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Handbook of case study factsheets

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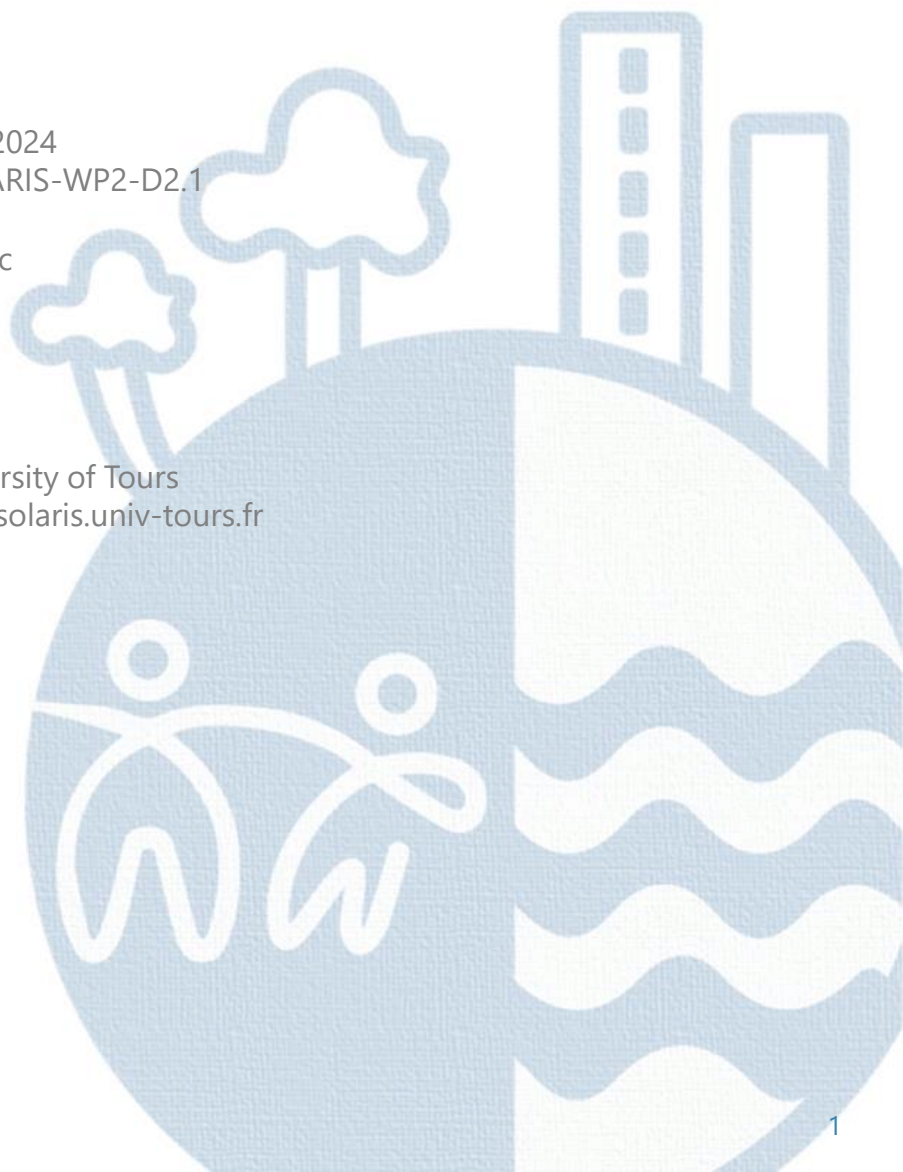
SOLARIS
SOLIDARITY IN CLIMATE CHANGE

**SOLIDARITY IN CLIMATE CHANGE ADAPTATION POLICIES:
TOWARDS MORE SOCIO-SPATIAL JUSTICE IN THE FACE OF
MULTIPLE RISKS**

Handbook of case study factsheets

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What to find in this handbook?

This report is part of the Work Package 2 (WP2) deliverable of the research project SOLARIS (SOLidarity in climate change Adaptation policies: towards more socio-spatial justice in the face of multiple RISks), funded by the participant countries to the SOLSTICE program of JPI Climate "Connecting Climate Knowledge for Europe". More information about the SOLARIS project, its purpose and outputs can be found here <https://jpi-climate.eu/project/solaris/>.

This 'handbook of case study factsheet's compiles results from the empirical work by the research teams, in the context of WP2. WP2 is dedicated to empirical investigations carried out at national level in the four SOLARIS countries (Belgium, England, Finland, and France) and eight case studies. The empirical research in WP2 is based on common conceptual and methodological work conducted in WP1, which enables cross-case analysis (WP3) and finally dissemination (WP4). The eight case studies cover climate change adaptation policies (CCAPs) and flood risk management (FRM) strategies implemented in the four countries. These strategies are implemented differently from one country to another, but they share similar questions when they launch projects and have similar concerns about the impacts of CCAPs. WP2 analyses the justice implications of these policies, the socio-spatial inequalities deriving from these strategies, and any initiatives that institutional stakeholders adopt to limit these inequalities.

An important aim of the project is to disseminate results of case studies analysis among practitioners and scientists via different media. Besides oral presentations, scientific articles, e-doc website etc., the project – in this document – delivers a handbook of case study factsheets. These factsheets are meant to (i) contribute to scientific work for thematic comparison, but more importantly, the factsheets aim to (ii) supply practitioners with cases/examples to learn from.

Context

Facing the unpredictability and unavoidability of climate change effects, governments in Europe must increasingly promote the further development of their CCAPs. In this field, adaptation to extreme hydraulic events such as flooding and erosion are more urgent than ever. As Tradowsky *et al.* considered when they examined floods in Western Europe in July 2021: "Models indicate that intensity and frequency of such events will further increase with future global warming" (Tradowsky *et al.*, 2023).

In such a context, climate change impacts raise controversies on the distribution of negative consequences. At the same time, however, adaptation to climate change itself raises questions of fairness, justice, and equity (Adger, 2001; Byskov *et al.*, 2021). Studies have highlighted the essential issue of justice in climate change exposure, especially in countries in the Global South (Bobo, 2006; Owen, 2020) as well as in Europe (Reckien *et al.*, 2014), however further analysis of justice issues related to CCAPs in Europe is needed. The SOLARIS project focuses on flood risk issues and illustrates how justice can be considered in public policy.

FRM has long raised issues of justice (Walker & Burningham, 2011). Flood risk itself is often unevenly distributed, due to the diversity of causes of flooding, types of landscape, the location of the houses and assets on which people depend. The impacts of floods and their consequences on individuals and communities is determined by a range of factors other than the severity of the flood itself, such as socioeconomic characteristics and capital, health conditions, age, and psychological characteristics (Thaler *et al.*, 2018). Furthermore, access to the benefits of FRM is also said to be "inherently unfair" (Johnson *et al.*, 2008; Johnson *et al.*, 2005). The (un)fairness of FRM is principally a question of who benefits from the measures and who pays for them (Begg, 2018). But other considerations include the ability of stakeholders to influence the decisions made and the way in which vulnerable people are recognised and defined.

As such, justice in FRM can be categorised as **distributional justice** (winners and losers in FRM including who pays for measures and whose flood risk is reduced), **procedural justice** (mechanisms to support representative and fair decision making), and **recognition justice** (How vulnerable and/or disenfranchised people are identified so that injustices can be tackled? What is the role of knowledge?).

These three forms of justice – as well as the way FRM is carried out – help to define some related terms, namely fairness, solidarity, equality, and equity. To analyse the socio-spatial injustices within CCAPs related to FRM, SOLARIS utilises three key research questions:

1. How and when are issues of equality and justice identified and addressed in FRM? How does it link up with other policies, like CCAPs?
2. How is participation in decision making for FRM facilitated?
3. What is the role of (and access to) knowledge in FRM? How does this support capacity building for addressing social inequalities?

Methods

SOLARIS is a qualitative social science research project aiming to explore justice in FRM across four countries: Belgium, England, Finland, and France. The three research questions have been answered for each participant country at both national and sub-national (case study) level.

This project takes a case study approach with a common protocol used during the investigation. The above research questions dominated the analysis, and the case study approach utilises four main empirical tools (mixed-method design) : analysis of policy/guidance documents/grey literature, interviews with stakeholders, local discussion groups, and participant observation.

The first method of data collection is **document analysis**. Document analysis involves the analysis of legal and policy documents such as legislations, rules, and programs (Massey *et al.*, 2014) to underline how FRM has considered the issues of justice. We aim to note the distance between the formal documents and the discourses of the different groups (through interviews and local discussion groups). In total, 187 documents (France, 86; Belgium, 24; Finland, 43; England, 34) have been formally analysed by the four countries, however others may have been consulted to direct the research. Where appropriate it has also been possible to draw on the analysis of documentation undertaken in previous research projects (see, e.g., Alexander *et al.*, 2016).

The second method of data collection is **semi-structured interviews** carried out with public authorities, policy makers, and other experts and practitioners involved at the national and case study level, as well as local NGOs. In some of the cases, interviews were also conducted with local at-risk inhabitants to supplement data. Specific attention was given to the implementation from national to local. Interviews typically lasted 60-90 minutes and began with a set of pre-prepared questions focussing on the role of justice and equality in FRM, both in policy and in practice, as well as participatory practices and the role of knowledge. Following on from these questions, the interviews would become less structured to expand and probe issues that participants had raised. All interviews were recorded with the participants' permission, transcribed, and thematically analysed through an iterative process. A total of 166 interviews were conducted in the four countries (France, 53; Belgium, 39; Finland, 49; England, 28).

The third data collection approach is the organisation of **local discussion groups**. The aim was to contribute to the analysis through a discussion with a limited number of relevant experts (flood risk managers, i.e., engineers, spatial planners, etc.; policy makers; NGOs, local resident experts) invited to the local discussion group. The idea is twofold: first, to ask for feedback on preliminary results and to provide knowledge exchange concerning next steps, and then to invite experts to reflect on the (in)equality and (in)justice issues that are raised by current spatial planning policies for FRM. Each country organised a Local Discussion Group per case study level.

The final and fourth data collection approach is **participation observation**. Participant observation implies the presence of the researcher in the social world of the respondents, in their usual activities (Beaud & Weber, 2003; Bryman, 2016). The objective is to understand their relationships and daily practices beyond the mere collection of their discourse (carried out in the context of an interview). This data collection strategy was implemented according to the case studies, the disciplinary context, and the willingness to experiment in each country. For instance, Finland realised an art experience called *SOLARIS-ART: Engaging with Solidarities in Flood Risk Management Through Community Art*. It is "a temporary public space for listening called the Outdoor Living Room (OLR). This is a unique method that was developed to set up a living space in public places to engage people, who would otherwise not feel comfortable attending more formal meetings" (Mazzotta, 2022).

Set-up of this handbook

To be quickly accessible, this handbook is structured in 4 sections. Each section addresses the situation in one participant country and compiles the SOLARIS main results both at national level (4 country facts sheets) and case study level (8 case study factsheets).

At national level, the country factsheets provide:

- A synthesis of the types of flood risks & recent events
- The main characteristics of CCAP and FRM policies in the country
- A synthesis of the main results, based on the 3 SOLARIS key research questions (distributive justice, procedural justice, recognition justice)

At case study level, the factsheets provide:












- A preliminary case description and identification of the main stakeholders involved
- The identification of the main SOLARIS key issues in the case study
- A synthesis of the main results, based on the 3 SOLARIS key research questions

The handbook can be read section by section, but readers may also be interested to compare case studies which share the same characteristics. Therefore, a matrix is provided below to facilitate the quick identification of the most relevant topics in each case study. With a list of symbols presented on the top right of each fact sheet, readers can easily visualise:

- The main FRM strategy (see Hegger et al., 2016) addressed in the case study (prevention, defence, mitigation, preparation, recovery)
- The research question(s) for which the case study is the most relevant (distributive justice, procedural justice, recognition justice)
- The spatial scale of analysis (national, regional, local scale)

A cell unchecked does not mean that it's not present or important, but that it was not a key focus of the case study.

Eventually, additional reports, data and illustrations are provided for each case, so that readers of the handbook may go easily further into the example.

Country	Case study	Flood Risk Management Strategies					Research Questions			Spatial scale			Page
		Prevention	Defence	Mitigation	Preparation	Recovery	Distributive justice	Procedural justice	Recognition justice	National	Regional	Local	
													
Belgium	Beerse			✓			✓	✓				✓	10
	Geraardsbergen				✓		✓		✓		✓		12
England	Lower Thames	✓		✓	✓		✓	✓	✓		✓		18
	West Sussex			✓			✓		✓		✓		20
Finland	Helsinki Metropolitan Area	✓			✓		✓	✓				✓	26
	Kokemäenjoki catchment area			✓			✓				✓		28
France	Ault	✓	✓	✓			✓		✓			✓	34
	Blois			✓			✓	✓				✓	36

Belgium (Flanders)

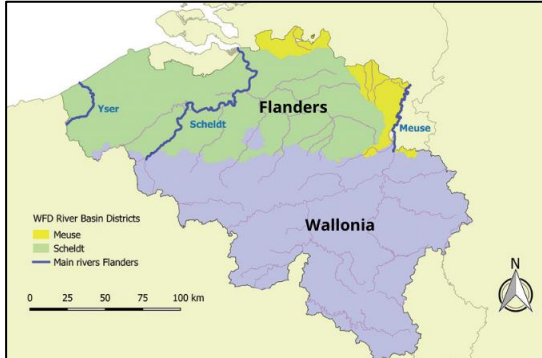
Case studies

Beerse

Geraardsbergen

Types of flood risks & recent events

- Climate change increases **all types of flooding** in Flanders. Heavy rainfall can cause fluvial floods by overflow of river embankments, as well as pluvial floods through surface runoff. Coastal flood risks are related to sea-level rise and storm winds above the North Sea.



- Population growth, urbanisation, and surface hardening** also contribute to potential losses and damages from floods in Flanders.
- Since 1988, about **5% of the Flemish territory** has flooded, resulting in **€50 million in damages** per year. 67,000 people would be affected by a flood with a return period of 100 years. 220,000 people could be affected by a flood with a return period of 1000 years.

Figure 1. Location of the region of Flanders in Belgium, an overview of its main rivers (Yser, Scheldt, and Meuse) and the subunits of the EU Water Framework Directive (2000/06/EC) river basin districts. Source: Vannevel *et al.* (2018).

Characteristics of CCAP

CCAP in Flanders is **fragmented**. Belgium is a federal state and consists of three regions: Flanders, the Brussels-Capital region, and Wallonia – with their own executive and legislative bodies. As a result, there are **federal, regional, and local adaptation plans**, many policy domains are involved, and uncertainty remains around responsibility for the implementation of adaptation measures. Climate change adaptation has only recently become a priority in Flanders, resulting in a **lack of institutional structures, rules, and (budgetary) means**. Climate change adaptation is at most a **network of stakeholders** from various policy domains.

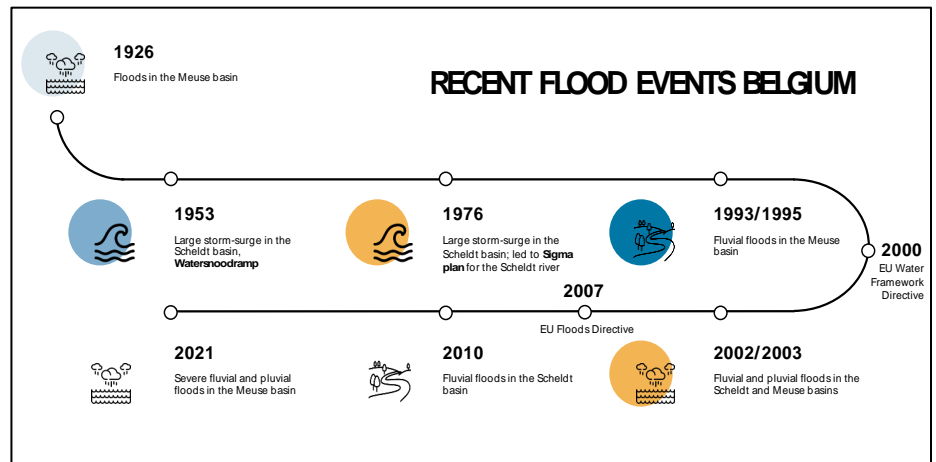


Figure 2. Timeline showing harmful floods in Belgium in the 20th and 21st century. Different icons indicate the type of flooding (pluvial, fluvial, or coastal). Source: Data obtained from Mees, Suykens, *et al.* (2016).

Characteristics of FRM

- FRM in Flanders is understood as **an aspect of climate change adaptation**, as water is one of the many environmental factors that is being altered by climate change. However, this relationship has only recently been acknowledged in the river basin management plans (RBMPs) – key tools for implementing the EU Water Framework Directive (2000/06/EC).
- We distinguish between **five FRM strategies**: flood risk prevention, flood defence, flood risk mitigation, flood preparation, and flood recovery (Mees *et al.*, 2016). Competences related to these strategies are divided over regional and federal levels in different governance arrangements.

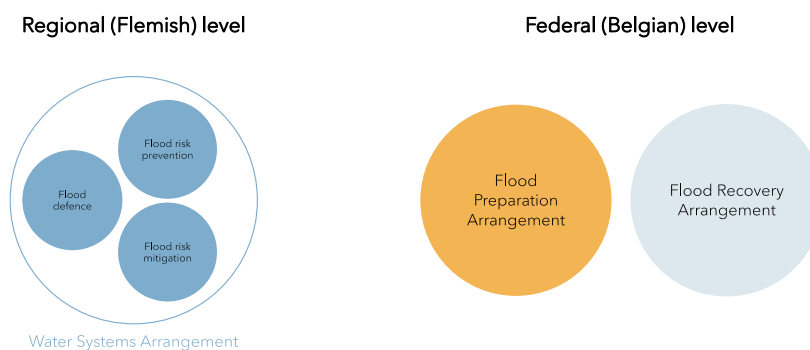


Figure 3. Overview of the different flood risk governance arrangements in Flanders. The Water Systems Arrangement includes the strategies of flood risk prevention, flood defence, and flood risk mitigation, and is governed at the regional level. The Flood Preparation Arrangements includes the strategy of flood preparation and is governed at the federal level. The Flood Recovery Arrangement includes the strategy of flood recovery and is also governed at the federal level.

Water Systems Governance Arrangement:

- Consists of the domains of **water management** and **spatial planning** and is characterised by a **fragmented actor structure**. Many governmental stakeholders are involved, divided over **regional, provincial, municipal, and sub-local levels** – stakeholders are responsible for different types of water courses (Mees *et al.*, 2016).
- These actors meet in the **Coordination Committee on Integrated Water Policy**, the principal actor for deliberating water policy in Flanders.
- There is a strong focus on the **three-step approach** (capture, storage, drainage) and **multi-layer water safety**, prescribing that equal attention should be given to flood prevention, protection, and preparedness, with shared responsibility between public and private actors.

Flood Preparation Governance Arrangement:

- Consists of the domains of **crisis management, emergency planning, and disaster relief** (Mees, 2017). Some risks require additional preparatory measures, for which provincial and municipal governments can draw up separate plans.
- Crisis response in Belgium is divided into three phases or **levels of action**. The appropriate phase is proclaimed depending on the size and nature of the emergency, the need for coordination, etc. Generally, crisis response starts at the municipal level and is lifted to the provincial or federal phase if necessary (Mees *et al.*, 2016).

Flood Recovery Governance Arrangement:

- Flood recovery is increasingly a **shared competence** between the federal government, private insurance companies, and regional governments (Mees *et al.*, 2016).
- Flood damage that is not covered by private insurance can in some cases be compensated through the **public disaster fund** (Mees, 2017). Once a flood is recognised as a natural disaster, the compensation procedure starts.



Figure 4. The River Scheldt flowing through the city of Antwerp, in Flanders. Source: Fotogeniek Antwerpen.

How and when are issues of equality and justice addressed in FRM? How does it link up with other policies, such as CCAP?

It is recognised that **climate change** is expected to slow economic growth, erode food security, and **increase inequality in Flanders**, and CCAPs underline the importance of justice and equality in this context. However, it is often not explained how these issues should be addressed. Although **flood risk management (FRM)** is an important aspect of CCAPs, **it is much more technical** and includes mostly **engineering solutions**. Overall, there is **little explicit recognition of justice and equality in FRM policy**. Interviews with FRM practitioners also show that they do not often experience injustices related to floods, and if inequality occurs, it is usually seen as a problem related to disaster relief.

Interest in the potential for floods and FRM policy to reinforce existing inequality is increasing, but a difference can be observed in how different experts understand this problem and see it as their responsibility. **Water managers are technical engineers**, specialised in reducing the physical risk of flooding. **Spatial planners**, for example, **are more sensitive to differences in socioeconomic and demographic characteristics that determine people's vulnerability to floods**. However, among all experts, uncertainty remains about who is impacted by floods and in what way, which groups are most vulnerable, and how to address this.

"We don't get exposed to inequality in floods much, because if floods occur, we can only collect data and inform emergency services [...]. Disaster relief and providing aid are tasks of the emergency services, that is regulated by law. The water manager has no obligations in this regard" (Interview, 26/08/2021).

"Water makes no distinction between rich and poor. [...] It is not just the impoverished neighbourhoods that experience flooding. We have never seen that. It is the average Fleming who is victimised by floods" (Interview, 27/09/2021).

What role for public participation?

Participation in Flemish FRM has increased rapidly in recent decades. In 2012/2013, a discourse emerged on **multi-layer water safety** in which responsibilities in FRM are shared between water managers, spatial planners, other governmental bodies and domains, and private stakeholders – including citizens. An example of citizen involvement in FRM is through property-level flood resilience (PFR). However, many water managers still believe that citizens should be **informed** of plans and projects, rather than actively included in decision-making processes. **Participation procedures in FRM are often used to reduce resistance and build support** for plans, while co-decision-making remains rare. Participation therefore runs the risk of being merely **symbolic**.



Figure 5. Multi-layer water safety includes collective protection through, for example, dikes and embankments, preventing development of flood prone areas, as well as property-level measures such as building on stilts, flood gates, and facilitating water infiltration. Source: Dienst Integraal Waterbeleid.

"In practice, water managers start participation processes with a few possible measures in mind and attempt to get citizens to propose the same measures. People feel like they came up with the plans together and that they contributed, resulting in more support" (Interview, 29/09/2021).

Is there knowledge and capacity-building on social inequalities?

There is abundant environmental, hydrological, technical, and ecological data on flood risks available in Flanders. Maps showing **social vulnerability to floods** also exist in Flanders, which include data on various socioeconomic and demographic indicators. However, interview respondents explained that these maps are not publicly available and not used by water managers when deciding on strategies to be implemented, because these choices are often made based **on cost-benefit analyses (CBAs)**. Justice concerns often do not have a monetary component and are therefore difficult to integrate in CBAs.

Knowledge on differences in the capacity of people to deal with floods does exist, but this is overlooked within the domain of water managers due to their technical and engineering focus. Knowledge and information sharing between domains is therefore imperative.

Administrative region: Flanders
Timeline: 2011-2022
Type of flood: Pluvial and fluvial flooding
Surface area and number of households involved: 1.57 ha, ~60 households



Case description

Residents in Beerse regularly suffer from **flooding**, often due to **heavy rainfall events** causing the Laakbeek (part of the Scheldt River basin) to overflow. The Laakbeek is characterised by a **pluvial regime** with large differences in the flow rate. Based on hydrological and hydraulic simulations, the Province of Antwerp decided to establish a **flood retention area** designed as a **nature-based solution** along the Laakbeek, to reduce flood risks further downstream. The measure can be seen as a combination of **flood risk prevention** and **mitigation**.

Stakeholders involved

Province of Antwerp, Department of Integrated Water Policy: initiated the project, conducted modelling simulations to determine the optimal strategy to reduce risks, provided funds (75%) for land acquisition, organised participation events together with the municipality.

Municipality of Beerse: provided funds for land acquisition (25%), organised participation events together with the province.

Interreg CO-ADAPT: provided funds for participation and to hire consultancies.

Previous landowners: initially were not willing to sell their land for the retention area, extensive negotiation processes followed including a legal battle with the province.

Regionaal Landschap Grote & Kleine Nete: provided expertise on the history of the land, local landscape and vegetation, translated numerical modelling results to local residents, acted as a 'neutral' or mediating partner in negotiations.

Consultancies: specialised in stakeholder engagement to support participation events.

Approx. 60 residents: involved in the design of the flood retention area during two participation events.

The area is 1.57 ha in size and located in a depression. The province bought the land from private owners in 2017. The neighbourhood was involved in the design of the flood retention area through **participation events**. The flood retention area was officially opened in November 2022.

Figure 7. Focus area. Source: [Dienst Integraal Waterbeleid, Provincie Antwerpen](#).



Figure 8. The area that will be transformed into a flood control area. Source: Dienst Integraal Waterbeleid, Provincie Antwerpen.



Figure 6. Residents working on the design of the flood control area during one of the participation events. Source: Dienst Integraal Waterbeleid, Provincie Antwerpen.

SOLARIS key issues: co-creation and tokenistic participation?

The project in Beerse was initiated by flood risk engineers from the Province of Antwerp, characterised by their **technical background** and **expertise**. The aim is often to reduce the physical risk of flooding through engineered solutions. Overall, there is a **lack of knowledge** on social vulnerability at higher levels of government, and more specifically within the domain of water management. As a result, the project initiators did not specifically consider the potential impacts of the project on socially vulnerable groups.

Whilst **participation events** were organised, questions remain around the inclusivity of the events as well as on the influence of residents on the outcome of the project. Socially vulnerable communities were not specifically targeted, and it is therefore conceivable that their interests and needs may have been overlooked. Often, local-level governments have more **contextualised knowledge** on the neighbourhood in which projects are being implemented. However, the Municipality of Beerse was not a full partner in this project.

Existing data

- Report: [SOLARIS Belgium Report \(2024\)](#).
- Report: [Assessment report of the focus area \(2017\)](#).
- Report: [Residents' participation in the Laak Beerse flooding area \(2019\)](#).
- Flyer: [Design of the flood control area](#).
- Paper: [Paauw & Crabbé \(2023\)](#).

How and when are issues of equality and justice addressed in FRM?

The neighbourhood surrounding the flood retention area is not considered as socially vulnerable. Households are characterised as middle-class with intermediate to higher education levels, **there is no social housing, and strong social ties between residents exist. Age might be a factor contributing to vulnerability.** However, importantly, the flood retention area is meant to reduce flood risks further downstream, and in the development of the project, no attention was attributed to the socioeconomic and demographic characteristics of people living there. **Justice and equality concerns were not on the radar of the project initiators.**

The flood retention area exemplifies another issue of recognition justice. Before the Province of Antwerp bought the land, it was owned by a family who intended to build on their land. **This conflict of interest resulted in a legal battle that significantly delayed the project,** even though flood risks downstream still existed. **Financial compensations are also required by law to compensate the previous owners** for the loss of their land. In other words, **the previous landowners had the power to delay, or even prevent, the construction of the flood retention area** and their interests were protected by planning policy, while the needs of potentially vulnerable communities downstream were overlooked. **The lack of attention to justice and equality can be explained by the technical expertise of the project initiators.** The project was developed by water managers, whose main expertise lies in reducing the physical risk of flooding through engineered solutions. Considering injustices in the design of the area was not seen as necessary for the success of the project.



Figure 9. Construction of the flood retention area. Source: Province of Antwerp.

What role for public participation?

Residents were involved in the design of the flood retention area in Beerse through, what the project initiators called, co-creation processes. **However, the project initiators did not actively think about whose opinions were important to include in these processes and whose might be forgotten** (such as those living downstream of the flood retention area). Socially vulnerable groups were also not necessarily targeted. **It remains unclear who was not reached and did not participate in the project, what their socioeconomic and demographic characteristics are, and which needs may not have been heard.** Furthermore, the primary objectives for the flood retention area had already been decided on before the co-creation events, and residents were not invited to provide input on this. Their impact remained limited to secondary aspects related to the design of the flood retention area, e.g., vegetation, benches, playground elements, etc. Interview respondents also indicated that one of the objectives of participation was to prevent resistance. **The 'co-creation processes' therefore partly remained symbolic and are unlikely to contribute to procedural justice.**

"I have no idea what the complete diversity of social profiles in the flood plains is. If we host information meetings, is that a good reflection of the people who effectively live in flood zones? [...] And for communication and different social profiles, I would not really know how to approach that"
(Interview, 27/08/2021).

Is there knowledge and capacity building on social inequalities?

The project initiators' understanding of the importance of justice and equality in the development of the project relates to the availability of knowledge about vulnerability and the capacity of people to deal with floods at higher levels of government in Flanders, and within the domain of water management. **Although national and regional-level socioeconomic and demographic statistics are available, they are insufficient to understand local needs and problems.**

The municipality, one of the stakeholders involved in the project, has more contextual knowledge of the neighbourhood in which the project is implemented and the needs of people living there. **Municipal authorities underline the importance of interdisciplinarity in mapping and tackling injustices and inequality in flood risks, as well as contextual knowledge.** However, the Municipality of Beerse was not a full partner in the development of this project.

"We need to include people from various policy domains such as urban planning, mobility, poverty, culture, and sustainability, as well as stakeholders from public social welfare centres in the municipality. [...] If you bring those people together, you will get a much more realistic idea of the vulnerable communities and their needs"
(Interview, 03/03/2022).

Administrative region: Flanders

Timeline:
2017-2019

Type of flood:
Fluvial and pluvial flooding

Surface area and number of households at risk: approx. 2000



Stakeholders involved

Flemish Environment Agency (VMM): initiated and funded the project, hosted an information meeting, hired experts to provide tailored advice to homeowners on the most suitable measures.

Municipality of Geraardsbergen: active role in communicating plans to residents and building support for the project.

Approx. 80 households: residents attended the information meeting and 83 signed up to receive tailored advice on the measures most suitable for their properties. Residents were responsible for implementing and funding the measures. 7 households fully implemented the advised measures, 18 households partly.

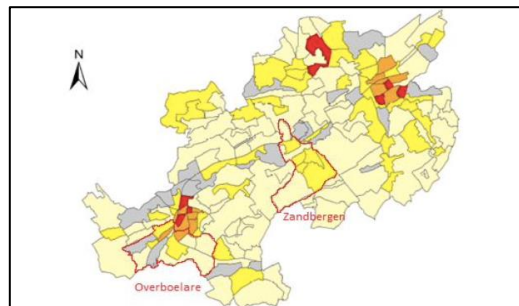


Figure 10. Social susceptibility to flooding in Geraardsbergen. Grey indicates resilient, red indicates extremely socially vulnerable. Source: Coninx & Bachus (2008).

Existing data

- Report: Results of telephone survey "Analysis of Property-level Flood Protection pilot projects 2015-17" (2019)
- Report: [Vulnerability of people towards floods: the development of a social flood vulnerability index.](#)
- Report: [Analysing and evaluating flood risk governance in Belgium \(2016\).](#)
- Papers: [Dieperink et al. \(2018\)](#), [Goosse et al. \(n.d.\)](#).

Case description

Floods in Geraardsbergen often occur after **extreme rainfall events** due to its location in the hilly Dender valley. The Dender is a tributary of the Scheldt River and is characterised by large fluctuations in its discharge regime. **Continued urbanisation** combined with climate change increases the amount of water the Dender needs to discharge. Large floods occurred in November 2010, January 2011 and June 2016.

The project of the VMM in Geraardsbergen focuses on **property-level flood resilience (PFR)**, e.g. waterproof interior materials or flood gates. PFR is classified as a **flood risk mitigation** measure. Property-level measures are needed because collective flood protection is insufficient to prevent floods, and it has been argued that PFR is very effective in reducing damage from floods. Households could sign up for the project to receive **tailored advice** on the measures most suitable for their properties.

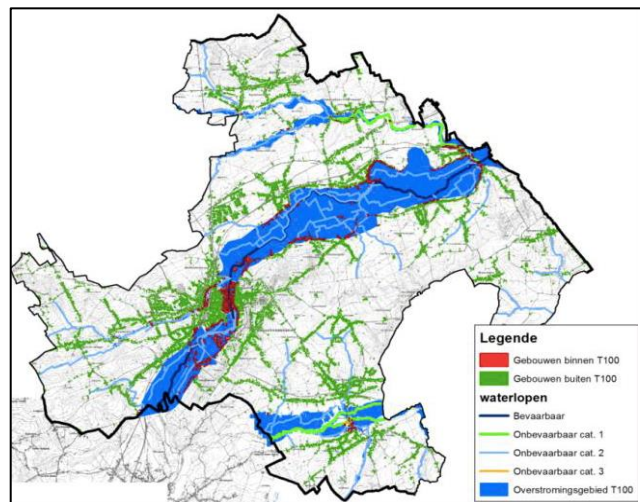


Figure 11. Modelled flood area in Geraardsbergen with a statistical return period of 100 years and an indication of the households located within the flood area, indicated in red. Source: VMM.

SOLARIS key issues: PLP and social vulnerability to floods

Geraardsbergen and the surrounding area are characterised by a **diverse set of social profiles**. Geraardsbergen's city centre is considered as highly socially vulnerable, whilst at the same time also experiencing **high flood risks**. These vulnerabilities will determine the capacity of residents take up responsibility in FRM through the implementation of PFR measures – potentially resulting in a situation where those who socially vulnerable are less well protected and less resilient to future flood events.

Social vulnerability and the resulting inequality and justice concerns were not actively considered in setting up this project. The goal was to provide everyone with the option to receive advice on the most suitable measures, and no attention was given to the ability of people to actually implement the measures. Residents can apply for a subsidy from the municipality to cover part of the costs, however this covers only up to €250. In the context of participation, **residents were not consulted** in the development of the project. They were invited to the information meeting, but they were not given the opportunity to voice their concerns on the feasibility and suitability of PFR measures for themselves or for their neighbourhood.

The lack of attention to social vulnerability in the development of this project could be explained by the technical knowledge base and expertise of those who initiated the project, as the project was set up by **water managers** from the VMM. The link with other policy domains, such as **poverty, housing, or integration** was not made. Furthermore, municipal policy makers often have more knowledge on social vulnerability and the needs and interests of local residents. The municipality was not a full partner in this project.

How and when are issues of equality and justice addressed in FRM?

Geraardsbergen and the surrounding area is highly vulnerable to flooding, with a high damage potential. Over the last decades, fluvial floods from the Dender river have caused flood damage on multiple occasions. Pluvial floods, which can cause mudslides and put pressure on the sewage system, occurred for example in 2016 and 2021.

Most potential **collective flood protection** measures, such as dikes or flood retention areas, have been implemented in Geraardsbergen. However, **these have proven to be insufficient to reduce flood risks**. The VMM therefore stimulates PFR. However, Geraardsbergen is also characterised by a diverse set of social profiles, with large differences in socioeconomic status. Especially the city center is socially vulnerable, but also highly vulnerable to floods.

A focus on PFR raises important questions around the capacity of people to implement the measures (e.g., sufficient financial means, mobility, health) and its consequences for building flood resilience for all. **FRM policy documents are technical and do not recognise differences** in the capacity of residents to implement their own flood risk reduction measures. There is little attention to the justice and equality concerns raised by PFR. These concerns were also not actively taken along by the VMM, who initiated the project in Geraardsbergen. They do recognise that PFR has the potential to reinforce inequality and argue that there is an opportunity to take this into account in the follow-up process through financial support for those who need it.

What role for public participation?

An information meeting was organised for residents in Geraardsbergen, where they could receive information about the need for PFR and were given the opportunity to receive personalised advice on the measures most suitable for their houses. **The project initiators recognise that it is more difficult to reach socially vulnerable communities**. However, no efforts were made by the VMM or the municipality to ensure that socially vulnerable groups were present at the information meeting. Questions therefore remain around who did not attend the information meeting, and what the main reasons were.

In addition, the actual uptake of PLP measures also remains limited. The main reason for residents to decide against PFR implementation remains unclear, although a major factor is expected to be costs, flood risk awareness, and a sense of urgency.

"I think the information meeting in 2018 was a very good initiative in itself. Only one important aspect was missing, and that is the link with other policy domains such as poverty. [...] And I think these two policy domains should have been brought together. Now it is only the policy domain of water management, or technical matters, that focuses on the problem of flooding. [...] But to my knowledge, the domains of water management, poverty, and maybe also integration, have not worked together on PFR and that is a major flaw" (Interview, 09/08/2022).



Figure 12. Floods in Geraardsbergen. Source: De Morgen.



Figure 13. Example of PFR. Source: Climate Just.

"Now, especially with those energy prices skyrocketing, if people are expected to invest in protecting their homes from flooding, I don't think there will be many who can afford that. If they have to choose between buying food and paying rent or protecting their homes from potential future flooding, they will choose food"

(Interview, 02/09/2022).

Is there knowledge and capacity building on social inequalities?

The **VMM did not actively consider differences in vulnerability or the capacity of people to take up PFR in Geraardsbergen**. This could be explained by their technical approach, as well as the fact that the VMM is a regional organisation that works at the Flemish level. Experts are further removed from local issues. The link with other policy domains, such as poverty, housing, or integration was not made in the development of this project.

National and regional-level socioeconomic and demographic statistics are available for the area, but these **remain insufficient to fully understand local needs and problems**. The municipal government and town councils are likely to have a better feeling of local issues and resident needs and may be better equipped to consider differences in the capacity of people to deal with floods. **However, the Municipality of Geraardsbergen was not a full partner** in the development this project. Increased collaboration between policy domains in FRM, as well as with lower levels of government, could increase the availability of information on how to consider justice and equality concerns in PFR.

England

Case studies

Lower Thames

West Sussex

Types of flood risks & recent events

There are five main forms of flooding in England: fluvial; coastal; surface water flooding; sewer flooding; and groundwater flooding (Environment Agency, 2020), which present a genuine danger to property and human life and wellbeing. **Around 5.2 million properties in England, or one in six properties, are at risk of flooding** (Environment Agency, 2009: 3)

The diversity in the UK's climate, geology, and land use result in high levels of variability in flood events and flood risk (Marsh *et al.*, 2016). Figure below shows average rainfall distribution between 1981 and 2010 (left), whilst the right image shows rainfall distribution in the autumn of 2019 as a percentage of the 1981-2010 average. In this event the heaviest rainfall was experienced in eastern areas that typically experience lower averages (Lincolnshire, Nottinghamshire, East Riding of Yorkshire, and Leicestershire).

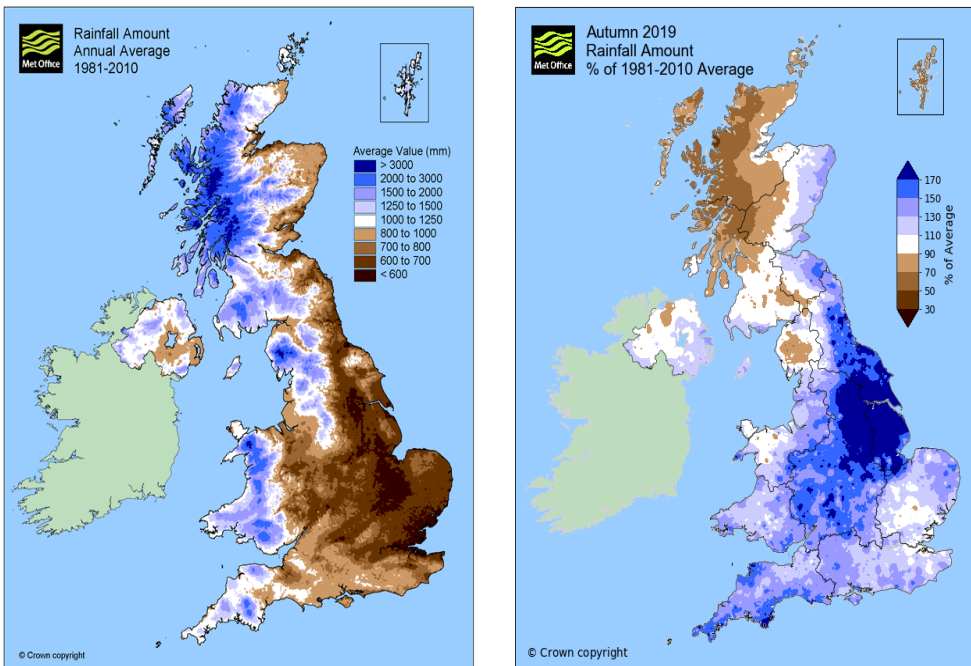


Figure 14. Maps to show the distribution of average rainfall amounts in the UK (1981-2010 - left) and that of Autumn 2019 as a percentage of the averages from the same period (right), demonstrating the variability of flood events. Source: The UK Meteorological Office.

The geology of the UK also plays a big role in surface run off and groundwater flooding. Additionally, areas of soft bedrock such as limestone can cause planning and development restrictions due to the dangers of erosion and sinkholes forming.

Flood risk is influenced by land use change; population growth; ageing drainage infrastructure; and natural processes (Alexander *et al.*, 2016).

Coastal erosion and flooding are also major concerns, with 45.6% of the English coast protected in some form (Kirby *et al.*, 2021), and parts of the east coast suffering the fastest erosion rates in Europe.

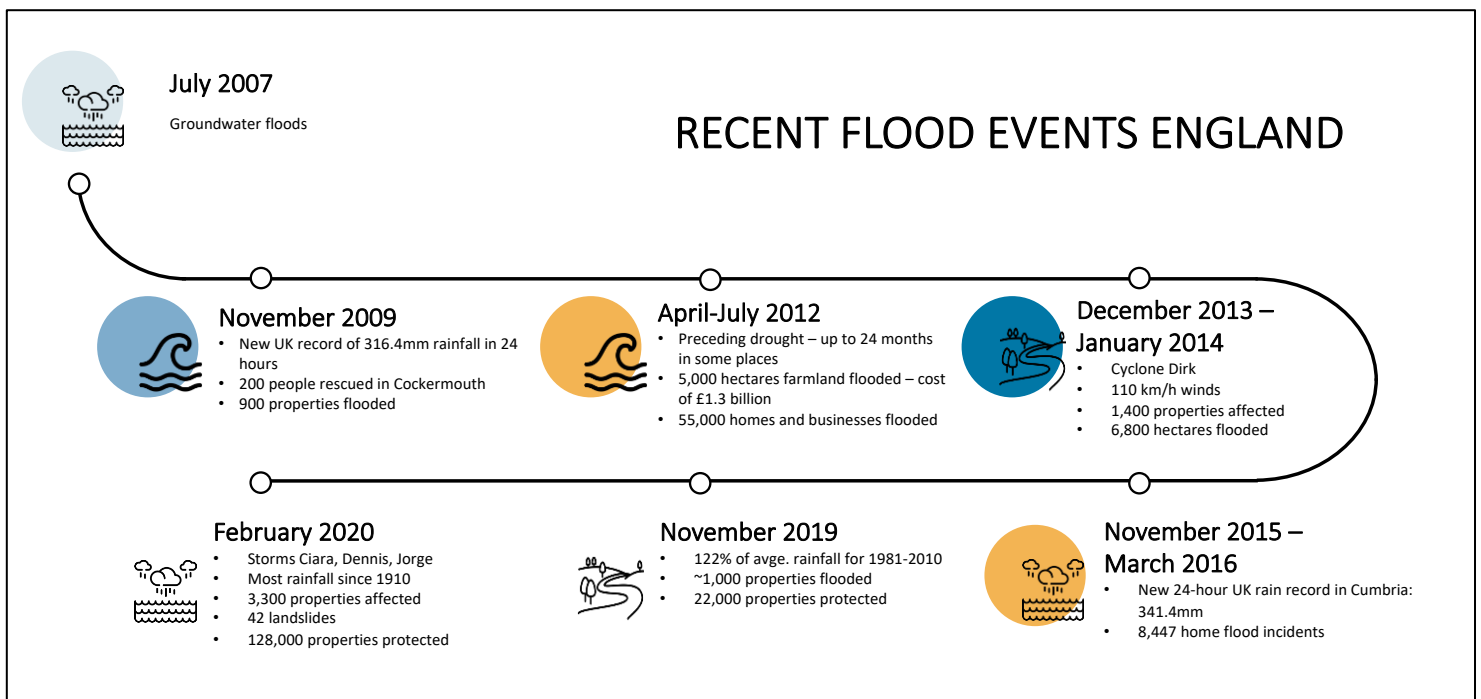


Figure 15. Timeline showing major flooding events affecting the UK since 2007.

Characteristics of CCAP in England

Climate change mitigation and adaptation actions in England are guided by **two main documents**:

- The Third National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting (DEFRA 2023)
- Climate Change Act 2008

In addition, there **are several key supporting documents and frameworks**:

- Independent Assessment of UK Climate Risk: Advice to Government For the UK's third Climate Change Risk Assessment (CCRA3) (Climate Change Committee, 2021)
- National Planning Policy Framework (NPPF)
- The UK Government Resilience Framework

CCAP actions are also integrated into other plans, such as *A Green Future: Our 25 Year Plan to Improve the Environment* (HM Government, 2018)

Characteristics of FRM in England

Flooding is a key topic in the NAP. The NAP is organised to respond to the climate change science outlined in the CCRA3 report. **This helps to draw a direct parallel between the CCRA3 assessments and corresponding actions.**

The NAP outlines policy responses to flood risk on a **sector-by-sector basis**, including energy, transport, telecommunications, healthcare, and cross-sectoral risks. The various governing bodies within these sectors are responsible for preparing plans to detail their preparedness for these risks. Three key elements of NAP are the **planning response to flooding** (as guided by the NPPF), **nature-based solutions to climate adaptation**, and the **FRM-specific Flood and Coastal Erosion Risk Management (FCERM) Policy**.

All five FRM strategies are implemented in England: flood risk prevention, flood defence, flood risk mitigation, flood preparation, and flood recovery.

Flood risk prevention through stringent spatial planning, as well as recovery through emergency response and property insurance are particularly strongly developed.

Flood and Coastal Erosion Risk Management

The Flood and Coastal Erosion Risk Management Policy Statement (FCERM-PS) (Defra, 2020) outlines 5 policy areas:

- Upgrading and expanding our national flood defences and infrastructure
- Managing the flow of water more effectively
- Harnessing the power of nature to reduce flood and coastal erosion risk and achieve multiple benefits
- Better preparing communities
- Enabling more resilient places through a catchment-based approach

Under each of these 5 policies the Government uses the FCERM-PS to communicate a) progress so far, b) its vision for the future, and c) 'our actions' (intended). This form of communication appears to act both help. Following the general trend towards the devolution of **more FRM responsibilities to las a form of accountability to the people** but also to clearly outline the ways that the government has helped and intends to **ower governance levels in England** (see Wiering *et al.*, 2017) the FCERM-PS highlights the importance of property level flood resilience, as well as partnership funding.

Governing FRM in England

In terms of policy implementation, and managing flood risk in England, there is not one organisation with overall responsibility. FRM is a shared approach between a number of different actors at different levels. At national level the **Environment Agency** is responsible for implementing FCERM policy and distributing the necessary funding (the Department for Environment, Food & and Rural Affairs – **DEFRA** – leads on this national policy formation. The insurance industry collectively shares flood risk liability through a scheme designed with government – **FloodRe**.

County councils are the highest level of **local government**. These are often the designated Lead Local Flood Authorities and coordinate FRM from all sources of flood risk. The technical work is supported by the **Internal Drainage Boards** and **the water and sewerage companies**.

District, borough, and city councils review flood risk in planning applications. Power to carry out work on ordinary watercourses and fix local flood issues. **Riparian owners** carry a major responsibility for FRM by being mandated to keep waterways of all sizes that run through or adjacent to the property flowing freely. **Town and Parish communities/councils** are the lowest form of government in England and instrumental in assessing flood risk and preparing flood plans. **Coastal groups and flood action groups** provide opportunities for citizen engagement in localised FRM. The **National Flood Forum** helps coordinate the work of the latter.

How and when are issues of equality and justice addressed in FRM at the national level? How does it link up with other policies, such as CCAP?

There is limited explicit attention paid to justice and equality in national FRM policy in England (i.e. FCERM). At best, this makes passing references to community, place, and public involvement in FRM.

The strongest mechanism for making FRM fairer in England is the Grant in Aid (GiA) funding calculator. Since 2012 there is a limit on the number of pence per pound that can come from central government to fund FRM schemes. The rest must be sourced locally through partnership funding (using the GiA), which is credited for making the schemes more tailored to local needs. The top 20% most deprived households according to the index of multiple deprivation do receive a greater 'scaling factor'. Some evidence remains, however, that purely economic basis of this calculator misses some nuances of FRM needs.

The CCRA3 report is instrumental for CCAP in England and its focus is shifting towards the impact that flooding (and other climate change processes) will have on the key 'societal goals' referred to Government policy and in the United Nations Sustainable Development Goals (SDGs). Crucially, the CCRA3 acknowledges the unequal distributional impacts that climate change will have.

"This is the irony and it comes back to the flood and coastal risk calculator. But it's based on economic value. So, something that's valuable like that [one isolated patch of farmland] is therefore up for protection. Even though intuitively it's a rather crazy thing to carry on doing."
(Interview, 08/06/2023).

What role for public participation?

England has well-established public 'consultation' mechanisms. These can be used for building applications (planning), local development or neighbourhood plans, 'white papers' published by Government to set out future legislation, and draft national policy. The FCERM Strategy aims to place local people and partners "at the heart of making local choices about the best combination of resilience actions for achieving greater flood and coastal resilience in the places in which they live and work."

Interviews suggested that a constraining factor in participation in FRM is **that FCERM funding does not include funds for engagement**. However, the EA is investing considerable resources in improving its engagement capacities, such as through specialised internal training.

Whilst the Environment Agency is hampered by its size (slower to adapt) and the pace of climate change, there is evidence from SOLARIS that it continuously reviews its engagement processes. For example, the stakeholder engagement sections of the guidebooks for the restoration of seagrass, saltmarsh, and of 'estuarine and coastal habitats with dredged sediment' clearly demonstrate a willingness to improve practices (Gamble C. *et al.*, 2021; Hudson *et al.*, 2021; Manning *et al.*, 2021).

"The FCERM Strategy was developed collaboratively, and we were one of the collaborators, over a couple of years. But the final draft that communities were involved in (...) and what came back out of DEFRA are two rather different things. In two main ways. Firstly, the level of ambition is not there...And the second thing was that it got rewritten. So, the language got changed from being collaborative and more sympathetic, to being very ministerial and top-down."
(Interview, 30/03/2022).

"...but now we're thinking and aiming for this engagement training and that sort of thing to become a lot more external facing..."
"...alongside that, there's also this new training is still being developed, umm, by the Community Resilience Team, which includes modules like dealing with change and uncertainty..." (Interview, 13/06/2023).

What knowledge and capacity-building on social inequalities?

Interviews suggest that the constraints on the flow of knowledge and on the building of capacities are significant. Perhaps most notably, **there is a severe strain on practitioners in FRM (and erosion) in England**. Responsible experts and practitioners are primarily engaged with the technical side of FRM: managing shorelines; maintaining defences; monitoring flows, etc. In many cases the capacity simply doesn't exist to expand into justice and equality considerations, and one retirement can have a significant impact on the effectiveness of responsible authorities, and on their internal knowledge.

There was little evidence in any interviews that the relatively rich data that exists at the national level in England on inequality, such as **the Indices of Multiple Deprivation**, are being used to guide FRM decisions. Even though systems have been explicitly designed for this purpose, such as the ClimateJust maps, the **uptake of this data seems to be primarily for research, rather than for FRM schemes**.

Administrative region: Various city and borough councils

Long running FRM schemes. 1970s - present

Type of flood: All types, but most commonly fluvial, surface water, sewer, and groundwater.

Surface area and number of households: Whole catchment 422 km². Households difficult to number. River Thames Scheme will protect 11,000 and 1,600 businesses



Figure 16. Map showing the approximate location of the case study area in relation to London.

Stakeholders involved

Environment Agency (EA) : National FRM body that supports municipal actions. One of the Risk Management Authorities (RMAs)

Slough Borough Council : Local authority with FRM responsibilities with EA (also an RMA)

Surrey County Council : as for Slough

Thames Water : RMA

Flood Action Groups : Help to support vulnerable people and flood victims. Guidance provided by the National Flood Forum.

Wildfowl and Wetlands Trust : Conservation NGO – leading on community engagement in Sponge City project

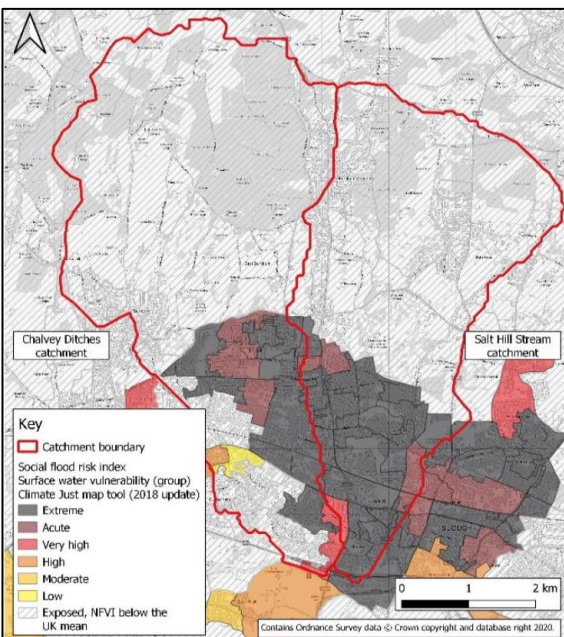


Figure 17. Social flood risk index, surface water vulnerability for two catchment areas. Source: Climate Just map tool (2018).

Case description

The case study area lies directly West of London. This stretch of the Thames passes through several settlements of interest, including Charvil, Twyford, Maidenhead, Slough, Windsor, Datchet and Staines-upon-Thames. These towns span the counties of Berkshire and Surrey. The area suffered widespread flooding in the winter of 2013/14. The main types of flooding are fluvial, surface water, and groundwater. Slough is making a concerted effort to tackle surface water flooding, in collaboration with the neighbouring county of Berkshire. This is partly through a resilience innovation fund grant and the design of a Sponge City.

RTS:

- Environment Agency
- Surrey County Council
- Datchet to Teddington
- 11,000 homes
- 1,600 businesses
- £501m total



SOLARIS key issues : incorporating justice over time and space

This case study covers a large area and a diverse range of settlements and landscapes. The sheer size of the total Thames River Basin (16,200 km² and 15m people) means that it has been split into 20 management catchments. Given these challenges of scale, SOLARIS took a higher level scoping approach to the core justice and equality issues. The case was informed by the RTS Scheme, the Jubilee River scheme, and the Slough Sponge City project. A project-based approach to flood risk management means that communities may be recognised differently, processes and outcomes may differ.

Jubilee River – conceived in the 1980s and completed in 2002. It protects 3000 properties from fluvial flooding. At the time of conception and construction, the Jubilee River was seen as a flagship example for the scale of extensive stakeholder consultation for an FRM project. Since then, this has become much more institutionalised. **Many protected areas are affluent.**

RTS - Engagement has been very extensive. This revolves around the recreational use of space. This is because the engineering plan for the scheme has been completed. There is capacity to meet other policy objectives, such as those defined by *Active Travel England*, and opportunities to build recreational spaces. Surrey County Council is providing a benchmark for policy integration by aligning the benefits of FRM with other social benefits. The Council is very well funded.

Slough Sponge City – This demonstrates how a local authority handles Flood Risk Management in times of bankruptcy whilst aiming to place the community at the centre. The sponge city is now less ambitious. There has been an emphasis on Sustainable Urban Drainage Systems (SuDS), which are the main FRM measure in Slough and neighbouring Berkshire. The Wildfowl and Wetlands Trust is leading on stakeholder engagement. Outsourcing these tasks to the WWT through partnership helps secure human resources for the task. The project can build on lessons learned during the national Flood Resilience Community Pathfinders Scheme (2013-2015), which assessed the high cultural diversity and deprivation in Slough, in the context of flood risk.

Existing data

- Report: [SOLARIS England Report \(2024\)](#).
- Report: [Flood Risk Management Strategy for Slough \(2013\)](#).
- Report: [Slough Local Development Framework \(2008\)](#).
- Report: [Interim Local Strategic Statement for Surrey \(2017\)](#).
- Report: [Flood Resilience Community Pathfinder: Final Evaluation Report \(2015\)](#)
- Report: [Analysing and evaluating flood risk governance in England – Enhancing societal resilience through comprehensive and aligned flood risk governance arrangements \(2016\)](#).

How and when are issues of equality and justice addressed in FRM?

The Community Flood Resilience Pathfinder Programme in Slough focussed on piloting engagement methodologies with communities between 2013 and 2015. **The Slough Pathfinder project recognised that working with communities to tackle flood risk was crucial.** It also recognised that some communities were easier to work with than others, often on cultural and linguistic grounds. Other aspects, such as distributive and procedural justice, were not explicitly addressed (Defra, 2015). The focus of the interventions was on setting up community-led Flood Action Groups. Those that were more successful in achieving results were in more affluent areas with greater social capital. Slough's present Sponge City project **explicitly recognises social justice issues, but only at a conceptual level** and it does not disaggregate different aspects. There are several workstreams that range from technical innovation to using volunteers, to working with communities. The current Slough City project fails to recognise any other flood risk management outcomes in the region and address inequalities exacerbated by past decisions and actions.

“The Slough case is interesting as it directly links non-FRM-related deprivation issues with the context of providing FRM. This is because the Council is officially bankrupt. This status puts a huge strain on the resources required for the Council to provide its normal services and officials working on the Sponge City concept have been “subjects of regular inquisitions by the Environment Agency to how we could, and whether we could continue to run the project, or whether the project should be pulled.” (Interview, 02/03/2023).

“Most grant programmes highlight equality as a core requirement, but in flood risk management projects in England this rarely leads to practical action to address different types of equality.” (Written correspondence, 30/03/2022).

What knowledge and capacity building on social inequalities?

The River Thames Scheme has run many consultations but has a mainly engineering basis due to the large area and hydrological challenges. Most of the knowledge comes from this perspective. It is acknowledged that there are differences between areas within the region (some areas are more socially deprived than others) and this partly recognised in the allocation of central funds. However, this occurs on a project-by-project basis. There is little capacity to recognise these differences in a wider context when considering the outcomes of flood risk management for affecting social inequalities.

What role for public participation?

This case study offers some encouragement because **there is attention paid to policy cohesion, which supports participatory processes.** Figure 1 below demonstrates how the local flood risk management strategy is explicitly linked to other policies, in this case transport policy. This policy integration has helped support the national (EA) place-making objectives. All policy areas share the promise to put people at the centre of decision-making processes. Interviews suggest that this has nourished a sense of involvement and confidence in policy. The fact that Surrey is a wealthy council is worth mentioning in relation to this finding.

[a family with a young girl enter and...] *“they're saying that firstly they want to know ‘does it stop us from flooding?’ and we go [checks map], yes it will”. And then when you start asking look, but what else would you want from it? And then ‘Ohh didn't realise, I don't know. There's no playgrounds near us or there's no access for my kid to go and enjoy countryside. And you go, right, well, let's have a look at you know, we can build that into the scheme if that's what the community are after.” (Account from a River Thames Scheme public consultation event).*



Figure 18. Local Flood Risk Management Strategy interaction with other Surrey County Council strategies. Source: [Surrey Local Flood Risk Management Strategy 2017-2032](#), p. 24

Administrative region: West Sussex County Council; Chichester District Council

Timeline: 2008-2013

Type of flood: Mainly surface water and coastal inundation

Surface area and number of households: Total West Sussex surface area is 1,991 km² but flood risk area is more limited. 109,000 residential and commercial properties deemed to be at risk of flooding.



Stakeholders involved

Environment Agency (EA) – National FRM body that supports municipal actions. One of the Risk Management Authorities (RMAs).

Chichester District Council– Local authority with FRM responsibilities with EA (also an RMA).

West Sussex County Council

Arun District Council

Flood Action Groups – Help to support vulnerable people and flood victims. Guidance provided by the National Flood Forum.

Royal Society for the Protection of Birds – Nature conservation NGO



Figure 19. Medmerry nature reserve and nature-based solution. Source: Destination Selsey.

Existing data

- Report: [SOLARIS England Report \(2024\)](#).
- Reports: West Sussex County Council, [Local Flood Risk Management Strategy \(2014\)](#), [Strategic Environmental Assessment \(2014\)](#) and [Climate Change Strategy Development Plans](#).
- Report: Shoreline Management Plans ([No.12](#) and [No.13](#)).

Case description

This coastal case study covers the administrative areas of Chichester District and Arun District within the county of West Sussex. The Office of National Statistics estimates a population for Chichester District of 120,192 and of around 159,827 for Arun District. The main coastal towns and cities across the two districts are Chichester and Selsey (Chichester District Council) and Bognor Regis and Littlehampton (Arun District Council). **Much of West and East Sussex is made up of the South Downs National Park** (The 'South Downs'). This is important for FRM as **there are strict building regulations in the South Downs, resulting in a 'coastal squeeze, and limited space for new housing.** Surface water flooding poses the largest risk in West Sussex, with 91,200 properties at risk (compared with sea and river risk: 12,500, and 5,500 at risk from both). Coastal erosion is a significant problem.

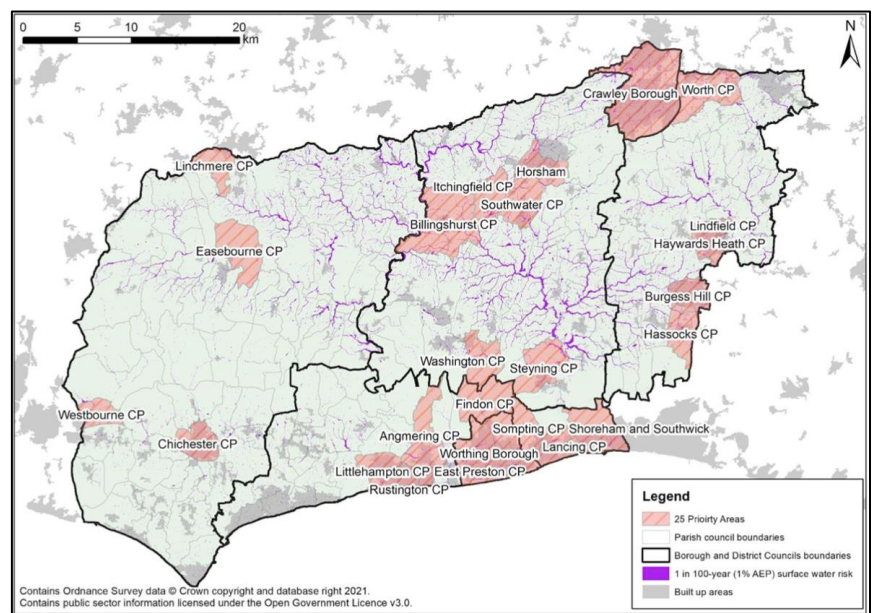


Figure 20. FRM priority areas as they will likely be presented in the new Local FRM Strategy for West Sussex, based on improved data and parameters.

SOLARIS key issues: justice complexity in light of multiple risks

This case has three main contexts for the study of SOLARIS concepts: surface water flooding from the South Downs; coastal erosion rates; and the Medmerry nature reserve (nature-based solution):

The overarching flood risk strategy for West Sussex is based on **surface water flooding as the main threat**. It follows that sustainable drainage systems (SuDs) constitute the main FRM strategy. The local strategy outlines clear objectives and tasks for this, including the responsible bodies and funding sources. **Large, privately owned housing estates exist in the area, with higher financial and social capital than neighbouring poorer communities.** This might aid the former in the process of seeking **FCERM GiA funding**.

There is a mix of hard and nature-based protection from coastal erosion and flooding. Some of the hard defences are privately owned and on private beaches (equality issue), whereas some are managed by the EA and local council.

The Medmerry realignment scheme was proposed as a win-win, nature-based solution to protect vulnerable habitats, such as for water voles, and also act as a form of coastal flood protection. Various actors with different agendas were involved in this process and engagement was poorly coordinated. However, the project enjoyed broad support.

Administrative region: West Sussex County Council; Chichester District Council

Timeline: 2008-2013

Type of flood: Mainly surface water and coastal inundation

Surface area and number of households: Total West Sussex surface area is 1,991 km² but flood risk area is more limited. 109,000 residential and commercial properties deemed to be at risk of flooding.

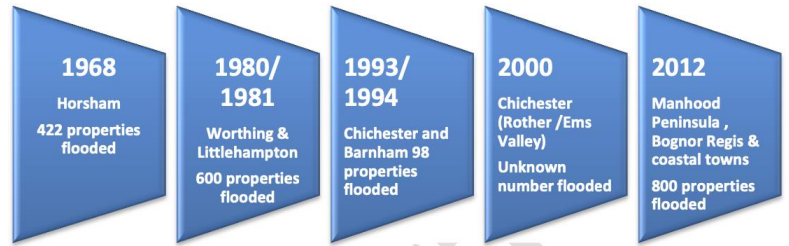


Figure 21. Timeline of the most serious flooding events in West Sussex. Source: Adapted from the LFRMS 1.

How and when are issues of equality and justice addressed in FRM?

The key policy documents for FRM in West Sussex do not engage explicitly with the topics of inequality and/or justice. The *West Sussex Local Flood Risk Management Strategy (LFRMS 1) 2013-18* focuses on surface water flooding and there is an emphasis on riparian owner responsibilities. As with the national level, **it does not address the range of citizen and community capabilities to manage water courses.** West Sussex County Council, in partnership with the Districts and Boroughs, have agreed to support key national objectives, including: **'Enable people, communities, business and public bodies to work together more effectively'**; and **'put communities at the heart of what we do'**. All Flood Risk Management Authorities (FRMAs) in West Sussex will need to demonstrate their progress in these areas.

The *Arun and Western Streams Catchment Flood Management Plan – Summary Report 2009* defines flood risk areas and designates policies for these, albeit without evidence for if or how social justice and equality factors were considered. The *West Sussex LLFA Policy for the Management of Surface Water, 2018* provides guidance on Sustainable Drainage Solutions (SuDs) but also does not engage with the topics of justice and equality. The local plan themes for FRM (as set out in the Chichester Local Plan: Key Policies 2014-2029) centre mainly on planning as a means of **avoiding "inappropriate development in areas at current or future risk, and [on directing] development away from areas of highest risk"**. There are several local interest groups who organise community involvement, such as Flood Action Groups and the Manhood Peninsula Partnership. From a coastal management perspective there are restrictions on the time available to practitioners:

"(It is) not a lack of interest, it's just a lack of time. You have to think: where do I want to spend my time? I could spend a lot of time working with the coastal groups, you know, residential groups and so forth. Or I could get on and do what I think is my professional job." (Interview, 09/08/2023).



Figure 22. Scenes of localised flooding during the 2012 event. Source: West Sussex County Council (2012).

What role for public participation?

The lack of dedicated FCERM funds for engagement causes problems locally in West Sussex. Local coastal protection engineers have informal interactions with people living at the coast while they spend time on the beach inspecting, upgrading, or planning sea defences. Very often these interactions come in the form of **curiosity, anger at a perceived lack of action, or a demand** to know how the Council is tackling the risk of erosion and/or flooding. Contact between local coastal communities and the authorities responsible for managing risk from erosion and/or flooding is:

"ad hoc at the moment. It isn't particularly planned" (Interview, 09/08/2023).

The West Sussex case study is unique in terms of the number of **privately-owned housing estates**, many of which are situated on the coast. These private estates are collectively owned by residents, so each house owner owns a share in the land. There is often a board of directors for the estate (about eight people for an estate of 350 houses near Bognor Regis) and a series of committees and sub-committees to help manage the estate. The collective financial and social capital of such neighbourhoods might help them overcome the challenges of kickstarting GiA funding applications, albeit without the 'disadvantage' of not containing any of the 20% most deprived households.

What knowledge and capacity building on social inequalities?

The responsibilities are well defined by the obligations of riparian owners to manage watercourses. However, the point at which authorities such as the County Council or the Environment Agency intervene is less well defined and appears to partly rest on the 'desire' of these two to act. The language of this excerpt appears to leave room for interpretation on a case-by-case basis.

Finland

Case studies

Helsinki Metropolitan Area

Kokemäenjoki catchment area

Types of flood risks & recent events

Finland experiences **relatively small flood dangers and rare flood-related casualties** compared to other countries due to its large number of lakes and low topography regulating water flows. Significant flood risks in Finland are often found in urban centers downstream of major rivers or at river intersections. Areas prone to frequent flooding include shallow river valleys in western Finland.

There are three main types of floods in Finland: fluvial floods (seasonal due to snowmelt, ice dams, or prolonged rains), coastal floods (caused by strong winds and Baltic Sea water level fluctuations), and pluvial floods (stormwater floods caused by heavy rainfall in urban areas). Frazil ice floods (early winter with severe frost and no ice cover) are also common.

22 significant flood risk areas cover over half of the mainland. In the event of an extreme flood, about 40,000 inhabitants and 25,000 buildings would be susceptible to flooding in these areas. **Nationally, average yearly tangible flood damages are about one million euros.**

Climate change contributes to increased risks of extreme hydrological events, such as urban pluvial flooding, summer droughts, winter floods, and frazil ice floods. Flood risks in large water bodies could double or triple by 2100. While flooding in Finland has primarily caused material damage, the potential for damage is projected to increase due to climate change.

Preparing for future flood risks is a priority in Finland, driven by the impacts of climate change and socio-economic development, including housing concentration in flood risk zones and an aging population

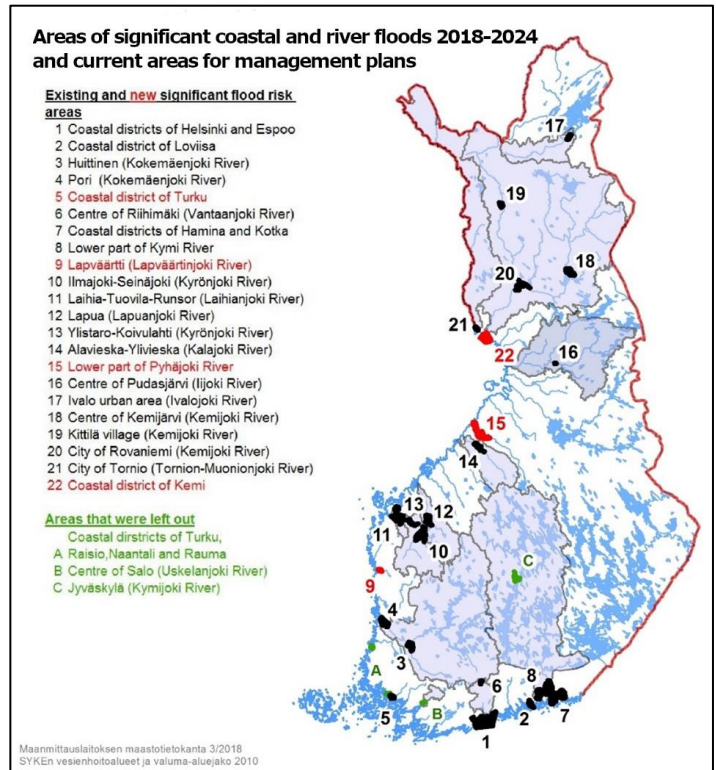


Figure 23. Areas of potential significant flood risk in Finland. Source: Ministry of Agriculture and Forestry (2018).

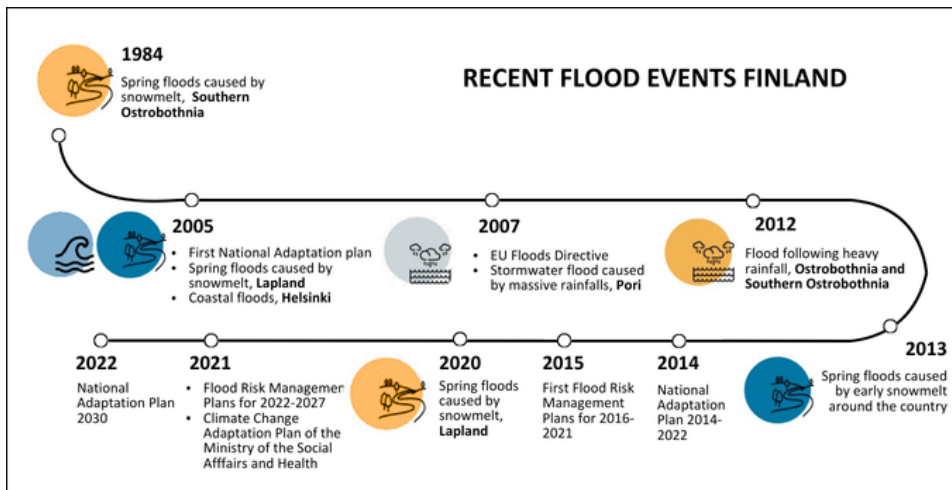


Figure 24. Timeline showing relevant Climate Change Adaptation (CCA) and Flood Risk Management (FR) policies and major recent flooding events.

Characteristics of CCAP in Finland

The Finnish government has been interested in climate change adaptation for two decades and has adopted various plans to reduce the adverse effects of climate change on human security, health and living conditions, nature, industries, infrastructure, and important societal functions (see figure on the left).

Flood risks are a priority in the National Climate Change Adaptation Plan, which aims to reduce the adverse effects of climate change. The plan is accompanied by a climate risk and vulnerability assessment, and some ministries have prepared their own sectoral plans to guide implementation.

While the policy discourse at the national level has favored adaptation, **adaptation planning in municipalities is based on voluntary actions, and there is no direct steering on adaptation policy** from the national level to lower levels of government. The variation in resources and capabilities to address climate risks may generate inequalities if smaller municipalities lack resources.

Characteristics of FRM in Finland

FRM in Finland is based on extensive, cross-sectoral, and cross-administrative cooperation between central, regional, and local authorities and other actors, manifested in the regional Flood Groups in each significant flood risk area, which are responsible for drawing up Flood Risk Management Plans (FRMP) and monitoring the implementation and follow-up of the planned measures.

The Finnish Flood Risk Act was implemented in 2010 to manage flood risks through multiple strategies to reduce the likelihood and potential consequences of flooding. The regulatory framework for FRM includes also other laws regulating water use, civil protection and rescue services, environmental protection, and climate.

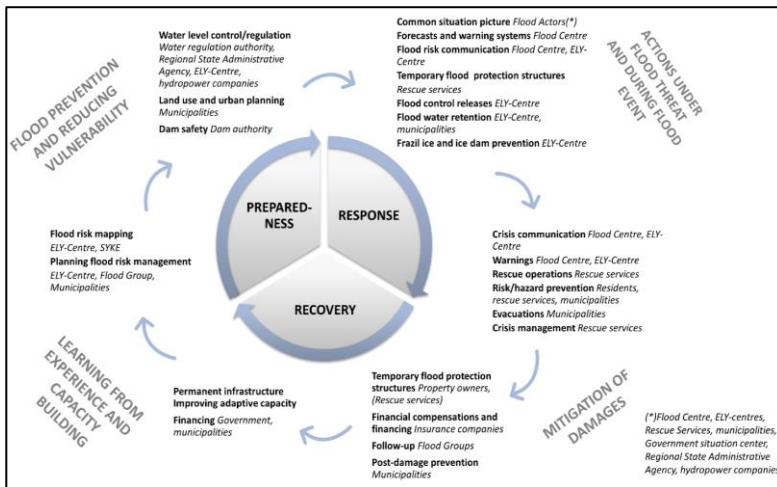


Figure 25. Illustration of the Finnish FRM cycle and the division of responsibilities of different activities between authorities and other actors. ELY-Centre = Centre for Economic Development, Transport, and the Environment. The Flood Centre is operated by the Finnish Environment Institute and the Finnish Meteorological Institute.

Flood defence strategy is a traditional pillar of Finland's FRM, alongside flood mitigation and preparation. Coastal and fluvial flood defence measures are implemented in a top-down manner and governed by the Flood Risk Act, Water Act, and Environmental Protection Act. Private hydropower companies have a role in regulating floods, as mandated by binding acts. Flood defence strategy is maintained through centrally managed decision-making, knowledge production, and financing structures, although environmental concerns and biodiversity protection pose challenges.

Flood Prevention is an important strategy in Finland's FRM. It is primarily governed at the regional-local level and institutionalized as a municipal task and land use planning activity (e.g., the Land Use and Building Act). Municipalities have operational responsibilities for planning and controlling construction, with cooperation between different levels of administration. Citizens have a role in municipal decision-making and are allowed to participate in planning processes, although challenges exist in integrating local experiential knowledge.

Flood Risk Mitigation is the least institutionalized strategy, and Finland's FRM does not explicitly address mitigation as a separate strategy. Nature-based solutions (NBS), particularly improving water retention in urban areas, are gaining importance. Implementation of NBS relies on experimentation and individual initiatives of urban planners and landscape engineers. Guidance and tools for planning green infrastructure have been developed to improve knowledge and awareness. Financial mechanisms, such as grants from regional authorities, support the restoration of riverbeds, embankments, and wetlands.

The responsibilities for **Flood Preparation and Response** are shared among regional and local actors. Division of duties is institutionalized and outlined in FRMPs based on the Flood Risk Act and Rescue Act. Operational readiness includes exercises, evacuation plans, rescue plans, and warning systems. Citizens and private property owners have responsibilities in preventing emergencies, protecting their property, and helping others during floods.

Flood Recovery: The 2010 amendment to the Flood Risk Act in Finland introduced a private flood insurance mechanism for compensating building damages caused by fluvial floods, while public property damages are covered by a separate public system. Since 2014, compensation for flood damages is provided through flood insurance included in home and property insurance, with coverage for exceptional floods occurring less frequently than once in 50 years. Municipalities are responsible for recovery actions, and regional authorities for the evaluation of the FRM system.

The main difference between FRM and CCAP in Finland is their political mandate. FRM is backed by the Flood Risk Act, which gives strong legal authority to different authorities to act in flood risk measures. CCAP is based on the Climate Change Act, which represents a general framework legislation without substantive legislation or assigned duties for municipalities concerning climate change adaptation.

How and when are issues of equality and justice addressed in FRM at national level? How does it link up with other policies, such as CCAP?

In Finland, the **issues of justice have not gained particular attention in the FRM policies**. There are currently no specific or institutionalised policy mechanisms at the national nor regional level to manage the differences in people's vulnerabilities to floods and flood-related emergencies.

Social impacts of FRM have been evaluated to some extent in official documents such as Government's proposal for the Flood Risk Act (HE 30/2010) and Flood Risk Management Plans but it appears that the evaluation lacks transparency in terms of the criteria used. According to the Government's proposal for the Flood Risk Act (HE 30/2010), the act was not expected to have any direct economic impact on private households, as the act did not include any obligations on households. In the proposal it was stated that the act would improve flood risk management planning and thus reduce damage to households. However, the proposal notes the fact that bearing the residual risk may entail costs, especially for those affected by stormwater flooding.

Floods and their social impacts have received increasing attention in the media. In recent years, news about needs to adapt to extreme weather events and their impacts such as floods have gained increasing attention. The focus of the flood articles has been on the planned flood risk management measures or on new research results.

We suggest interpreting the low attention of issues of justice in the Finnish FRM in the light of the relatively low human and economic losses caused by the floods thus far in Finland. The policy strategy chosen – to reduce people's physical exposure to flooding through flood defence and prevention measures and by relying on climate and flood scenarios – has worked well and there has been no acute need to explore vulnerability disparities further.

In the FRM documents, **there is a strong discourse of human interest but little sensitivity towards social dimension of flood risks or plurality among people**. Socio-economic impacts are evaluated while considering and prioritizing flood risk measures but often this is limited to the cost-benefit analysis. In the Flood Risk Management Plans (FRMPs), costs of potential flood damages are evaluated as part of the risk analysis. Inequity, inequalities or (in)justice are not explicitly mentioned in any of the analysed legal or policy documents.

What role for public participation?

In the FRM domain, there are **participatory requirements regulated by the existing law**. The **Flood Risk Act obliges regional authorities to allow everyone access to the proposal for the designation of significant flood risk areas** and the proposal for a flood risk management plan and their background documents, and to give them the opportunity to comment on the proposals in writing or via internet. **The Land Use and Building Act, guiding flood risk prevention measures, aims at ensuring everyone's opportunity to participate in planning**.

It appears, however, **that even the minimum level of participation is not very ambitious in FRM**. Participation appears to be occurring **on the level of consultation and informing (cf. Arnstein's ladder)**. The public authorities enable citizens to comment on proposals and documents, but public engagement is mostly driven framings of the authorities. The documents do not explicitly address the social engagement of vulnerable social groups or other targeted groups. **FRM policies have not explicitly discussed the intrinsic and instrumental values of participation**.

What knowledge and capacity-building on social inequalities?

Research and scenarios have guided CCA and FRM policy direction more than realised risks. It has guided policymaking in a proactive way, especially in relation to extreme weather events and their impacts. There is an abundance of high-quality environmental, technical, hydrological, socio-economic, and demographic data available for assessing flood risks. The central information system in Finnish FRM is the national Flood Information System, which is maintained by the Finnish Environment Institute.

Flood mapping is required by law in the areas with significant flood risk, and they are updated annually. The basis of the flood risk maps is the national building register, through which it is possible to obtain detailed information about the whole of Finland at the building level: the number of residents, the characteristics of the households, the age structure, etc.

Traditionally, the selection of measures, i.e., the selection of a flood strategy, is based on a cost-benefit analysis.

Multi-criteria decision analysis (MCDA) has also been used in the selection of FRM goals and measures. The impact assessments are mainly based on an expert assessment for each management area. Although an effort has been made to include impact assessments to people's livelihoods, social impact assessments lack perspectives related to differences between people's abilities, vulnerabilities, and inequalities.

Currently, the FRM does not make sufficient use of the available data. Statistics Finland publishes annual statistics on the income and educational level of residents and other socio-economic indicators at the level of the dwelling unit, but the FRM only uses data on the number of residents and the type of residential buildings. Information about the vulnerability of different groups of people to the effects of floods or how to survive them is not available at the national level.

Administrative region: Helsinki, Espoo, Vantaa, Kauniainen (municipalities)

Timeline: Spring 2022

Type of flood: Coastal, pluvial, and fluvial floods

Surface area and population: 3,697 km², 1,3 million

Case description

The coastal area of Finland's capital region Helsinki and Espoo faces significant flood risks due to high population density, important infrastructure, and changing land use patterns. The region is also vulnerable to floods caused by snowmelt and heavy precipitation. **Economic growth, land use change, population growth, and climate change** increase vulnerability to floods. Stormwater flooding is already increasing, adding pressure to manage these risks.

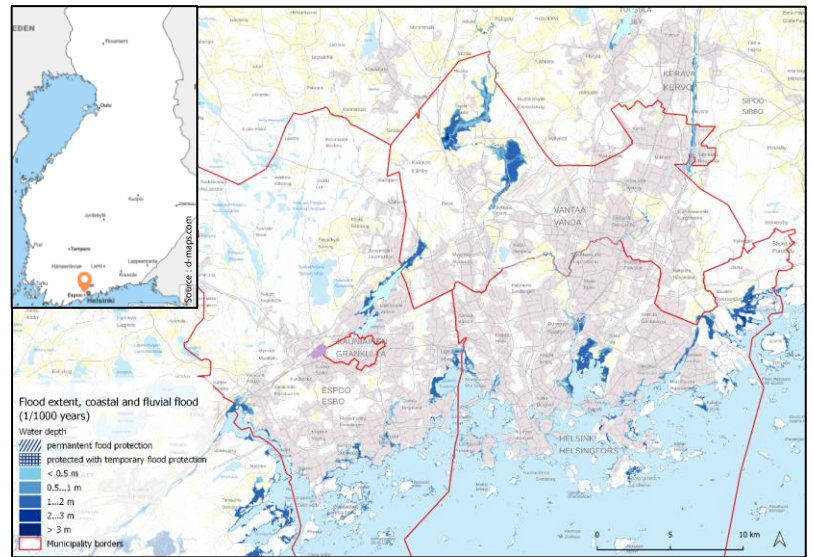


Figure 26. Case study area and coastal and fluvial flood maps for flood occurring once in a 1000 years. Source: Finnish Environment Institute & ELY Centres.

SOLARIS key issues: equality and adaptive flood risk management

Socio-spatial inequalities

The social vulnerability to flooding varies in different areas of the HMA, and there is a need for a deeper qualitative approach to understanding it. We explore how vulnerable groups are considered in FRM, and to understand the challenges of the current system in terms of justice and recognition of different vulnerable groups.

Flood risk management strategies

Two flood risk management plans have been developed, addressing coastal and fluvial flooding. Land use planning is identified as the most important measure to reduce flood risks. The plans also emphasize improving flood knowledge and preparedness across society. Future projections indicate increasing flood risks in the HMA, and prevention and mitigation strategies are prioritized. The current FRM approach would benefit from becoming more flexible and sensitive to social vulnerabilities to adapt to climate and societal changes effectively.

Collaboration with key stakeholders

Improving the uptake of knowledge on vulnerabilities at local level is the basis for socially just flood risk management. By discussing with FRM and adaptation experts, residents, and NGOs we gain a deeper understanding of different interpretations of social vulnerabilities and flood risks, as well as share knowledge and experiences between stakeholders in a local discussion group.

Existing data

- Report: SOLARIS Finland Report.
- Report: [Kazmierczak, Analysis of social vulnerability to climate change in the Helsinki Metropolitan Area \(2015\)](#).
- Report: Uusimaa ELY Centre, Flood Risk Management Plans for 2016-2021 and 2022-2027.
- Reports: Municipal and regional adaptation plans and strategies.
- Other grey literature.

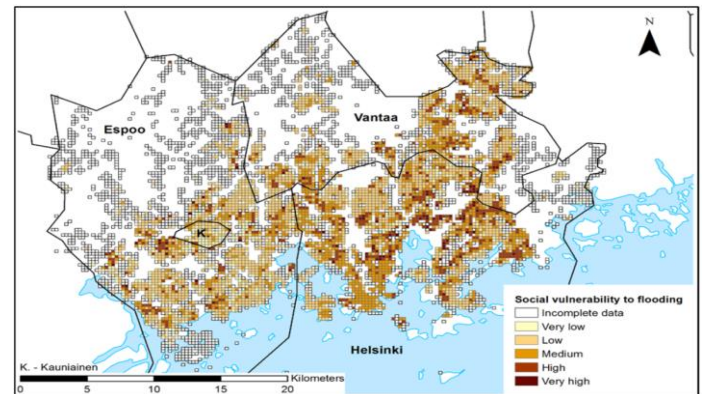


Figure 27. Maps social vulnerability to flooding in the Helsinki Metropolitan Area. Source: Kazmierczak (2015).



Figure 28. The biggest coastal flood in recent history occurred in December 2005, when the sea water levels in the Gulf of Finland reached record highs. At Helsinki's Market Square, sea water rose to +151 cm above the theoretical mean sea level. Source: Esa Nikunen.

Stakeholders involved

In the HMA, FRM follows the national framework. Stakeholders such as the Uusimaa ELY Centre, municipalities, rescue services, NGOs, and citizens are involved in FRM planning and implementation.

How and when are issues of equality and justice addressed in FRM?

The **Helsinki and Espoo Coastal Flood Risk Management Plan does not address inequality and equity as such, but it addresses the unequal effects of flooding through the concept of vulnerability.**

According to the FRMP, FRM aims to protect "people", "residents", "road users", those affected by a flood disaster or "everyone", as well as property more generally. The plan also mentions elderly people in residential care and the need to take this into account in flood risk planning.

The case study interviews suggest that **actors' perceptions of justice differ in terms of the way in which inequalities are viewed in the context of FRM. The perceptions of interviewed public authorities and residents on flood risk areas emphasise the protection of property and real estate and the equal distribution of material benefits and disadvantages.** Representatives of interviewed NGOs emphasise the human aspect and the fact that it is society's task to ensure that the weakest members of society can survive without suffering further disadvantages or missing out on benefits, as people have different abilities and starting points in life.

The climate change adaptation domain is challenging or disrupting the historically very technocratic and egalitarian discourses of the FRM domain. **The adaptation domain recognises social vulnerability as a function of the characteristics of individuals** and the living environment, and social and institutional context that influence people's ability to adapt. For example, the action plan of the adaptation strategy for the metropolitan area (HSY 2012), pays attention to justice as recognition and the social and health services were tasked with a case study to identify groups vulnerable to climate change and extreme weather events and to identify their needs in times of emergencies. **Cooperation between the city, businesses and stakeholders, and the involvement of residents is seen as a key to achieving the adaptation objectives (City of Helsinki 2015), which at least suggests the city's efforts to promote equity in planning processes.**

What role for public participation?

At the level of HMA, **participatory processes related to FRM are those of FRMPs and land use planning. Residents are also in direct contact with municipalities** and municipal authorities about flooding or in situations when water levels are high, municipal authorities are responsible for responding to citizen feedback. The interviews suggest that **FRM in the HMA is affected by the typical problems associated with participation, such as low awareness of risks and opportunities for influence,** lack of clarity about the effectiveness of participation, the neglect of NGOs in participatory processes, optimism about better governance expressed by public authorities, and concerns about the loss of policy effectiveness due to participation.

In an interview, one official pointed **out that it is difficult to use the knowledge of citizens and expressed suspicions whether participatory practice will improve the outcome of decisions.** Similarly, the active participants who were most aware of the process were most critical towards participatory processes. **So far, flooding is mainly discussed in the context of risk and flood communication by municipalities was not considered particularly successful.**

What knowledge and capacity building on social inequalities?

There is a considerable amount of data relating to the Helsinki Metropolitan Area, but only **little information on the social vulnerability of different groups of people is currently available to planners.** So far, one social vulnerability assessment has been carried out in Finland using data on socio-economic variables. In 2015, the Helsinki Region Environmental Services (HSY) commissioned an analysis that examined social vulnerability of the Helsinki Metropolitan Area to floods and heat waves. According to our interviews, this analysis has not been utilized in planning to any larger extent. **Preparedness and emergency organisations feel that they do not have enough information (e.g., about the location of vulnerable groups) to take proactive measures,** which means that they must rely on a very reactive, authority-oriented approach.

Awareness of flood-related risks and responsibilities is low among residents, and the FRM work done by public authorities is conceived to be invisible. This may, again, be due to a lack of experience of significant flooding, which would assert pressure on the predominantly technical system. **Our interviewees from resident associations seem to lack information on measures that they can take, and they do not generally perceive a need to prepare themselves in everyday life.** In addition, there is high trust in the authorities to manage flood risks, which can explain their less pro-active approach.

Administrative region: Central Finland, County of Southwest Finland, Kanta-Häme, Pirkanmaa, Päijät-Häme, Satakunta, South Ostrobothnia

Timeline: Autumn 2022

Type of flood: Coastal flood, fluvial flood, pluvial flood, frazil ice, ice jams

Surface area and number of households: 27,100 km², currently 15,000 residents at flood risk

Case description

The Kokemäenjoki river basin in Finland, which flows into the Baltic Sea, has two major flood risk areas in Pori and Huittinen. The upper part of the basin with regulated lakes experiences fewer floods compared to downstream areas. Various types of floods affect riverside towns and agricultural land in the catchment area, mainly river floods. In the case study area, the river flows through important agricultural lands, with Huittinen and Kokemäki as the main inhabited areas. **Climate change** is already impacting the region, leading to increased seasonal variation and intensity of flooding, including more frequent winter floods and stormwater flood risks in urban areas.

SOLARIS key issues: building solidarity between the upstream and downstream

Flood risk management strategies

Kokemäenjoki river and its catchment area are regulated for hydropower and flood defence, and the flood management plans focus on assessing and managing flood risks through defence and preparation strategies. The case focuses on an ongoing dispute that concerns the Säpilänniemi adjustment channel in the middle part of the river, that has been in the planning since the 1970's, and originally proposed as a FRM measure. The proposed channel is a contested FRM measure, supported by some stakeholders but not universally, with climate change as a major justification for its implementation.

Socio-spatial inequalities

The current situation exhibits **socio-spatial inequalities, where some individuals and their livelihoods** as well as different geographical areas (upstream vs. downstream) **are vulnerable to increased flooding**, while others may be impacted negatively by the proposed FRM measure. Climate change has influenced flooding patterns and frequency in the Kokemäenjoki river, necessitating adaptation measures. This case study examines **FRM practices and conflicting interests in the context of climate change adaptation**, allowing for multiple stakeholder perspectives. The rural context and catchment-level analysis of the Kokemäenjoki river basin and the planned adjustment channel demonstrate varying benefits and burdens, shedding light on whose interests are prioritized in FRM planning.

Citizen involvement

With participatory methods, including focus group discussions and art-based methods, we gain deeper understanding on how to build solidarity between the upstream and downstream cities, where the socioeconomic situation and vulnerabilities may differ. How can art-centred methods help citizens to reflect on their vulnerabilities? How to get the citizens more involved in the decision-making process?



Figure 30. Spring flood in Huittinen, 2020. Source: Varely (2020)

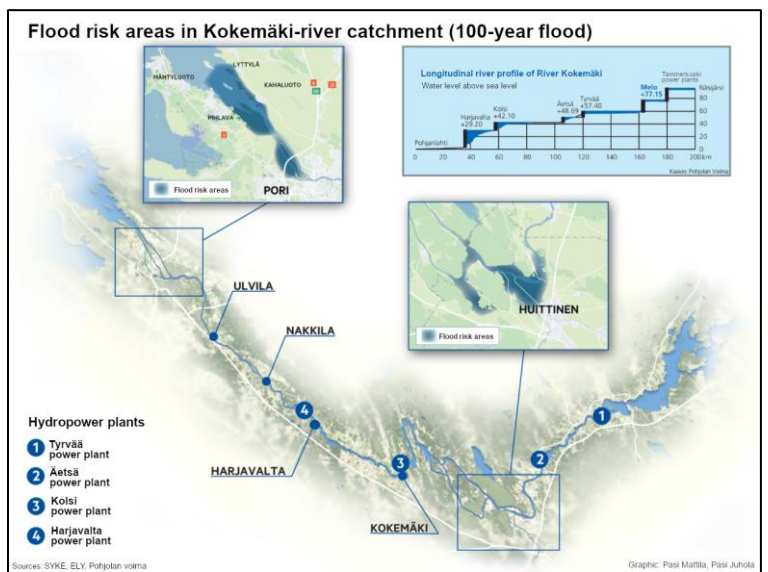


Figure 29. Kokemäenjoki river, and a closer look at the significant flood risk areas in a 100-year flood. Source: Pasi Mattila and Pasi Juhola (translated into English by authors).

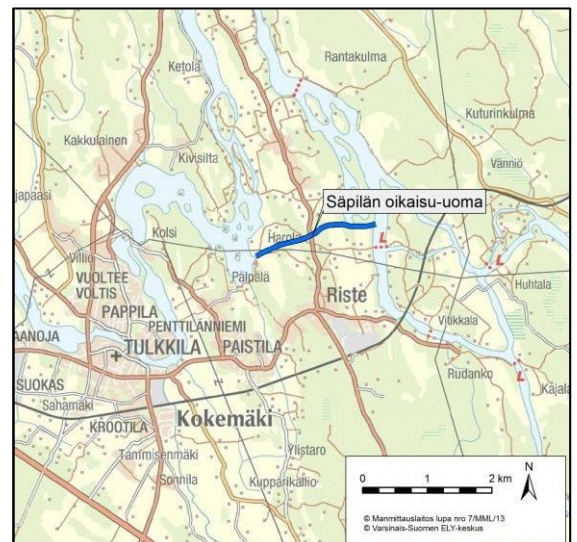


Figure 31. The proposed Säpilänniemi adjustment channel (oikaisu-uoma). The channel would cut through the peninsula in Kokemäki. Source: Varsinais-Suomi ELY Centre.

Stakeholders involved

In the Kokemäenjoki region, FRM follows the national framework, but the network of actors is larger than in HMA due to the large river basin area. Stakeholders such as the **Pirkanmaa and Varsinais-Suomi ELY Centres, municipalities, rescue services, NGOs, hydropower companies, and citizens** are involved in FRM planning and implementation.

How and when are issues of equality and justice addressed in FRM?

Following the national FRM process, **issues of equality and justice are not explicitly addressed in the FRM policies** in the Kokemäenjoki river basin. Evaluation of social impacts of planned FRM measures is done in a very general fashion, which leads to social impacts. Various social vulnerabilities and inequalities are being overlooked in the planning of measures. Flood vulnerability refers above all to susceptibility to financial loss due to floods. Farmers in the flood risk areas are recognized as the most vulnerable group. Farmers and their livelihoods' vulnerability towards flooding events is recognized, at least locally. Social justice and inequalities refer mostly to risk of financial loss and interference to livelihoods.

Due to the general social impact assessment and insufficient consideration of social vulnerabilities, Säpilänniemi adjustment channel seems **to override considerations of social justice and inequality of the project in the longer term and instead focus on mending the current situation**. The negative impacts of the channel to the nearby Natura2000 protected area are well documented in the FRMPs, while similarly the channel is presented as the only option for managing the flood risks in the whole basin area. The channel project also generates concerns for environmental health and heritage, due to the many potential adverse effects to ground water, Natura2000-sites, surface water quality, and recreation. The case of the Kokemäenjoki river illustrates well **the socio-economic nature of vulnerability and highlights** that those who live along the river or whose livelihoods depend in some way on the river will be even more vulnerable in the future.

What role for public participation?

Both regional authorities (ELY-centers) and municipalities are required to involve stakeholders in the FRM processes following the national guidelines. **However, the use of participatory tools or their outputs is not widely known or understood**. Locals seem willing to participate and are well informed about the possible benefits and trade-offs of different FRM solutions, such as the Säpilänniemi adjustment channel. The technocratic orientation of FRM indicates that not all stakeholders may have the same opportunity to influence FRM because they may not have the resources or knowledge to participate.

Communication between the different stakeholders along the river seems to be lacking, as participation processes mainly involve organisations, such as municipalities, and not local residents. People who face flood risks could be interested in being more involved in the process but may not know how they can contribute to the planning of FRM.

Actors such as the power companies, regional authorities, municipalities, and public services seem to interact well with each other indicating a typical example of corporatist system. This might be the reason why **the voice of specific interest groups such as farmers and environmentalists are more likely to be heard than the voice of private citizens**.

Existing data

- Report: SOLARIS Finland Report.
- Report: Varsinais-Suomi ELY centre, Flood Risk Management Plans.
- Reports: Pilot studies on floods at Kokemäenjoki.
- Reports: Regional adaptation strategies and plans.



Figure 32. An ice jam in Kokemäenjoki river in 2015. Source: Varsinais-Suomi ELY Centre.



Figure 33. Natural landscape on the banks of the river Kokemäenjoki. Source: Johan Munck af Rosenschöld.

What knowledge and capacity building on social inequalities?

FRM is based on monitoring data and scenario building. The FRMPs rely on technical information and solutions, leaving social vulnerabilities and inequalities vaguely addressed. The residents have a considerable amount of knowledge on flood events and even on specific FRM measures, such as the Säpilänniemi adjustment channel. Information on the impact of measures is also abundant.

Empathy and solidarity are felt towards people facing flood risks, people affected by management plans and the river environment itself. Residents across the Kokemäki river expressed understanding for other residents facing flood risks and those who have experienced floods firsthand. There seems to be at least some dissatisfaction with FRM, and people facing floods express their concerns of not being recognised by the authorities to the extent they feel necessary.

Climate change will affect FRM needs. New winter flood risks would require more knowledge to adapt to them, making those affected even more vulnerable to the effects of climate change.

France

Case studies

Ault

Blois

Types of flood risks & recent events

France faces multiple flood risks: fluvial floods along the main rivers; pluvial and flash floods especially in the South of France; tidal floods and storm surges in the West and the North coast; and flooding by runoff especially in urban areas.

Climate change will increase in the probability of occurrence, frequency and intensity of extreme precipitation events. The scenario of a temperature rise by 3.2 to 5.4° C will increase the flows above the reference high water level in the South and North-East of France (Andre and Marteau 2022). On the Atlantic and Channel coasts, this increase could modify each return period towards a closer return period. Extreme and unpredictable rainfalls that cause pluvial and flash floods would increase in frequency.

Today, **17.1 million inhabitants are exposed to the consequences of fluvial flooding.** 1.4 million inhabitants are exposed to the risk of marine submersion. More than 9 million jobs exposed to river floods and more than 850,000 jobs exposed to marine flooding and 20% of homes are exposed to submersion (Ministry of Environment, 2023).

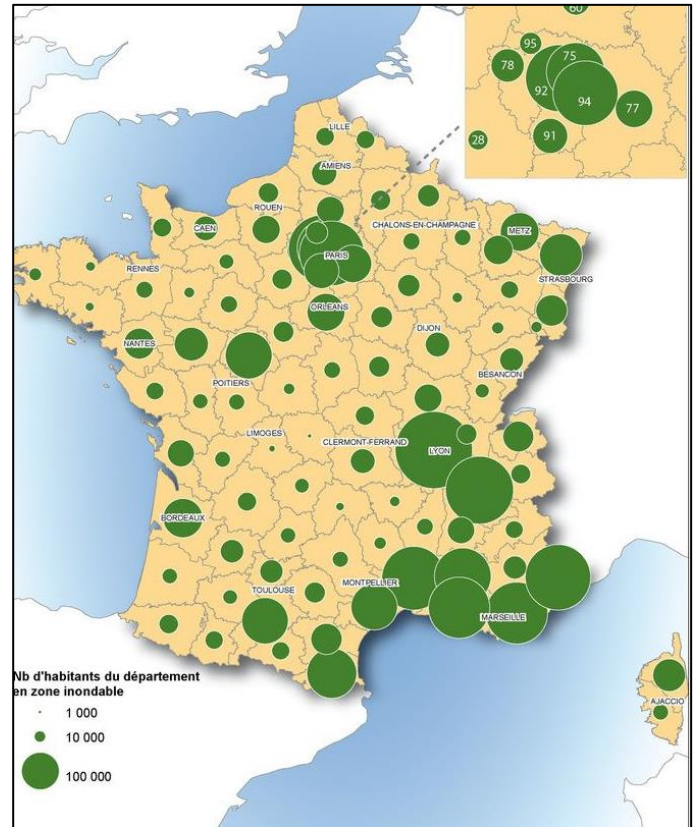


Figure 34. Number of people exposed to flood risk in French Departments . Source: Ministère de l'environnement – IGN (2015).

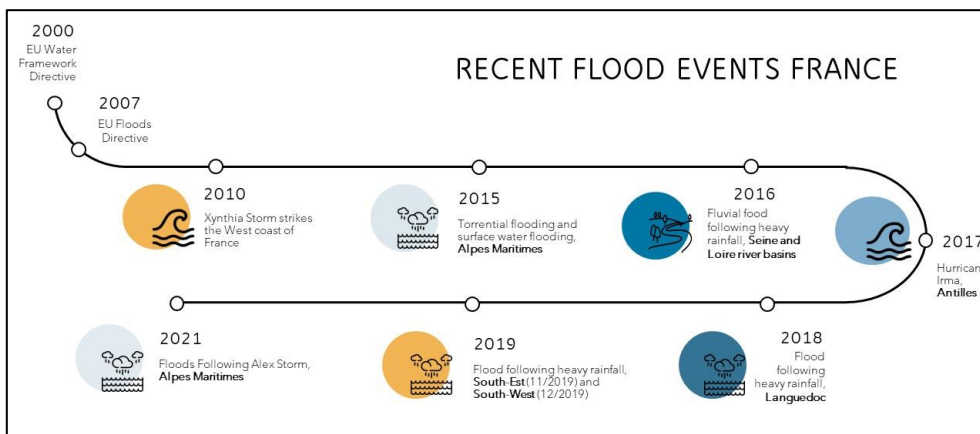


Figure 35. Recent flood events in France. Source: CCR (2021;2021), DGPR (2017), Cerema (2016).

Characteristics of CCAP in France

Public policies can no longer ignore the climate warning in France (Hrabanski and Montouroy 2022). The implementation of Climate Change Adaptation Policies is based on very institutional, top-down, and normative approaches. Nevertheless, these approaches go together with concrete steps: skills-producing institutions, national strategies, local implementations, and mandatory rules.

If the issue has become more normative in public policy (Hrabanski and Montouroy 2022), **their translation at the local level** is heterogenous in all policy sectors and all municipalities. Moreover, this implementation at the local scale does not necessarily imply a significant change in the practices, resources and interests of the actors (Hrabanski and Montouroy 2022).

The 3.2° to 5.4° C rise in temperature would increase of 110% in damage and costs of fluvial floods (Andre and Marteau 2022). Cost and damages caused by flash floods will increase by 130% in France (Andre and Marteau 2022).

According to natural disaster insurance data, over the period 1982-2020, total flood losses alone accounted for €21.6 billion of insured damage, with an average annual cost of €554 million (CCR, 2021).

Characteristics of FRM in France

The climate issue is directly present in the 2007 European Flood Directive. **Since then, FRM instruments must contain a Climate Change Adaptation section (MEDDE 2013a).** Climate change is considered as a physical phenomenon that will have impacts on the hydraulic extreme events.

France established public policies concerning natural and industrial risks management since the 1980's, through one instrument, the Flood Risk Prevention Plan (*Plan de Prévention des Risques d'Inondation - PPRI*). We distinguish five strategies in FRM: flood risk prevention, defence, mitigation, preparation, and recovery.

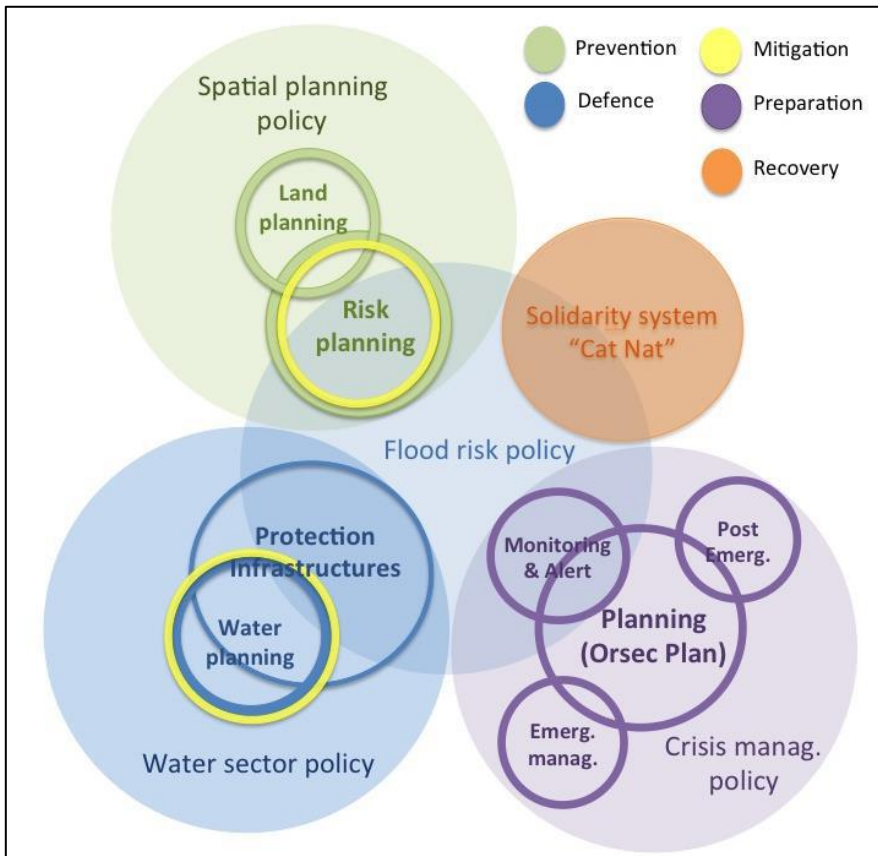


Figure 36. French flood risk management system. Source: [Larrue et al. \(2016\)](#), p. 33.

Prevention is a strong pillar in France, in terms of political legitimacy. It is historically centralised management, but as a result both of Decentralisation and the European Flood Directive in 2007, we are experiencing a diversification of the stakeholders in the flood prevention strategy.

Flood defence strategy represents a dominant and centralised strategy in France, in terms of public investment (dikes, dams, embankments).

Flood preparedness represents a well identified strategy. It mainly means civil protection which does not mean "security against flooding". The mission is multi-risk and remains one of the main prerogatives of the national authority.

Flood recovery strategy has its own independent existence. Since 1982, the national government has organised a national solidarity system to compensate damages caused by natural disasters (Barnier law) based on the principle of collective solidarity to compensate impacts of events considered as abnormal, recognised as such by public authorities.

As for **mitigation**, it is a very crossing-cutting strategy.

Many are linked together, if we look closely at the actions and the stakeholders. There are links between defence and preparedness, between prevention and defence (with actors working and setting targets together at local scale).

Last, with the implementation of recent laws, such as the Law on Modernisation of Territorial Public Action and the Affirmation of the Metropolis (MAPTAM) in 2014, the links between defence and preparedness have strengthened.

The MAPTAM law delegates the competence of defence (dikes) to mayors, who are now responsible for both management of protection infrastructures and crisis management.

How and when are issues of equality and justice addressed in FRM at the national level ? How does it link up with other policies, such as CCAP?

In France, several policies address the issue of inequality or fairness, depending on the policy objective, as required by the principle of equality of citizens before the law (Article 1 of the Constitution of 1958). We can mention **redistributive fiscal policies**, that aim to reduce inequalities between citizens, through the structuring of social legacies that affect pre-tax inequality and through social minima. **In spatial planning, equality between regions and citizens is rooted in most public policies** and promoted by the French Ministry of Territorial Cohesion. Following the 2003 heatwave and the pandemics, **health inequalities have come to the attention of public authorities** (Lang 2015). The issue of **environmental inequalities is rarely and belatedly formulated**. Finally, the French government has recently published a roadmap for the implementation of the UN 2030 Agenda (CGDD 2020). However, it is not clear how the latter will be concretely implemented at local level.

In the field of risk management, the central government has set up a national solidarity system for the **compensation of damages** caused by natural disasters (Law n° 82-600) based on the principle of collective solidarity (implemented through a tax on housing and car insurance paid by each citizen). The 1982 law laid the foundations for what was to become the Barnier Fund in 1995. **When analysing the vocabulary used by policy makers in Climate Change Adaptation Policies (CCAP) and Flood Risk Management (FRM) documents, the terms of solidarity (between territories of the same basin or between citizens) and equality/equity are used.** The term **vulnerability** is generally not linked to a notion of social justice, particularly in FRM documents. Its definition retains the idea of the exposure of an asset and its capacity to be affected by an event. While framework documents on climate change explicitly articulate the idea of equality and justice in the face of risk, this idea is less integrated in the FRM documents (MTES 2021; MDEM, Cerema, et Cepri 2018).

What role for public participation?

French legislation introduces the notion of "public participation" in the 1980s (the "Bouchardeau" law of 1983) and 1990s, but some legal mechanisms, such as public enquiries, exist since at least the 19th century. The law of 1995 on the strengthening of environmental protection, introduced a "principle of participation". Since then, an extensive deliberative procedure ("Débat Public") has been compulsory at national level to facilitate debates on major planning and environmental projects. **A gradual evolution can be observed from the 1980s to the 2000s. The "Bouchardeau" law speaks only of "information" while the "Barnier" law evokes "participation" and "association" of the public in decision-making** (Blondiaux et Sintomer 2002). The principle of the public's right to information on major natural hazards was enshrined in the law of 1987, which led to the production of a compulsory information document on major hazards at both departmental and municipal level (DICRIM). The implementation of the 2007 EU Directive reinforced the involvement of citizens, particularly in the preparation of the Flood Risk Management Plan (FRMP) at the scale of hydrographic basins (Drobenko 2010). However **publications highlight how these participatory mechanisms break the habits of practitioners, who find dialog with residents difficult** (Hassenforder *et al.* 2020). Empirical research shows that residents have very little knowledge of risk documents (Ledoux 2006; Douvinet *et al.* 2013).

At local level, authorities tend to launch additional, non-compulsory, participatory processes. Such initiatives aim at raising awareness among population. They are often defined in synergies between local authorities and the civil society (for instance artistic experiments) (Metzger *et al.* 2018). *Ad hoc* processes are also implemented to reduce the difficulties and potential conflicts during project implementation. They are carried out before public enquiries.

What knowledge and capacity-building on social inequalities?

In policy documents, **flood risk knowledge is framed by modelling and forecasting** based on quantified data on climate phenomena. Reports by insurance experts focus on climatological and geomatic skills, as well as big data management (Andre et Marteau 2022; CCR 2020). The aim is to model climate risks, costs and losses. Recently **several observatories have been set up to collect, process and map climate data**. Typologies of historical flood events are valued to integrate historical data and preserve memory. Social sciences are mentioned as important, especially for risk perception through cognitive sciences and especially in crisis management. Additionally, **the second Climate Change Adaptation Plan emphasises the need for "participatory" science**, mobilising a "bottom-up" approach with local actors in a co-building perspective. Digital and on-line tools are promoted to facilitate access to scientific resources.

However, social inequalities and the means to tackle them are not addressed in the same way in all documents. The CCAP documents clearly raise this issue, which is less the case in the FRM documents. However, when it comes to identifying these social vulnerabilities (i.e. data), these framework documents lack detail. **Although the issue of fairness or social inequalities is not formulated as such in FRM documents, it is possible to identify indicators related to it.** The National Vulnerability Reference Framework mentions the social level of the population (approximated by the median income) to measure the ability to "return to normal" quickly after a hazard. The document also mentions "light housing" (i.e. caravans, mobile homes, slums...) and vulnerable population (disabled, dependent on a medical equipment). The recommendations therefore stress the need to relocate populations or protect them by reinforcing infrastructures. But there is no mention of the implications of such displacement for justice or equality.

Administrative region: Somme Department, Hauts de France Region

Timeline: 2012-2023

Type of flood: Coastal risk (cliff erosion mainly)

Surface area and number of households: 6 km², 1397 residents (INSEE 2019)



Figure 37. Location of Ault



Figure 38. A city in face of coastal erosion. Source: M. Bonnefond (2022).

Stakeholders involved

In 2011, the State services asked the **Syndicat Mixte Baie de Somme - Grand Littoral Picard** to implement a Flood Prevention Action Programme (PAPI), an integrated strategy for the management of the coastline in the short, medium and long term in accordance with national requirements.

The **State services (DDT/DREAL)** are in charge of Flood Risk and Coastal Risk Prevention Plans (PPR). In Ault, two PPRs were approved, in 2001 and 2015. The latter indicated the need to extend the areas at risk, taking into account climate change.

The municipality of Ault was supported by the SMBSGLP and its financial partners to define a new urban project taking into account coastal risk.

A local NGO, "Ault-environnement", gradually took over and challenged the projects. For a few years, they waged a legal battle against the PPR (with the support of the municipality), but were defeated in 2020.

Case description

Ault is located along the Channel. The chalk cliff of Ault is located is inexorably retreating at a rate of 30 to 70 cm per year. Several streets have disappeared during the last century and the phenomenon of erosion now threatens nearly 80 houses. In 2001, a first erosion risk prevention plan (PPR) was drawn up by the State services. After major operations to combat the sea, the municipality planned to relocate the most at-risk properties a vast urban redevelopment project. In 2012, the commune of Ault was one of the five sites selected at national level for an experiment within the framework of the national strategy for managing the coastline. Local authorities in Ault could benefit from a determined area to relocate inhabitants: the "ZAC du Moulinet", property of the Syndicat Mixte Baie de Somme - Grand Littoral Picard.



Figure 40. The "ZAC du Moulinet", a specific area to relocate housing and activities from the coastline. Source: Syndicat Mixte de la Baie de Somme/DRI.

SOLARIS key issues: equality and adaptive FRM

Socio-spatial inequalities

Previous researches tend to show that population living along the coastline and in the area at risk in Ault is older but also more educated than the rest of the local population.

The project to relocate goods and people was initially identified as a relatively viable project, as **the relocation site was identified from the outset**, with the presence of an available sector within the urban area (ZAC du Moulinet). However, **there was a great deal of opposition. Initially, opponents complained about the methods of informing and involving the local population.** Local opponents also pointed out that the city of Ault did not benefit from the same subsidies than others.

Flood risk management strategies

The project in Ault is in line with recent developments, at least in France, in risk management methods. **The issue of cliff erosion is gradually being integrated into a broader question of local adaptation to climate change.** If, from the start, a vast relocation project was planned, it was progressively postponed and more attention was given to technical measures to slow down cliff erosion, such as adapting the sewage system near the cliff and waterproofing the town centre.

From conflicts to collaboration with key stakeholders

In 2015, a new erosion risk prevention plan was drawn up, further emphasising the importance of the issues at stake.

However, local opposition tended to increase and the project was restructured. While the issue of relocation of goods and people was identified as a priority, the new project places much more emphasis on the implementation of technical solutions to reduce the factors that aggravate erosion (vibrations linked to traffic, infiltration of runoff water, wastewater networks, etc.). However, inhabitants still live in areas of extreme risk and a new consultation process, has been initiated in 2020 in order to relaunch reflexions.

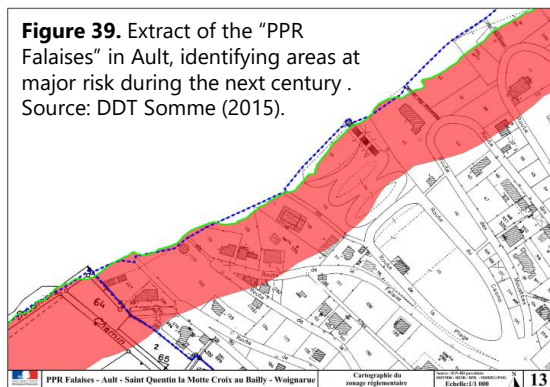


Figure 39. Extract of the "PPR Falaises" in Ault, identifying areas at major risk during the next century. Source: DDT Somme (2015).

Existing data

- ault-environnement.com.
- Report: Buchou, [Quel littoral pour demain ? \(2019\)](#).
- Report: « [Plan de Prévention des Risques Naturels Falaises Picardes](#) » (2015).
- Report: SMBSGLP, « [Programme d'Actions de Prévention contre les Inondations \(PAPI\) Bresle Somme Authie. Document principal du dossier PAPI vg](#) » (2015).

How and when are issues of equality and justice addressed in FRM?

The local FRM documents in Ault (PPRN of 2001 and 2015) consider vulnerabilities based on the exposition to hazard, i.e the **presence of housing or economic activities**.

The planning documents (PLU, PADD, and PLUI) mention the challenges of adapting to climate change, but how these challenges (such as relocation) will be addressed remains unclear. When the Moulinet project was announced, the idea of relocating activities and houses from the coast to the Moulinet area (ZAC du Moulinet) was to be introduced. However, no social studies had been carried out on the people concerned. The socio-spatial impact is framed exclusively by the financial compensation for property.

The PAPI (Flood Prevention Action Regional Programme), a partnership document to manage risk at the scale of the whole Bay of the Somme (SMBSGLP and ARTELIA Eau et Environnement 2015), mentions "solidarity", but not in its social meaning. The term is framed by a physical vision of risk highlighting its spatial dimension (solidarity between the land/coast), its temporal dimension (solidarity between the present and the future), and its ecological and dynamic dimension (actions in one place could affect biodiversity in another). **These notions of solidarity are linked to a notion of coherence: because of the ecological and geographical interconnectedness of the Bay's territories, responses cannot be the same everywhere** (see quote).

Moreover, policy documents and citizens use the same terms, but not in the same way. For instance, the PAPI defines different levels of spatial solidarity between territories from a risk management perspective to explain why risk responses cannot be the same everywhere. Citizens, and local actors, such as the municipality, mention solidarity to criticise actions taken elsewhere and not in Ault.

Finally, there is a sense of justice linked to temporality. Based on long-term projections and their sensitive experience, residents do not understand the rigidity of regulatory documents that change in the short term.

What role for public participation?

The project raises questions about **residents' participation** in public policy. Ault Environment activism is motivated by the resident's feeling that they have not been considered or consulted in the formulation of the project. Difficulties in accessing expert reports also played a role. If official documents confirm that there was a consultation process, these records (period 2010-2019) make little mention of a strong conflict with the residents, which is evident in the interviews and in the press analysis. **It seems that the record of the consultation process chooses to forget the social conflict.**

There is a consensus among the stakeholders on the mistakes made with regard to the 2013 relocation project, in terms of the communication strategy and the social approach. We are currently witnessing a semantic shift. The term "resilience" is widely preferred to "relocation". **The case study provides lessons on the difficulties of involving citizens in adaptation measures as radical as relocation: the lack of communication with residents seems to have been important in triggering the conflict.** The timing of this communication (is it at an early stage or not?) and the vocabulary used seem to be crucial in limiting local conflicts.

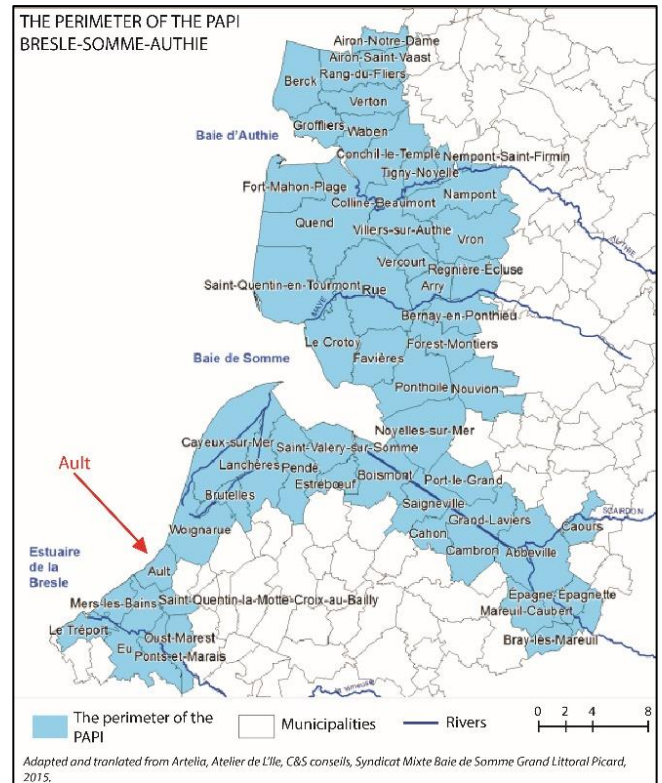


Figure 41. The perimeter of the PAPI. Source: SMBSGLP and ARTELIA Eau et Environnement (2015), p. 21.

"Only continuity and coherence allow the effective protection of the Bay territory. Due to the topographical configuration any very localized failure is likely to generate damage on a much larger scale" SMBSGLP, and ARTELIA Eau et Environnement. (2015) : p. 146.

What knowledge and capacity building on social inequalities?

How to address inequalities at local level remains unanswered? As the relocation project is no longer funded, the question of how to deal with it is being postponed. Whether or not Barnier Fund is viable in the event of relocation remains an open question in Ault. For the French legislation, the erosion coming from the sea **is not a risk, because it is presented as inevitable. The question is not "if" it will happen, but "when" it will happen.** However, continental erosion can be accentuated by various factors such as sewage system or rain and can therefore be considered as a risk.

Ault Environment showed ability to channel and articulate different kinds of knowledge about the cliffs (popular knowledge, artistic knowledge), including expert knowledge, in order to call for a democratisation of the debate.

Inhabitants also use an empirical knowledge of the risk of erosion based on their experience. Based on this sensitive experience, they distance themselves from the discourses of the experts.

Administrative region :

Centre-Val de Loire, Loir-et-Cher (41)

Timeline : 2000-2023

Type of flood: Fluvial flooding

Surface area and number of households involved: 400 inhabitants in 2002, no current estimation.



Stakeholders involved

Blois Agglomeration

Coordinated the Deferred Development zone (the French "ZAD") process. Set up urban planning documents. Coordinated and design the rehabilitation and development project of La Bouillie with private consultants and organised the participatory modules. Led the ZAD and funded 10% of the global costs. Responsible for acquiring land ownership in the area.

Municipality of Blois

Negotiated the local Flood risks prevention plan with the State services Involved in social support measures surrounding the ZAD. Set up urban planning documents.

State services

Built the local Flood risks prevention plan negotiated with local policy makers. Participated in the ZAD creation and in technical committees during its development. Financed the acquisition of real estate in the ZAD : the fund for the prevention of major natural hazards funded 90% of the costs from 2005.

Inhabitants

Organised public meetings and led the protest against the "ZAD". During the rehabilitation process, other citizens, living in the surroundings and not in la Bouillie district got involved.



Figure 42. A banner in La Bouillie calling for public participation in workshops: "what future for la Bouillie ?". Source: Cardinal (2021).

Existing data

- Report: [SOLARIS France report \(2024\)](#).
- Book chapter and article: [Rode \(2014\)](#), [Rode \(2008\)](#).
- PhD thesis: [Doussin \(2009\)](#) / [Fournier \(2010\)](#).
- Video presentation of the rehabilitation process: [Agglopolys \(2021\)](#).

Case description

During the first part of the 20th century, "La Bouillie" district developed, initially informally, behind a spillway and within a discharge channel built in the 17th century. Since 2003 with the creation of a zone of deferred development, **housing and economic activities have been relocated to restore the flood retention area and improve protection in the surrounding area**, particularly in the Vienne district. 400 people, 20 businesses and many people living in informal, lightweight dwellings were located in La Bouillie, which used to be a popular neighbourhood.

Once the process of de-urbanisation has begun, new proposals for the future of the land emerged. Several non-permanent uses have been proposed in line with flood risk management. The planners aim to manage risk while creating synergies between agricultural, recreational and contemplative uses. A **consultation process** has been launched since February 2021 and **participatory workshops** have been organized in June 2021.

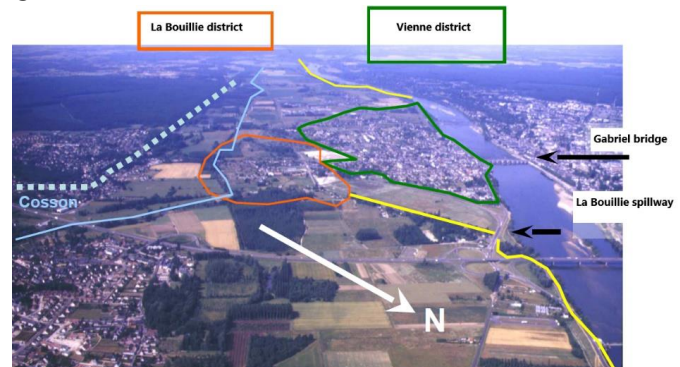


Figure 43. Location of "La Bouillie district in Blois. Source: Agglopolys (2017).

SOLARIS key issues: inequalities induced by the de-urbanization process and new futures designed

The process of de-urbanization is designed as a measure to reduce the flood risk exposure of the inhabitants of the **surrounding districts, and the individual exposure of the inhabitants of la Bouillie. The risk exposure was initially approached through a technical lens in a top-down approach**, ignoring the lived environment of the inhabitants. This technocratic approach led **to local conflicts and fed the social vulnerability of some residents**, especially the elderly, working class and deeply rooted in the area.

The inhabitants created an association to protest for recognition and to negotiate "fair" compensation. Eventually, from 2005, **the Agglomeration set up social support initiatives and enhanced compensation rules** for the most deprived which pacified relationships, even if some families were not able to re-house in equivalent conditions.

The ambition is now to conceive a **Natural Urban Agricultural Park**, which can be classified as a Nature-Based-Solution (NBS). It gives a **new centrality to La Bouillie** and aims to transform this historic urban edge into an environmental amenity for local residents and tourists. However, the participation processes have focused on secondary aspects and have not been oriented towards the recognition of past or existing uses of the space. **Many participants live nearby, but not in La Bouillie, and have associative activities linked to the district. Past and present residents of la Bouillie do not take part in the workshops.** For example, travellers who have lived in the area for decades are invisible and their situation is managed separately.

How and when are issues of equality and justice addressed in FRM?

In the Local Flood Risk Management Policies (PPRI), **the notion of vulnerability is addressed by the number of exposed inhabitants and strategic facilities (retirement homes, schools, etc.) that could be affected.** Once urbanized, the spillway could no longer play its role of discharging the river during floods, protecting the surroundings.

Decision to de-urbanise is an act of solidarity with the rest of the city, but it is never introduced as such. Compensation for delocation and support for care are seen as forms of financial justice. Debate on justice for the residents of La Bouillie is reduced to a financial dimension, and compensation does not concretely consider the other damage (symbolical and psychological) caused by the delocation. Now that the area is almost de-urbanised, the agglomeration intends to promote an "ecological and solidarity-based transition" for new urban development projects. In planning documents supporting this regeneration process, La Bouillie is a space for imagining a new urban project. **The consequences and inequalities caused by the process of delocation are not discussed, nor is the question of who will benefit from the site once it is redeveloped.**



Figure 44. Trenches dug in La Bouillie to prevent illegal settlement. Source: Cardinal (2022).

"Perhaps we didn't realise that we were breaking the memory of people who had lived there for years, who saw themselves ending up there [...] it was a modest population, which had built up through mutual aid... A real neighbourhood life, a real social life" (Interview, 04/2022).

What knowledge and capacity building on social inequalities?

From the beginning, the delocation project was built as a measure to reduce the flood risk exposure of the inhabitants of the surrounding districts, and the individual exposure of La Bouillie's inhabitants. **Vulnerability here was only seen and quantified as the concentration of upstream human and economic issues.** However, to better understand social vulnerability caused by the delocation process, the central government services commissioned a report. Once urbanized, the spillway could no longer play its role of discharging the river during floods, protecting the surroundings. The latter revealed that people were quite old, from the working class, strongly rooted in the area and had a low level of risk-awareness. However, this knowledge was not considered in the first phase. In 2006, following social mobilisations, the Agglomeration decided to improve the compensation rules for the most disadvantaged. This allowed former residents to be re-housed in better conditions and to calm the local situation. Today, most of the remaining inhabitants of La Bouillie district are travellers living in caravans. **The understanding of vulnerability is more sectoral, focused on social and economic issues of travellers as a community.** On the site, the understanding of vulnerability is more focused on the landscape, influenced by the strong landscape approach promoted by local stakeholders. This notion insists on the degradation of the site which must be beautified by the redevelopment project.

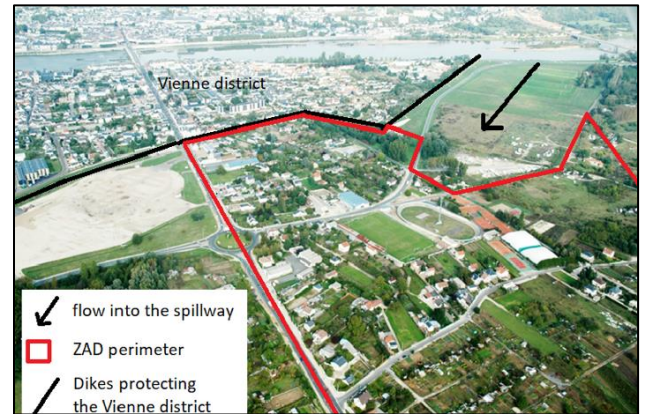


Figure 45. La Bouillie, within the perimeter of the "ZAD" before the delocation process. Source: Agglomération de Blois (2002).

What role for public participation?

In a first phase, **activism and protests were a response to the lack of institutional participation** processes from 2003 onwards. Finally, this mobilisation led to the development and improvement of compensation and social support policies in 2008, but this had no concrete impact on the de-urbanisation project. In a second phase, **formal participatory processes became a cornerstone** to legitimise the redevelopment project from 2021 onwards, to put an end to the conflictual trajectory of La Bouillie caused by the delocation process, and to stimulate a new dynamic, based on socio-ecological transition.

However, participation processes are only seen as a future-building process with selective barriers: the former and current residents from the neighbourhood do not participate in the workshops. Traveller and travellers' activities, currently staying in the space are thus seen as being "not very compatible" with the futures projected for the area.

"If you don't have money, you are despised all your life. You are in a situation of handicap. So you escape as best you can. All these people from the Bouillie, obviously, they weren't the cream of the crop, but they were good, honest people. They had worked all the time, small jobs, and then at the end of the day, they were thrown out, like dogs" (Interview, Former resident, 01/2022).



Figure 46. The association's historic home retains a protest bann. Source: Cardinal (2020).

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