action Programmes for Flood Prevention (PAPIs) have become fairly widespread since they were created in 2002 (95 have been approved as of 2015), but they do not share the same qualities in

terms of implementation or efficiency. What can be said after more or less ten years of implementation: are they actually "good practices"?

This instrument provides an opportunity in that it reconfigures flood policy in three main directions:

- it integrates all FRMS into a single provision, thereby attempting to overcome the traditional fragmentation of strategies;
- it is the result of a co-development process among all local actors engaged in the flood domain and the State (which may also trigger new forms of cooperation);
- it is based on partnership funding, which allows a better balance and sustainability of investments. It represents a solution to public funding cuts.

### *Barriers*

The implementation of this provision has seen the emergence of certain limitations to the aforementioned objectives.

First, PAPIs seem in practice to fail to overcome fragmentation of action. The first thing to be pointed out is that they tend to operate through a multiplicity of measures organised on several axes (that can be classified into our own five FRMS). These axes of measures are not thought out in a coordinated manner; they are more a collection of different measures with no direct connections. The first step in PAPI methodology might be to seek a higher degree of integration among these various axes.

Second, despite the stated objective of strategy diversification, defence still prevails, and some PAPIs even appear to be a mere alibi for funding dike maintenance. It is difficult to consider them as a means of reducing protection path dependency.

Finally, PAPIs reveal certain limitations due to the fact that they are generally contracted and implemented within a tight schedule (corresponding to political mandates and administrative obligations such as implementation of the FD) or budget cost reduction obligations. The quality of PAPIs is highly dependent on whether the preparatory studies have had enough time and money available to fully understand local configurations and make the connections among all the elements at stake, which include environmental issues, infrastructure impact studies, local planning and cost-benefit analysis. Our case studies have shown that taking several years to complete preparatory studies – five or ten, instead of one – can sometime be very detrimental to long-term solutions. Moreover, the longer the initial studies last, the more long-term the solutions (although this obviously does not apply automatically). Most actors then pledge for more time.

### **8.3.2 Decentralisation and the assertiveness of agglomerations**

#### *Opportunities*

The second opportunity that is highly specific to the French institutional context is the newly-created competence on the "management of the aquatic environment and flood prevention" ("GEMAPI"). The definition of this competence, which is the domain of (inter-)municipalities, is a concrete step towards further decentralisation in the water and flood areas (in an effort to clarify the distribution of responsibilities, it clearly places inter-municipalities in charge). This may offer a great opportunity



for local actors to obtain a better grasp of flooding issues, and confirms the global tendency towards the rise of urban agglomerations in flood risk management.

Implementing decentralisation consists in seeking a progressive integration of a balance between issues of public interest – such as public security – and the need to leave some margin of action, economic development for instance, to local contexts. Opportunities can also be seen in the increasing collaboration between the State services and local authorities, which becomes even more necessary if one considers that by retaining the ability to influence local decisions despite decentralisation, the State ensures a certain degree of quality of flood management measures and projects.

### *Barriers*

At the same time, there are barriers associated with this mission.

1. Although some local authorities have the capacity to implement this new competence easily enough through their technical services, which are already working on these issues, some territories will not have the same ability. The risk is that there are very different and unequal capacities to manage this new competence. This might be particularly the case for small *Communes*, which could be severely affected by a lack of financial, knowledge and human resources to assume this new competence and responsibility.
2. Uncertainties regarding funding still remain: although a new tax has been associated with this reform, it is not clear yet if it will be sufficient to implement the “GEMAPI competence” fully.
3. The transfer of competences imposed by the recent MAPAM law may lead to competition between inter-municipalities and River Basin Water Boards. By handing over competence for flood risk management to the (inter-)municipal level, the law may counteract or deny historical institutions developed at the basin level (like River Basin Water Board – EPTB – and River syndicates). Indeed, large inter-municipalities with sufficient resources to deal with flood risk management may retain their competence, whereas smaller ones might transfer it to River Basin Water Boards. Besides, public actors involved in river basin Water Boards like *Conseils Départementals*, which often took the lead, might withdraw their involvement in flood risk management.

Finally, decentralisation can at one and the same time as be considered to be both the main opportunity and the most problematic issue in terms of improving flood management. The French State is in midstream, oscillating between its duty to ensure the safety of French citizens, as a remnant of its traditional responsibilities, and a tendency to devolve more and more competences to local authorities, mostly to relieve pressure on public expenditure. While some competences are transferred to the local level, therefore, the State still keeps an eye on what the local authorities are doing, in a semi-trust-based relationship. Once again, although the State has unburdened itself of several competences, its services at a local level still work on controlling what the local authorities are doing.

### **8.3.3 Mitigation as an opportunity**

According to the STAR-FLOOD definition of resilience, despite the low level of institutionalisation of mitigation, it can be evaluated very positively as a step towards increased coordination between sub-arrangements and policies. Looking into mitigation is a whole new way of understanding floods, but it still requires more research on the different mitigation solutions. Mitigation should be looked at as a starting-point for motivating new studies comparing flood issues, with pragmatic work to be carried on cost-benefit analysis in various scenarios, such as dikes, making room for water with retention basins within protected areas, dams or houses on stilts. Budget restrictions may encourage alternatives to structural solutions. In this regard, increasing attention and research is being dedicated to multi-functional solutions that combine, for example, reductions in vulnerability to flooding, the drainage of run-offs and the development of biodiversity.

### **8.3.4 Other potential barriers and opportunities**

As we have mentioned in the previous chapter, some observers claim that the integration of strategies – the STAR-FLOOD postulate – does not necessarily represent an essential precondition for making societies more resilient to flooding. According to European Center for Flood Prevention (CEPRI), for example, the fragmentation of strategies and competition among actors and policy sectors in France may represent an opportunity for triggering dynamism and innovation in the flood domain.

Furthermore, among the barriers to the determination of a long-term view of this area, two further elements are worthy of mention. Firstly, there is the absence of major disasters with a national impact: this is undoubtedly an opportunity, but at the same time it does not encourage the maintenance of this issue on the political agenda, and hinders learning processes. Secondly, a further barrier may be represented by the Flood Directive itself. The high level of formalisation – with attention being focused only on High Flooding Risk Areas (TRI) - and the time schedule for local implementation may prevent local actors from treating it as an opportunity for developing a consistent, long-term policy programme to combat flooding. Consequently, public authorities (State and local authorities) are focusing more on implementing the Directive on schedule rather than taking significant initiatives in terms of flood management. Even if the French government participated to initiate and promote the Floods directive at European level, its implementation is producing formal obligations to public authorities to comply with which prevent for a more flexible approach.

## **8.4 Recommendations for strengthening and redesigning flood risk governance in France**

Our recommendations and suggestions are based upon the French context as it exists today, and seek to raise some aspects that might be improved.

### **8.4.1 Going further with decentralisation: strengthening integration of spatial planning and FRM by making risk planning a local competence**

By giving more risk management powers to local authorities, the “GEMAPI competence” offers a first legal step in the evolution of flood policy as a local matter to be managed locally. Nonetheless, in order to design an effective and efficient local flood policy, local authorities would be more efficient

if they had all the resources, power and responsibilities necessary to fully take up the challenge. In particular, to complete the work started by GEMAPI, we believe that responsibility for risk planning is an essential precondition for establishing the connection between risk planning and urban planning, and therefore for fully integrating risk into development projects.

To overcome the weaknesses associated with the lack of connection between risk planning and land planning, it would be sensible to continue decentralisation of flood risk planning, and at the same time to truly empower local authorities, that is: keeping these authorities politically and legally responsible for the consequences of failures in flood prevention. In this regard, our recommendation is to devolve competence for the development of Flood Risk Prevention Plans (PPRIs) to urban agglomerations, and to make them compulsory.

This might be achieved by turning PPRIs into local planning documents drafted and implemented by local authorities themselves, while leaving the State with a technical support and final validation role. By so doing, flood prevention would be better integrated into local planning. We believe that the local level is technically more appropriate and democratically more legitimate. This is a pragmatic point of view as well, because decentralisation of the PPRI competence seems to be more in line with the current French situation, that is: the economic disengagement of the State and the progress of decentralisation in other areas. If municipalities were strictly accountable for their decisions on flood prevention, they would be deterred to favor economic development over flood prevention.

On this assumption, municipalities would be required to adopt a PPRI. It would be advisable that this obligation is hierarchically imposed by the State in order to conform to the decentralised powers of municipalities; instead, municipalities would be more efficiently pushed to become active through the following incentive mechanism: urbanisation (or further extensions of it) would be subject to development of a PPRI, which must comply with certain pre-defined legal standards. The State would still play an important control role in this new configuration by certifying and validating PPRIs, which would preserve national interest in flood policy. However, it would be more efficient for local action the the State intervenes at the end of the risk planning process and not throughout the process, as is currently the case. The State services could also offer important technical support to small urban agglomerations in the definition of flood zoning.

The advantage of this system is that the State would not be an external, higher authority; instead, it would control *ex post* by challenging the legality of municipal PPRIs before the courts where necessary. With full competence for flood management and urban planning, municipalities would be completely responsible for their decisions. This would allow improved adaptation of the PPRI to local needs and perspectives, while at the same time encouraging local authorities to take risk into account in their development projects by making them responsible for risk planning. In addition, it would also be possible to reduce their rights to compensation if they do not satisfy their obligations.

Another solution for encouraging local authorities to take risk into account might be to make reimbursement for flood damage contingent on the effective implementation of a PPRI. This would naturally be a more severe incentive to act on flood prevention and should therefore be subject to a wide-ranging, critical political debate on the evolution of the current flood policy.

#### **8.4.2 Improvements in private citizen participation and agency**

A second issue is the involvement of private citizens in flood management policy. In fact, citizens are already considered to be primary actors with reference to their own safety. Nonetheless, they can only be key actors if participation is sought more than it is today, or more effectively; until now, public participation has been practically non-existent. In addition, participation cannot be limited merely to public information. What is still lacking is a clear reflection on the role that citizens should play. There is currently too much confusion regarding the borders between making citizens competent actors in flood risk management on the one hand and making them responsible on the other. More than promoting participation as an unquestioned (democratic) value, it should be made clear why citizens should be involved, under what circumstances, and how, what the (political, judicial and economic) limits of citizens' involvement are, whether participation is always "a good thing", and how the role of citizens is constructed in relation to other public actors. This debate was raised during the STAR-FLOOD national Workshop in France. The actors involved in FRM who attend the workshop have discussed the link between participation and responsibility. However, they do not seem ready to make that connection in their flood risk practices.

#### **8.4.3 Using the local strategies introduced by the Floods Directive as a first step**

##### ***To enhance State and local collaboration in FRM***

Local strategies present an exceptional opportunity for overcoming the traditional opposition between the State and local authorities through a top-down or bottom-up approach. Through a constructive, circular approach, the Local Strategy for Flood Risk Management (SLGRI) can be an important element for driving forward improvements in terms of planning and creating real collaboration between the State and local levels in order to ensure consistent and equal implementation.

#### **8.4.4 A number of further elements have emerged from our analysis, and might be of value from a comparative perspective.**

The European Floods Directive does not match local implementation capacities and requirements

A significant gap has emerged between the requirements of the European Directive and its local implementation. As the European Centre for Flood Prevention (CEPRI) claims (2015, source: interview), the capacity of local contexts to implement the European requirements has been underestimated, and local actors need more time to adapt to and appropriate them.

In some cases, as in Le Havre and Nevers, it is clear that the local strategy will be developed on already existing tools. The agenda for transposition of the Directive is sometimes counterproductive in terms of national strategy. Starting out from the maps of High Flooding Risk Areas (TRI), carrying out the Flood Risk Management Plan (PGRI) and returning to the TRI through the Local Strategy for Flood Risk Management (SLGRI) is not a clear route, and has not been thought through in an interactive manner. Sometimes, pressure from the EU Commission forces the local level to respond very mechanically, without leaving sufficient time or space for more proactive processes. In other cases, local actors find that the European mapping is of no interest, as the mapping required is on too large a scale.

---

Our case-study analysis also raises some broader considerations on the STAR-FLOOD's basic assumption that urban areas and regions that are vulnerable to flooding will be more resilient if multiple Flood Risk Management Strategies are implemented simultaneously and aligned. Our analysis suggests that the critical element for enhancing resilience is not to be found in the integration of the various FRMS; rather, the main problem with resilience is the extent to which the flood issue can be integrated with other policies (*e.g.* spatial planning). Indeed, FRM cannot be disconnected from other local dynamics.

To what extent is the normative, political and technical flood management system adequate to integrate the flood issue into the various local policies and dynamics? In France, the traditionally centralised FRM policy was not conceived in a pro-active or performing manner. As currently structured, the zoning system mainly represents a tool for constraints, and is the battlefield on which the national and local levels face each other. In all our case studies, the Flood Risk Prevention Plan (PPRI) represents an obligatory passage point through which local actors must create margins of flexibility in order to adapt the flood issue to their particular situations. In some cases, it is found to be too constraining, and so efforts are made to soften its effects and make urbanisation possible (Var Valley in Nice and Le Havre). In other cases, where urban pressures are low, the PPRI's life is independent from local planning documents (Paillons Valley in Nice and Nevers). In these contexts, the main question is how to satisfy the formal requirements of the rules (PPRI), while the flood problem is also treated in the framework of other locally-tailored tools (such as river contracts or other action programmes).

## References

### General references

- Allard, P., 'Le rôle des ingénieurs des Ponts et Chaussées au XIX<sup>ème</sup> siècle dans la gestion des crises environnementales' in Beck, C., Luginbuhl, Y. and Muxart, T., (ed.), *Temps et espaces des crises de l'environnement*, Versailles, Editions Quae/Cemagref, 2006, pp. 249-260.
- Arts, B., Leroy, P., and Van Tatenhove, J., 'Political modernisation and policy arrangements: A framework for understanding environmental policy change', in *Public Organisations*, Rev. 6., 2006, pp. 93-106.
- Bayet, C., *Riverains inondables et défenseurs de l'environnement. Mobilisations et contestations associatives dans le domaine de la prévention des inondations*, Paris, CEVIPOF, 2005. <http://www.ladocumentationfrancaise.fr/rapports-publics/054000579/index.shtml>
- Borraz, O., *Les politiques du risque*, Paris, Les Presses de Sciences Po, 2008.
- Blatrix, C., Blondiaux, L., Fourniau, J.-M., Lefevre, R. and Revel M., *Le débat public : une expérience française de démocratie participative*, Paris, La Découverte « Recherches », 2007.
- Le Bourhis, JP., 'Du savoir cartographique au pouvoir bureaucratique. Les cartes des zones inondables dans la politique des risques (1970-2000)', *Genèses*, vol. 3, no. 68, 2007, pp. 75-96.
- Le Bourhis, J.-P. and Bayet C., *Écrire le risque. Cartographie du danger et transformations de l'action publique dans la prévention des inondations*, Rapport CNRS/Ministère de l'Écologie et du Développement Durable, 2002.
- Braud, F. 'L'éventualité de la responsabilité pénale', *L'actualité juridique, droit administratif (AJDA)*, 2012, pp. 1342-1344.
- Cartier S., Entre recours à l'état et recours au marché, principes de solidarité face au risque de ruissellement érosif en pays de Caux, PhD Thesis, University Paris X, 1999.
- Cartier, S. (a), 'Ruissellement érosif : prévention des risques ou des conflits?', *Natures Sciences Sociétés*, Vol. 10, no. 3, 2002, pp.48-53.
- Cartier, S. (b), *Chronique d'un déluge annoncé. Crise de la solidarité face aux risques naturels*, Grasset, Paris, 2002.
- Chiappero D., Patrimoine ligérien et développement urbain, définition et nouvelles pratiques d'aménagement, PhD Thesis, University of Tours, France, 1996.
- Coeur, D., 'Aux origines du concept moderne de risque naturel en France. Le cas des inondations fluviales (XVIII<sup>ème</sup> – XIX<sup>ème</sup> siècles)', in Favier, R., Granet-Abisset, A.-M., *Histoire et mémoire des risques naturels*, Grenoble, MSH-Alpes, 2001, pp. 117-137.
- Czarniawska, B., *Organising in the face of Risk and Threat*, Cheltenham, Edward Elgar, 2009.
- Decrop, G., and Galland, J.-P., *Prévenir les risques : de quoi les experts sont-ils responsables ?*, Paris, L'Aube, 1998.
- Dourlens C., (2003), *La question des inondations. Le prisme des sciences sociales*, Ministère de l'Équipement, Paris, DRAST, CERPE, 2003.
- Doussin, N., Mise en œuvre locale d'une stratégie globale de prévention du risque d'inondation : le cas de la Loire moyenne, PHD Thesis, University of Cergy Pontoise, France, 2009.
- Douvinet, J. et al., 'Les maires face aux plans de prévention du risque inondation (PPRI)', *L'Espace géographique*, Vol. 1, no. 40, 2011, pp. 31-46.
- Favier, R., *Les pouvoirs publics face aux risques naturels dans l'histoire*, Grenoble, MSH- Alpes, 2002.
- Favier, R., 'Sociétés urbaines et culture du risque. Les inondations dans la France d'ancien régime', Conference, *Catastrophe et santé. La perception du risque entre histoire et actualité*, 2005, Genève, 27- 29 janvier 2005.
- Favier, R. and C., Pfister C., *Solidarité et assurance. Les sociétés européennes face aux catastrophes (17<sup>è</sup>-21<sup>è</sup>s.)*, Grenoble, MSH-Alpes, 2007.

- Fournier, M., *Le riverain introuvable ! La gestion du risque d'inondation au défi d'une mise en perspective diachronique : une analyse menée à partir de l'exemple de la Loire*, PhD Thesis, University François Rabelais, Tours, 2010.
- Gaudin, J-P., 'Submersion, subversion : les crues de la Loire au XIXème siècle, ou les incertitudes de l'évidence technique', in *Deuxième journée d'étude techniques et sociétés (30 mars 1979)*, Publication de l'École Nationale des TPE, numéro 4, pp. 129-134.
- Giddens, A., *The Constitution of Society: Outline of the Theory of Structuration*, Cambridge, Polity Press, 1984.
- Gralepois, M., *Les risques collectifs dans les agglomérations françaises. Contours et limites d'une approche territoriale à travers le parcours des agents administratifs locaux*, PhD Thesis, University Paris-Est, Paris, 2008.
- Gralepois M., 'L'agglomération à flux tendus. La politique de sécurité civile française au secours des pannes urbaines', *Flux*, vol. 3, no. 81, 2010, pp. 57-66.
- Gralepois, M., *Face aux risques d'inondation*, Paris, Éditions d'ULM, 2012.
- Hague, J.P., *Les eaux courantes et l'Etat en France (1789-1919). Du contrôle institutionnel à la fétichisation marchande*, Paris, Ecole des Hautes Etudes en Sciences Sociales, 1998.
- Hajer, M.A., 'Coalitions, practices and meaning in environmental politics: from acid rain to BSE', in D.R. Howarth and J. Torfing (eds.), *Discourse theory in European politics*, London, Palgrave, 2005, pp. 297-315.
- Hajer, M. and W. Versteeg, 'A decade of discourse analysis of environmental politics: achievements, challenges, perspectives', *Journal of Environmental Policy & Planning*, 7 (3), 2005, pp. 175-184.
- Hegger, D., Driessen, P., Dieperink, C., Wiering, M., Raadgever, T. and Van Rijswick, M., 'Assessing stability and dynamics in flood risk governance', *Water Resources Management*, vol. 24, 2014, pp. 4127-4142.
- Hubert, G. and Pottier, N., 'L'évaluation de la politique réglementaire', in Laganier, R., *Territoires, inondation et figures du risque – La prévention au prisme de l'évaluation*, Paris, L'Harmattan, 2006.
- Hubert, G. and Reliant, C., 'Cartographie réglementaire du risque d'inondation : décision autoritaire ou négociée ?', *Annales des Ponts et Chaussées*, no. 105, 2003, pp. 24- 31.
- Ifop, Agences de l'eau, Rapport national – Baromètre national d'opinion, 2011.*
- Kaluszynski, M., 'La judiciarisation de la société et du politique', *Colloque RIAD - Association Internationale de l'Assurance de Protection Juridique*, Paris, 21-22/09/2006.
- Kessler, D., and Vandier, J. 'Catastrophes naturelles et précaution', *Risques. Les cahiers de l'assurance*, no.20, 1994, pp.79-87.
- Kingdon J., *Agendas, alternatives, and public policies*, New York, Harper Collins, 1984.
- De Lampedusa T., *Le guépard*, Paris, Seuil Paris, 1959.
- Ledoux, B., *La gestion du risque d'inondation*, Paris, Lavoisier, 2006.
- Madaoui, L., 'Gestion des milieux aquatiques: la compétence dont le bloc local ne veut pas', in *La gazette des communes*, 9 December 2015, <http://www.lagazettedescommunes.com/210599/gestion-des-milieux-aquatiques-et-prevention-des-inondations-la-competence-dont-le-bloc-local-ne-veut-pas/> (accessed 7 July 2015)
- Martin, B., Ansel, R., Guerrouah, O., and With, L., 'Territorialisation ou déterritorialisation du risque ? Analyse comparative et critique de la procédure de réalisation des PPRNP', *Riseo : risques études et observations*, 2010, <http://www.riseo.fr/-Revue-1-#page29> (accessed 7 July 2015)
- Martinais, E., 'Les fondamentaux de la prévention des risques industriels. L'inspection des installations classées, la réglementation française et ses évolutions récentes : quelle place pour les 'nouveaux' acteurs ?', *Proceedings of the Seminar Les enjeux d'une gestion territorialisée des risques technologiques*, PUCA, RIVES, ENTPE, 30 Novembre 2007, p.37.
- Mercier, D., 'Après Xynthia : vers un repli stratégique et un État fort ?', *Noroi*, vol. 1, no. 222, 2012.

- Picon, A., *L'invention de l'ingénieur moderne : l'École des Ponts et Chaussées 1747-1851*, Paris, Presse de Presses de l'École nationale des Ponts et chaussées, 1991.
- Picon, B., and Allard, P., 'Les inondations du Rhône aval de 1856, 1993, 1994, 2003 et leurs répercussions sociétales', *La Houille Blanche*, no. 2, 2007, pp. 52-57.
- Pietri A., *Le Paillon – Torrent de Nice*, PHD Thesis, University of Aix-Marseille, 1954.
- Pigeon, P., 'Les Plans de Prévention des Risques (PPR) : essai d'interprétation géographique', *Géocarrefour*, vol. 82, no. 1, 2007.
- Pottier, N., Reliant, C., Hubert, G. and Veyret, Y., 'Les plans de prévention des risques naturels à l'épreuve du temps : prouesses et déboires d'une procédure réglementaire', *Annales des Ponts et Chaussées*, no. 105, 2003, pp. 40-48.
- Pustelnik, G., 'Les établissements publics territoriaux de bassin, pivots de l'action territoriale pour une gestion équilibrée de l'eau et des milieux aquatiques à l'échelle des bassins versants : Premiers retours d'expérience', *Revue des sciences de l'eau*, vol. 21, no. 2, 2008, pp. 199-218.
- Reghezza-Zitt M., and Sanseverino-Godfrin V., 'Aménagement durable des territoires soumis à de fortes contraintes : enjeux et perspectives à travers l'examen des outils juridiques. L'exemple de la basse vallée du Var (06)', *Annales de géographie*, vol. 3, no. 685, 2012 p. 242-265.
- Renard, B. et al., Evolution des extrêmes hydrométriques en France à partir de données observées. *La houille blanche*, vol. 6, 2006 p. 48 – 54 [<http://cemadoc.cemagref.fr/cemoa/PUB00019269>]
- Rode, S., *Au risque du fleuve. La territorialisation de la politique de prévention du risque d'inondation en Loire moyenne*, PhD Thesis, University of Nanterre, Paris X, 2009.
- Rosanvallon, P., *Le modèle politique français. La société civile contre le jacobinisme de 1789 à nos jours*, Paris, Seuil, 2004.
- Rouvillois, F., (ed.), *La société au risque de la judiciarisation*, Paris, Lexisnexis, 2008.
- Roy, A., 'Les Français clairvoyants sur leur exposition au risque d'inondation', *Le 4 pages de l'Institut français de l'environnement (Ifen)*, no. 123, 2008.
- De Saint Seine, J., *Monographie hydrologique et hydraulique du Paillon de Nice en vue de la gestion du risque d'inondation*, PhD Thesis, Institut national polytechnique de Grenoble, 1995.
- Terray, L., and Boé J. (2013), Quantifying 21st Century France Climate Change and Related Uncertainties, *Comptes Rendus Geoscience*, online 30 May, 2013 (doi:10.1016/j.crte.2013.02.003)
- Tricot, A., and Labussière, O., 'Les difficultés d'application des plans de prévention en France : lorsque le territoire façonne le risque', *Cahiers de géographie du Québec*, vol. 53, no. 148, 2009, pp.119-134.
- Vinet, F. *Le risque inondation: diagnostic et gestion*, Paris, Lavoisier, 2010.
- Vinet, F. et al., 'La mortalité comme expression de la vulnérabilité humaine face aux catastrophes naturelles : deux inondations récentes en France (Xynthia, Var, 2010)', *Vertigo - la revue électronique en sciences de l'environnement*, vol. 11, no. 2, 2011 <http://vertigo.revues.org/11074> ; DOI : 10.4000/vertigo.11074
- Wiering, M.A. and Arts, B.J.M., 'Discursive shifts in Dutch river management: 'deep' institutional change or adaptation strategy?', *Hydrobiologia*, no. 565, 2006, pp. 327 – 338.
- Van Tatenhove, J., and Leroy, P. (2000) (ed.). *Political modernisation and the environment: the renewal of environmental policy arrangements*, Dordrecht/Boston/London, Kluwer Academic Publishers.
- Wolff, M., Fol, S., Roth, H., and Cunningham-Sabot, E., 'Shrinking Cities, villes en décroissance : une mesure du phénomène en France', *Cybergeo : European Journal of Geography*, no. 661, 2013 (accessed 8 December 2013)

### **Political reports**

- Bourrelrier, P.-H., (ed.), *La prévention des risques naturels, rapport de l'instance d'évaluation présidée par Paul-Henri Bourrelrier*, Paris, La Documentation française, 1997.



- Dauge, Y. Rapport au Premier ministre sur les politiques publiques de prévention des inondations, 1999 (not published).
- Deneuve, M., Rapport de commission d'enquête sur les Inondations dans la Somme : des leçons pour l'avenir, Document du Sénat, no. 34, 2001.
- Galley, R., Rapport sur les causes des inondations répétitives et exceptionnelles et sur les conséquences, Document Assemblée Nationale, no. 3386, 2001.
- Kert, C., Rapport sur les techniques de prévision et de prévention des risques naturels en France, Office parlementaire d'évaluation des choix scientifiques et technologiques, 1999.
- Léonard, J-L., Rapport d'information sur les raisons des dégâts provoqués par la tempête Xynthia, Assemblée Nationale, no. 2697, 2010.
- Mathot, P. and Mariani, M., Rapport de la commission d'enquête sur les causes des inondations et les moyens d'y remédier, Assemblée Nationale, no. 1641, 1994.
- Ministère de l'Ecologie, du Développement durable et de l'Energie (MEDDE), Politique de gestion des risques d'inondation, Paris, 2012.

### **Expertise reports**

- Association Française pour la Prévention des Catastrophes Naturelles (AFCPN) and Conseil général de l'économie, de l'Industrie de l'énergie et des technologies (CGEJET), 'Des instruments financiers face aux risques de désastres en France et dans le monde', Conference Proceedings, Paris, 2 March 2012, Paris.
- Centre Européen de prévention de Risque d'Inondation (CEPRI), *L'ACB (analyse coût/bénéfice) : une aide à la décision au service de la gestion des inondations, Guide à l'usage des maîtres d'ouvrage et de leurs partenaires*, November 2011.
- Centre Européen de prévention de Risque d'Inondation (CEPRI), *Les digues de protection contre les inondations. La mise en œuvre de la réglementation issue du décret n°2007-1735 du 11/12/2007*, Les guides du CEPRI, 2007.
- Commissariat général au développement durable (CGDD), *Premiers enseignements tirés de la mise en œuvre des programmes d'action de prévention des inondations (PAPI)*, avril 2009.
- Commissariat général au développement durable (CGDD) 'Le régime d'assurance des catastrophes naturelles en France métropolitaine entre 1995 et 2006', *Etudes et Documents*, n°22, 2010.
- Commissariat général au développement durable (CGDD), 'Les dépenses publiques et les bénéficiaires de la prévention des risques naturels', *Études & documents*, n° 94, Septembre 2013.
- Commissariat général au développement durable (CGDD), 'La sécurité liée à l'eau : gestion des risques et arbitrages', no 100, 2013.
- Commissariat général au développement durable (CGDD), *Rapport sur l'état de l'environnement 2010-2014, Comptes économiques de l'environnement*, 2014.
- Commissariat général au développement durable (CGDD), *Analyse multicritères des projets de prévention des inondations, Guide méthodologique*, juillet 2014.
- Conseil d'État, *Responsabilité et socialisation du risque*, Etudes et documents, Documentation française, Paris, 2005.
- Conseil général de l'environnement et du développement durable (CGEDD), *Articulation des plans grands fleuves avec les futurs Plan de Gestion du Risque Inondation*, Rapport n° 008436-01, décembre 2012.
- Conseil général de l'environnement et du développement durable (CGEDD), *Evaluation à mi-parcours du Plan Submersion Rapide*, mars 2014.
- (FFSA) et Groupement des entreprises mutuelles d'assurance (GEMA), *Bilan chiffré de l'assurance des catastrophes naturelles en 2012*, avril 2014.
- Fonds de prévention des risques naturels majeurs (FPRNM), *Rapport sur la gestion du fonds de prévention des risques naturels majeurs, Annexe au projet de loi de finances pour 2015*, avril 2014.

- Institut national de la statistique et des études économiques (INSEE), *La population des régions en 2040*, no. 326, 2010.
- Migaud, D., Bayle, J.-P. and Bertrand, J.-M., *Les enseignements des inondations de 2010 sur le littoral atlantique (Xynthia) et dans le Var*. Rapport public thématique. Paris: Cour des Comptes, 5 juillet 2012.
- Ministère de l'Ecologie, du Développement durable et de l'Energie (MEEDE) and Directions regionales de l'environnement, de l'aménagement et du logement (DREAL), *Bilan de l'activité de la CMI et des instances locales Juillet 2011 à mai 2013*, June 2013.
- Ministère de l'Ecologie, du Développement durable et de l'Energie (MEEDE), *Première évaluation nationale des risques d'inondation - Principaux résultats*, July 2012.
- Ministère de l'Ecologie, du Développement durable et de l'Energie MEEDE, *Actes du groupe de travail relatif à la sécurisation du contenu réglementaire des plans de prévention des risques naturels prévisibles*, Workshop proceedings, 2010.
- Ministère de l'Ecologie, du Développement durable et de l'Energie MEEDE, *Programme Information, participation du public, concertation et association dans les PPR*, December 2007.
- Ministère de l'Ecologie, du Développement durable et de l'Energie MEEDE, *Risk Prevention Directorate, Annual report*, 2013.
- Mission Risques Naturels (MRN), *Evaluation de la contribution des Plans de Prévention des Risques Naturels (PPRN) à la réduction de la vulnérabilité collective et individuelle*, Novembre 2009.
- Observatoire national sur les effets du réchauffement climatique (ONERC), *Prise en compte de l'élévation du niveau de la mer en vue de l'estimation des impacts du changement climatique et des mesures d'adaptation possibles - Document de synthèse*, février 2010.

### Legal references

- Allaire, F., 'La prévention et la gestion des risques naturels', *Actualité juridique, droit administratif*, July 2012.
- Anziani, A., *Rapport d'information fait au nom de la mission commune d'information sur les conséquences de la tempête Xynthia*, Sénat, Paris, France, 2010.
- Auby, J.B., and Auby, J.-F., Noguellou, R., *Droit des collectivités locales*, PUF, Themis, 2009.
- Auby, J.B., 'Digues', *Droit Administratif*, no 8, 2012.
- Auby, J.B., Périnet-Marquet, H. and Noguellou, R., *Droit de l'urbanisme et de la construction*, vol. 1, Domat droit public-droit privé, Lextenso, Paris, 2012.
- Bécet, J.-M., 'Les digues et le droit', *La semaine juridique - Administration et Collectivités territoriales*, no 49, 2010.
- Bentoglio, G. and Betbéze, J.-P., *L'État et l'assurance des risques nouveaux - Exercice prospectif*, La Documentation française, 2005.
- Bétaille, J., *Les conditions juridiques de l'effectivité de la norme en droit public interne : illustrations en droit de l'urbanisme et en droit de l'environnement*, PhD Thesis, University of Limoges, 2012.
- Billet, P., 'Esquisse de méthodologie juridique de délimitation des zones inondables', *Environnement*, no 8, 2007.
- Calvet, F., *L'appréhension juridique du risque d'érosion côtière*, PhD Thesis, Perpignan 2014.
- Cans, C., *Traité de droit des risques naturels*, Le Moniteur, Paris, 2014.
- Cans, C., Pontier, J.-M., Touret, T., 'Xynthia, ou l'incurie fautive d'un maire obstiné', *Actualité juridique, droit administratif (AJDA)*, 2015, p. 379.
- Debono, A.-L., 'Le contrôle de la légalité interne des plans de prévention des risques naturels', *Actualité juridique, droit administratif (AJDA)*, 2011.
- Deliancourt, S., 'La détermination de la qualité de propriétaire d'une digue pour déterminer les obligations d'entretien', *La semaine juridique - Administration et Collectivités territoriales*, no 49, 2013.

- Février, J.-M., 'Responsabilité du fait des plans de prévention des risques', *Environnement et développement durable*, no 10, 2008.
- Foulquier, N., *Droit administratif des biens*, LexisNexis, Manuels, Paris, 2013.
- Frier, P.-L., Petit, J., *Droit administratif*, LGDJ, Domat droit public, 2014.
- Godbillon, B., 'L'autorisation de construire et le risque naturel. Le devoir de vigilance en droit de l'urbanisme', *Actualité Juridique de la Propriété Immobilière*, 1999, p. 68.
- Gonin, S., 'Le régime de responsabilité en matière de digues de protection contre les inondations', *Bulletin du droit de l'environnement industriel*, no 31, 2011.
- Guettier, C., 'Indemnisation des victimes de catastrophes naturelles et socialisation du risque', *Revue générale du droit des assurances*, n° 1997/3, July 1997.
- Hostiou, R., 'L'expropriation pour risque naturel', *Actualité juridique, droit administratif (AJDA)*, n°24, 2012, p. 1324.
- Hubert, T., 'Le fonds de prévention des risques naturels majeurs', *Actualité juridique, droit administratif (AJDA)*, no 24, 2012.
- Larroumec P., 'Les responsabilités en matière de police administrative', *La Semaine Juridique Administrations et Collectivités territoriales*, no. 15, 2012.
- Lebreton, « La compatibilité en droit de l'urbanisme », *Actualité juridique, droit administratif (AJDA)*, 1991, p. 491.
- Le Louarn, P., 'La tempête Xynthia, révélateur des insuffisances du droit ?', *La Semaine Juridique Edition Générale*, no 19, 2011.
- Marcangelo-Leos, P., 'Loi MAPAM : la nouvelle carte des compétences en matière d'environnement et de transports', *Droit de l'environnement*, no 222, 2014.
- Pontier, J.-M., 'De la solidarité nationale', *Revue de droit public*, 1983.
- Pontier, J.-M., 'La puissance publique et la prévention des risques', 2003.
- Pontier, J.-M., 'La responsabilité du fait des risques naturels prévisibles », *Actualité juridique, droit administratif (AJDA)*, no 24, 2012.
- De Poulpiquet, J., 'Notaire - Devoir de conseil', *JurisClasseur Civil Code*, Fasc. 420-30. LexisNexis, 2006.
- Prieur, M., *Droit de l'environnement*, Dalloz, Précis, 2011.
- Romi, R., 'La sécurité civile et le droit de l'environnement', *Droit de l'environnement*, n°122, 2004.
- Sousse, M., 'Risques naturels, gestion de crise', in *JurisClasseur. Environnement et Développement durable*, Vol. no 4510, LexisNexis, 2008.
- Sousse (a), M., 'Dispositifs de prévention des risques naturels', in *JurisClasseur. Environnement et Développement durable*, Vol. no 4510, LexisNexis, 2013
- Sousse (b), M., 'Risques naturels : procédure d'expropriation et acquisition amiable', *JurisClasseur. Environnement et Développement durable*, Vol. no 4510, LexisNexis, 2013.
- Sousse, M., 'Prévention des risques naturels dans le droit de l'urbanisme', *JurisClasseur Environnement et Développement durable*, Vol. no 4510, LexisNexis, 2014.
- Steinlé-Feuerbach, M.-F., 'La nouvelle obligation d'information sur les risques technologiques et naturels en matière de transaction immobilière', *La Semaine Juridique Notariale et Immobilière*, 2004.
- Van Lang, A., 'L'émergence d'une approche intégrée du risque d'inondation', *Actualité juridique, droit administratif (AJDA)*, no 24, 2012.
- Vautrot-Schwarz, C., *La police administrative*, PUF, Thémis, 2014.
- Villeneuve, P., 'De quelques questions environnementales... dans le projet de loi NOTRe', *Energie, Environnement, Infrastructures*, no7, 2015.
- Villeneuve, P., 'La gestion des milieux aquatiques et de prévention des inondations dans la loi MAPTAM', *Actualité juridique des collectivités territoriales (AJCT)*, juin 2014, p. 296.
- Waline, J., *Droit administratif*, Dalloz, Précis, 2014.

## Annex 1 - Interviewees

Date	Name	Scale/type of organisation	Institution	Direction/Service	Function/title	Interviewer(s)
<b>National</b>						
25/03/14	M. Jacquet	State	Ministry of the Environment	Ministerial Directorate for Risk Prevention (DGPR) – SRNH	Director	Lévy/Trémorin
06/02/14	M. Morel	State	Ministry of the Environment	DGPR – SRNH – PPR	Project Manager	Lévy/Trémorin
06/02/14	M. Prévost	State	Ministry of the Environment	DGPR – SRNH – PSR Mission	Project Manager	Lévy/Trémorin
06/02/14	G. Rat	State	Ministry of the Environment	DGPR – STEEBH	Chief of service	Lévy/Trémorin
03/02/14	J. Faye	State	Ministry of the Environment	DGPR – Preventive Information	Director	Lévy/Trémorin
04/02/14	A. Schmitt	State	Ministry of the Environment	DEB	Director	Lévy/Trémorin
05/02/14 and 11/06/15	C. Guénon and C. Mengus	State	Ministry of the Interior	Civil Security Department (DGSCGC) Emergency planning (SDPGC)	Director Project Manager	Lévy/Trémorin Bruzzone
25/03/14	N. Cristin	State	CGDD		Project Manager	Lévy/Trémorin
07/02/14	D. Marcovitch	Associations	Flood Committee (CMI)			Lévy/Graplepois
06/02/14	H. Bourrelier	Associations	AFPCN			Lévy/Trémorin
	N. Bauduceau	Associations	European Center for Flood Prevention (CEPRI)		Director	Lévy/Trémorin

15/04/14	Y. Collombat	Parliament	Parliament		Deputy of Var Region	Bruzzone/Graplepois
15/04/14	M. F. Beauflis	Parliament	Parliament		Deputy of Tours Region	Lévy/Graplepois
10/02/14	R. Nussbaum	Insurance	Insurance expertise mission	MRN	Director	Lévy/Trémorin
10/02/14	P. Bidan P. Michel J. Capblancq	Insurance	CCR		Director Project Managers	Lévy/Trémorin
Le Havre						
07/03/14	A. Duflot	State	Regional services	Natural Risk Service		Trémorin/ Graplepois
07/03/14	M. Piney	State	Regional services	Hydrology and Flood Forecasting Service		
06/03/14	A. Revel P. Lefevre	State	Departmental services	Le Havre Territorial Service/ Environment Risk and Security Mission		
05/15	E. Blondel	State	Departmental services	Risk and nuisances service		
07/03/14	C. Meier	State	Departmental services	SIRACED PC		
05/15	P. Porcelli	State	Emergency Services (SDIS)			
05/15		<i>Département</i>	Seine Maritime Department (CG76)			

06/03/14	E. Hauchard	Inter-municipal level	Le Havre Agglomeration (CODAH)	Water Cycle Service		
05/03/14	P. Mallet	Inter-municipal level	Le Havre Agglomeration (CODAH)	Risk Prevention Service		
05/03/14	M. Braquehais	Inter-municipal level	Syndicat Mixte des Bassins Versants de la Pointe de Caux			
06/03/14	E. Lemaire	Municipality	Le Havre	Security Service		
05/15	N. Landry	Municipality	Montivilliers			
05/15		Private	Harbour authority			
05/15	P. Lions	Associations	ORMES			
Nice						
19/06/14	Y. Gruffaz	State	Regional services (Régional Directorate for Environment, Land Planning and Housing - DREAL)	Risk Prevention Direction /Natural Risk Prevention Service/PAPI coordination		Lévy/Bruzzone
11/02/15	P. Ribollet	State	Prefecture services	Natural and Technological Risk Prevention (DDTM 06)	Head of Service	Lévy/Schellenberger
11/02/15	J-E Orlandini	State	Prefecture services	Civil Security (SIDPC)	Head of Service	Bruzzone
19/06/14	A. Martin	State	Regional Flood Forecasting Service (SPC)			Lévy/Bruzzone
24/06/14	C. Servella	Inter-municipal level	EPA	Territorial strategy and planning	Director	Lévy/Bruzzone
24/06/14	M. Cason	Inter-municipal level	EPA	Sustainable development	Project Manager	Lévy/Bruzzone
09/02/15	C. Floury	Regional Basin	Water Agency – Rhône Méditerranée Corse	Alpes Maritimes Sector	Project Manager	Bruzzone/Schellenberger

16/06/14	K. Souriguère	Département	Alpes Maritimes Département (CG 06)	Environmental Direction/ Water Course Management Service	Head of Service	Lévy/Bruzzone
23/06/14	O. Marcucci	Inter-municipal level	Nice Métropole	Urban Planning Direction	Director	Lévy/Bruzzone
	C. Sanson	Inter-municipal level	Nice Métropole	Storm water and hydrological studies	Director	Lévy/Bruzzone
23/06/14		Inter-municipal level	Nice Métropole	Environmental Service		Lévy/Bruzzone
12/12/14	E. Dehesdin	Inter-municipal level	Paillons Inter-municipal Syndicate (SIP)		Project Manager	Lévy/Bruzzone
26/06/14	P. Almot Y. Ferrand	Municipality	Nice	Risk Prevention Direction	Head of Service	Lévy/Bruzzone
26/06/14	J. F. Pelletier	Municipality	Saint-Laurent-du-Var	Risk Prevention Direction	Head of Service	Lévy/Bruzzone
23/06/14	Molinari	Association	GIR Maralpin			Lévy/Bruzzone
10/02/15	P. C. Maria	Inter-municipal level	Paillon Inter-municipal Syndicate (SIP)		Director	Bruzzone/Schellenberger
12/02/15	L. Parzy	Association	France Nature Environnement 06		Director	

25/06/14	C. Cousinié	Association	La Mouette Laurentine / Region Verte			Lévy/Bruzzone
12/02/15	N. Bonfils	Association	Plaine du Var OIN: Pour Un Débat Citoyen			Trémorin/Bruzzone/Schellenberger
16/06/14	B. Gourmanel	Association	ADHEC			Lévy/Bruzzone
18/06/14	S. Attas	Private	Nice Cote d'Azur Airport	Development and Planning Service	Director	Lévy/Bruzzone
26/06/14	P. Féart	Private	Hydrologist consultant			Lévy/Bruzzone
16/06/14	C. Voiron	University	Espaces et Cultures Research Unit (UMR)			Lévy/Bruzzone
17/06/14	A. Lalo	University	Sophia Antipolis University			Lévy/Bruzzone
Nevers						
13/01/15	A. Dufay	State	Regional Services	Loire Basin Service		Bruzzone /Schellenberger
21/11/14	M. Bottero	State	Departmental Services	Risk Planning Service	Project Manager	Lévy/Schellenberger
21/11/14		State	Departmental Services	Flood Forecasting Service		Lévy/Schellenberger
18/11/14	J. F. Quien	State	Departmental Fire and Rescue Service (SDIS)		Head of Service	Lévy/Bruzzone
25/11/14	V. Le Bouar	Département	Nièvre Département (CG 58)	Infrastructure Service	Head of Service	Lévy
12/11/14	J-C. Eude B. Rossignol P. Philippe	Basin	Loire Water Board (EPL)	General secretary, Research and Data Service	General Secretary, Project Managers	Lévy/Schellenberger
18/02/15	P. Philippe	Basin	Loire Water Board (EPL)	Flood prevention Service	Project Manager	Lévy



19/11/14	H. Fallet E. Bastarolli	Inter-municipal level	Nevers Agglomeration	Environment Direction/Flood Prevention Service	Director Project Manager	Lévy/Bruzzzone/Schellenberger/Trémorin
13/01/15	I. Bonnicel	Inter-municipal level	Nevers Agglomeration	Water Management Commission		Lévy
14/01/15	D. Rime	Municipality	Nevers	Urban Planning Direction	Head of Service	Lévy/Schellenberger
21/11/14	J. L. Cottenot	Municipality	Sermoize	General Secretary	General Secretary	Lévy/Schellenberger
19/11/14	P. Kaluzni	Association	Loire Vivante			Lévy/Bruzzzone/Schellenberger

## Annex 2 - Historical development

Period/Era	Event/conjunctural factors	Main legal changes	General trend/structural factors
19th century	1856: the whole country is struck by a huge flood on the Loire, Seine, Rhône and Garonne rivers. Huge damage and countless victims. Most of the dikes in the valleys are breached. Napoleon visits the most severely damaged cities to witness the aftermath of the flood of the century.	In 1856, just after the events, a circular from Napoleon III initiates an initial movement, and in 1858 a law implements the first legal provisions evidencing the role of the State and all local authorities in fighting floods.	This period marks the beginning of a long period focusing on defence strategy. A belief in technical progress and the desire to dominate nature is accompanied by the development of the main engineering corporation, Ponts et Chaussées, created by Napoleon III. Dikes are built on the national rivers to protect the main cities.
1914-1918	Damage from the First World War.	Legal principle of national solidarity shared by the French nation.	National solidarity becomes an underlying principle of public disaster management.
1930s	Many flood events in the South-West of France causing severe damage to housing and people.	In 1935, a decree-law is adopted to prohibit construction that hinders the free flow of water and maintains flood expansion areas.	A flood risk management plan is established for the first time in France: the Submersible Surface Plan (PSS). However, it does not integrate flood risk into urban policy and urban planning instruments. The PSS is purely a technical tool for risk management. Strictly speaking, there is still no urban planning tool aimed at reconciling urbanization and flooding.
1940s	1939-1945: Second World War 1948: Marshall Plan.	New French Constitution (1946): recognition of the principle of national solidarity and equality during disasters.	Reconstruction works. France faces a major housing crisis due to bombing. Most infrastructures are destroyed. The first goal is to rebuild as fast as possible. Economic era of the “trente glorieuses” begins. Economic and demographic boom.
1950s	1949: the largest civil security disaster France has faced in the century. A dike failure in Fréjus causes 423 casualties. Hundreds of homes are destroyed, and roads and railways are seriously affected.	1952: Creation of the ORSEC Plan. This emergency planning document is the first to have been created in France, and is characterized by its generalist approach, in which emergencies are not thought of in terms of a specific risk but for all types of risk.	The creation of the ORSEC plan marks the beginning of French preparation strategy. For the first time, emergencies are considered in advance and planned according to a number of factors. The generalist approach still has a strongly effect on the administrative structure and the difference in methodologies between prevention and preparation.
1960s		1964 Water Act 1967: creation of the first urban planning document at a	

		municipal level with a generalist approach. Flood risk is one of the factors taken into account in urban planning.	
1970s	1973 and 1979: two major petrol crises.		The turn of the late 1970s is synonymous with the end of the “trente glorieuses” era. Budgets tighten and public investment decreases due to stagflation and the rise in national deficits.
<b>BASELINE YEAR (1982)</b>			
1980s	1987: Grand-Bornand disaster (€ 107 million of damage and 27 victims).  1988: major flooding in Gard <i>Département</i> (€ 500 million of damage and 10 victims).	1982: creation of the Natural Disaster Scheme “CAT-NAT”. The solidarity principle justifies a compensation regime at a national level for flood damage. A complex system of actors is set in place.  1982 and 1983: First decentralization acts.  1984: A new generation of planning tools dealing with flood prevention and urban planning (PER).  1987: new law on civil security and flood prevention (controlling urbanization).	The 1980s are the era of the Socialist Party and the affirmation of national solidarity. The compensation regime for floods of damage is born.  The decentralization process starts with the first act of decentralization. This is probably one of the most influential events for flood risk management policy in France, especially as regards the administrative structure.  The end of the 1980s and the two major flood events trigger renewal of the civil security system, and especially the affirmation of the public information principle. It is now compulsory to inform citizens of the risks to which they are exposed.
1990s	1992: major flood events in the South of France, especially in Vaison-la-Romaine (47 casualties and € 500 million of damage) 1995: major flood events in Brittany and Paris regions (€ 610 million of damage and 10 deaths). 1999: flood events in the South of France (€ 533 million of damage and 36 victims) and major storm in December with huge economic impact (€ 1 billion) and 10 victims.	1992 Water Act 1995: Legislative basis for environmental law; creation of the FPRNM (a national fund dedicated to floods prevention measures ) The Flood Risk Prevention Plan (PPRI) is implemented. It is still the main legal urban planning document for the prevention of flooding and prohibiting construction in certain areas. 1999: Creation of the inter-municipal bodies as we know them today	After a long period with no major events, the 1990s are characterized by important new flooding.  New urban planning and flood prevention measures are introduced. The PPRI and the Barnier Fund push forward a proactive vision that to a certain extent combines risk prevention and urban planning  Reforms in the administrative system: the rise of the inter-municipal structure and its empowerment in terms of flood management policy.
2000s	2001: AZF event. Explosion of a	2000: European Water Framework Directive.	The AZF event has a powerful effect on risk management

	<p>chemical plant in Toulouse.</p> <p>2002: major flood in the Gard Département (€ 1.2 billion of damage, 23 victims).</p> <p>2003: major flood event across the whole country: € 1.5 billion of damage and 10 victims.</p>	<p>2002: creation of the Action Programme for Flood Prevention (PAPI) (contractual funding programme on integrated flood management).</p> <p>2003: Major Hazard Act.</p> <p>2004: Civil Security Act.</p> <p>2006 Water Act.</p> <p>2007: European Flood Directive.</p>	<p>policy.</p> <p>Progressive diversification of FRM through PAPIs.</p> <p>Consolidation of the preparation strategy with the law of 2004: citizens are responsible for their own safety.</p>
2010s	<p>2010: Xynthia event (storm surge on the Atlantic coast) is a major disaster for the nation. 47 people die due to marine submersion. Huge property damage. Another flood event in the south: over € 1.5 billion of damage, 25 victims.</p>	<p>2010: Environmental Protection Act (implementation of the Flood Directive), which brings broader public participation into the environment domain and risk management.</p>	<p>Important consequences of the Xynthia event:</p> <ul style="list-style-type: none"> <li>- new trend towards the criminalization of Mayors linked to their responsibilities in terms of public safety.</li> <li>- marine submersion enters the public agenda, closely linked with global warming.</li> </ul>

STAR  
FLOOD

