SOLARIS
SOLIDARITY IN CLIMATE CHANGE

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

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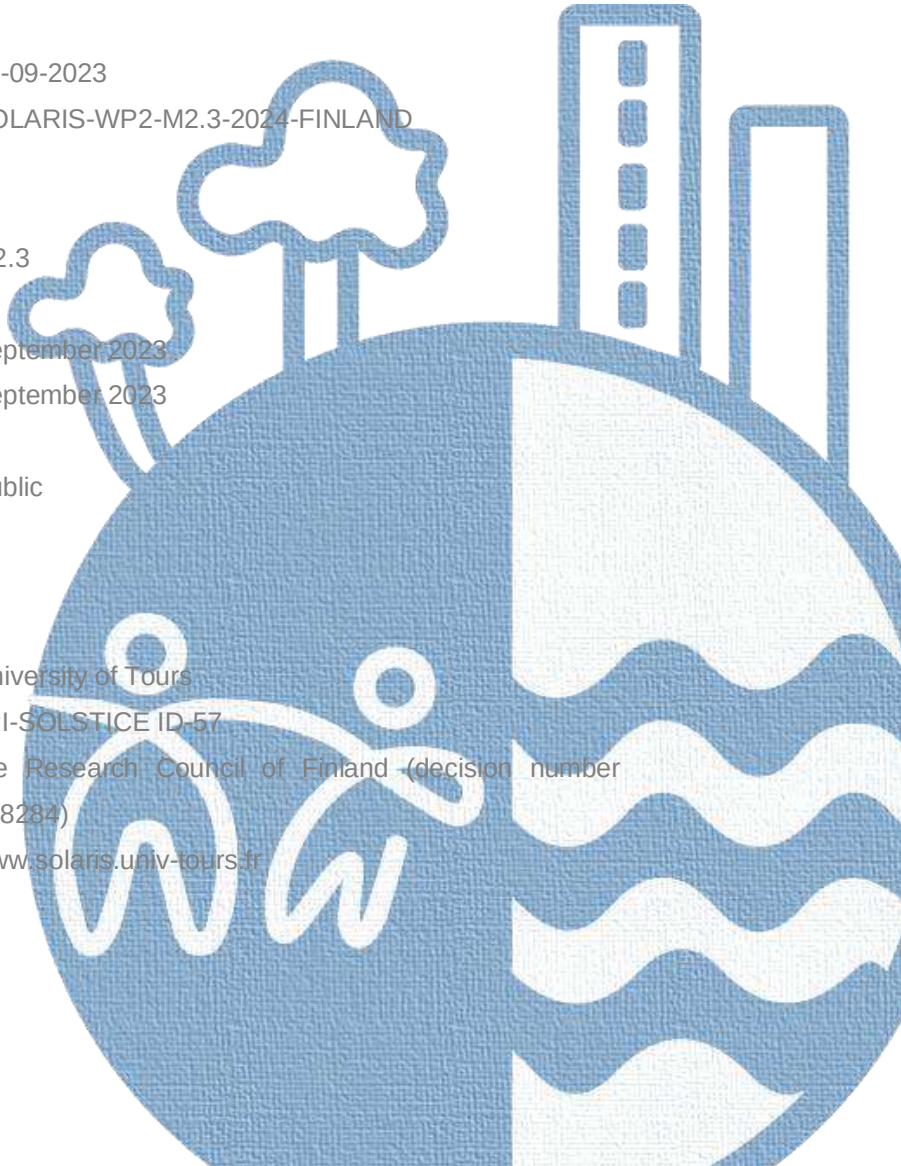

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Preface

What to find in this Work Package 2 country report?

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 document is part of the compilation of reports on the empirical investigations carried out at national level in the four SOLARIS countries (Belgium, England, Finland, and France) and eight case studies. WP2 is dedicated to case study analysis, based on common conceptual and methodological work conducted in 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 (practitioner's handbook, oral presentations, scientific articles, e-doc website etc.).

Context

Facing the unpredictability and unavoidability of climate change effects, public policies in Europe must (re)consider their CCAPs. In this field, adaptation to extreme hydraulic events such as flooding and erosion are more urgent than ever. As Tradsowki 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 and 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).

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 and 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).

Section 1: National-level analysis

Hydro-meteorological events

Types of flood risks in Finland

Compared to many other countries, the dangers caused by floods in Finland are still relatively small, and flood-related casualties are rare. This is mainly due to the large number of lakes and low topography which regulate water flows. Due to the length of the country, the long coastline and the many watersheds, there is also considerable spatial variation in the scale and impacts of flooding (Parjanne et al. 2021). Floods are particularly common in areas with few lakes to store water and smooth the water flows. Frequently flooded areas include, for example, the shallow river valleys of western Finland, where spring floods in particular can cause damage (Figure 1).

The areas in Finland experiencing significant flood risks are often urban centres downstream of major rivers (such as the city of Pori in the Kokemäenjoki estuary), or at the intersection of large rivers (such as Rovaniemi in Lapland at the intersection of the Kemijoki and Ounasjoki rivers) (Gregow et al. 2021).

There are three main types of floods in Finland. Most common are fluvial floods, which are often seasonal and develop because of snowmelt, a blockage caused by ice dams, or prolonged rains that fill up lake basins. *Frazil ice floods* occur especially in early winter when there is severe frost and no ice cover in the river yet. Ice crystals formed in turbulent and subcooled water can cause ice dams to accumulate, causing rapid local flooding. *Coastal floods* are often caused by strong winds and differences in air pressure, as well as by the seasonal fluctuations in the water levels of the Baltic Sea. Lastly, *pluvial or stormwater floods* are caused by heavy rainfall that overwhelms drainage capacity especially in urban areas. Tidal floods do not exist in Finland.

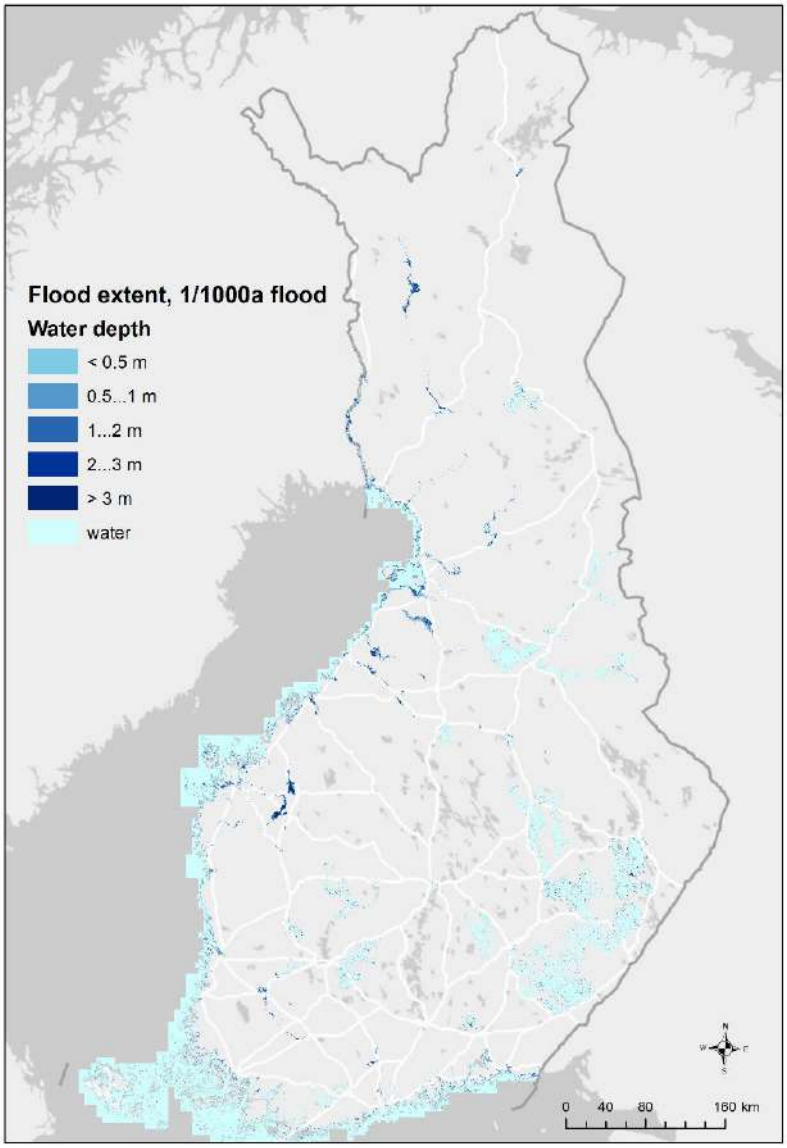

Figure 1. *Flood hazards in Finland*

Mapped areas of fluvial and coastal floods occurring once in 1000 years. The darker the blue, the deeper the water. There are altogether over 100 flood maps covering different parts of Finland. Flood hazard and risk maps are openly available for all and updated yearly by regional authorities and the Finnish Environment Institute.

Finland's flood risks are assessed every six years in accordance with the EU Floods Directive. In these preliminary assessments risks are evaluated based on flooding probability and possible significant damages defined in the Finnish flood risk legislation (see section 'Public policies'). Significant damages include harmful consequences for human health or safety, long-term disruption of essential services such as water and energy supply, telecommunications, road transport or other similar activities, long-term disruption of economic activities that safeguard the vital functions of society, long-term or widespread damage to the environment, or irreparable damage to cultural heritage. Based on the latest assessment in 2018, there are 22 significant flood risk areas in Finland (Finnish Environment Institute 2019) (Figure 2). Of these, 17 are inland along the waterways and five on the coast. Although the areas cover more than half of mainland Finland, the expected loss and damage is fairly low due to population distribution and large rural areas in the Middle and Northern

Finland with sparse population. According to the latest risk assessment, in the event of an extreme flood (once in 1000 years), about 40,000 inhabitants and 25,000 buildings would be susceptible to flooding in significant flood risk areas (Finnish Environment Institute & ELY-centres 2021) (Figure 3). The next assessment will be done in 2024. To date, loss and damage from flooding has remained low, but the damage potential is projected to increase in the future, given the high proportion of flood risk areas in the total land area and the increasing flood risks due to climate change.

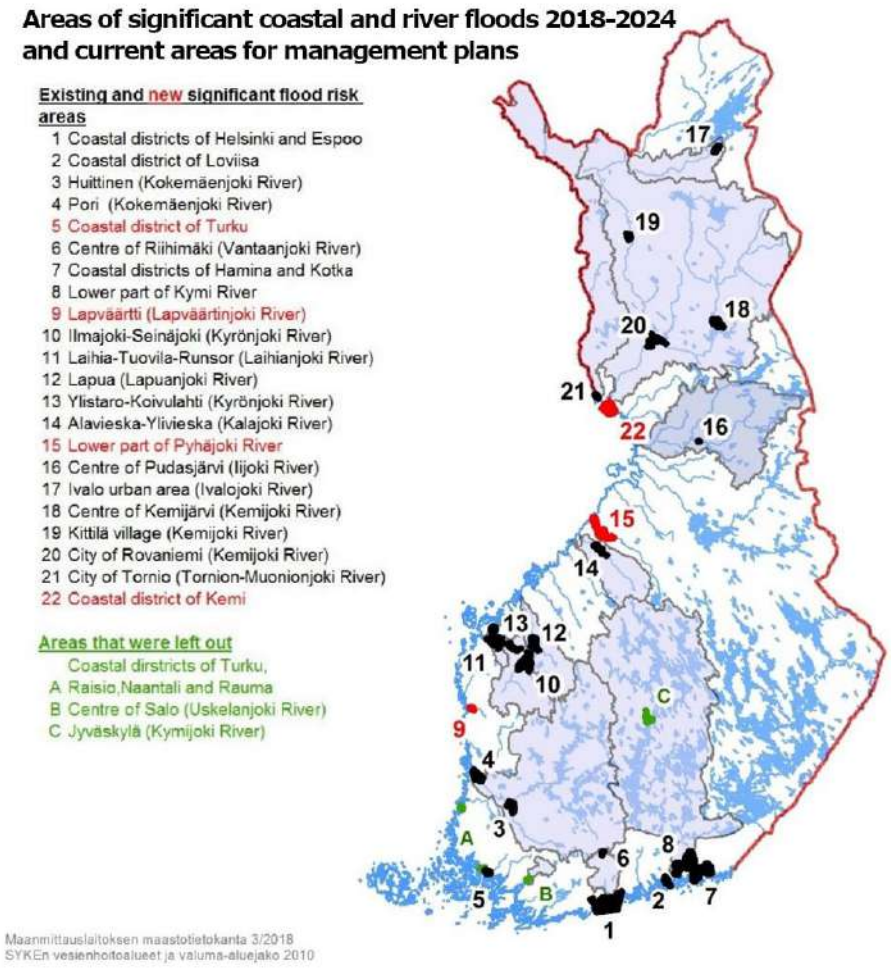

Figure 2. *Areas of potential significant flood risk in Finland.*

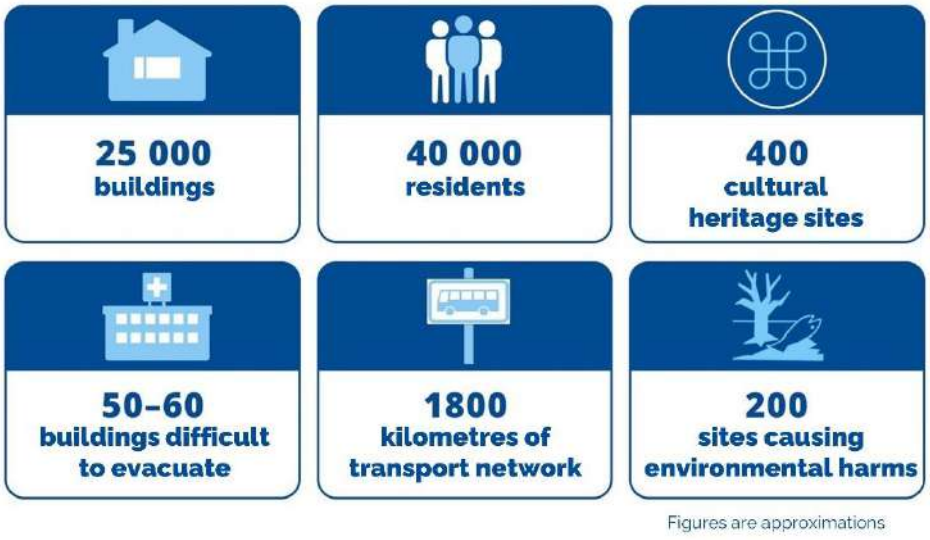

Figure 3. *Key figures for Finland's major flood risk areas for flooding of average magnitude once in a thousand years (Finnish Environment Institute & ELY-Centres 2021).*

So far, floods have rarely caused anything other than material damage. Most often flooding causes direct damages, e.g., to building structures, or indirect damages, such as losses and disruptions in agricultural or industrial production. Nationally, direct tangible flood damages have been assessed in detail: it is estimated that the average annual flood damages are about one million euros (Finnish Environment Institute & ELY-centres 2021). Due to the few impacts on inhabitants other than material damage to property, conducting assessments of flooding impacts on people and their wellbeing or abilities to prepare for or recover from flooding have not been seen as necessary or at least high on the political agenda.

Climate change affects the dynamics of the hydrological system (i.e., seasonal river discharges, snow cover and water levels in lakes), which significantly increases the risks of extreme hydrological events (Veijalainen et al. 2010; Veijalainen 2012). Some examples of the consequences of climate change are increased risk of urban pluvial flooding, summer droughts, winter floods, and frazil ice floods (e.g., Gregow et al. 2016). At worst, flood risks in large water bodies in Finland could double or triple by 2100 (Parjanne et al. 2018).

Preparing for future flood risks is high on the political agenda (Ministry of Agriculture and Forestry 2021). The need for higher preparedness efforts is not only exacerbated by the impacts of climate change, but also socio-economic development, such as concentration of housing in densely populated areas in flood risk zones as well as aging population. It is estimated that socioeconomic development can have an even stronger effect on the development of future flood risk than climate change (Parjanne et al. 2018).

Public policies

In Finland, public power is exercised by the state, which operates at three levels - central, regional, and local - and by autonomous municipalities. The central government consists of ministries and their agencies and institutions. The State's regional administration is made up of the Regional Administrative Agencies (hereinafter AVI) responsible for the legal supervision and implementation tasks at the regional level, and the

Centres for Economic Affairs, Transport, and the Environment (hereinafter ELY Centres) taking care of operational and development tasks at the regional level. The State's local administration is made up of agencies such as the police.

Municipal autonomy is guaranteed by the Constitution of Finland (731/1999) which stipulates that municipal administration must be based on the self-government of the municipal residents. Hence, a key feature of Finnish municipalities is the requirement of democracy. Local democracy includes the right to vote in municipal elections, to take initiatives and to participate in the decision-making process of, for example, land-use planning. The local government system, with more than 300 municipalities each of which has their own elected decision-making body, enjoys a strong public consent.

The Local Government Act (410/2015) requires municipalities to provide critical day-to-day services to their residents. Municipalities are also responsible for local land-use planning and building control. Currently, there are no upper-level planning instruments with the mandate to guide local level planning on issues other than those of national importance, as stated in the mandate of Regional Plan. In addition to planning, municipalities provide many critical services by building and maintaining infrastructure such as street networks, recreational areas, public transport, water supply and sanitation, waste management and environmental protection. Many municipalities also provide housing services and distribute electricity and district heating.

The organisation of public health, social care and emergency services in Finland was recently reformed and a new level of public administration was established. Since the beginning of 2023, the new Wellbeing Services Counties have been responsible for organising public health, social care, and rescue services. However, the City of Helsinki is an exception to this as it organises social welfare, health and rescue services in its own area.

The administrative division of duties between state administration and municipalities affects the organisation of climate change adaptation and flood risk management (hereinafter FRM) tasks albeit with some differences. Municipalities are independent legal entities, and therefore no new tasks may be assigned to them, or old ones taken away without a law providing for it. According to the Local Government Act, there are three types of municipal tasks: 1) the tasks independently decided and taken by the autonomous municipalities (general competence); 2) statutory tasks of the municipalities (specific competence) and 3) contract-based tasks (mandate tasks). For example, municipalities can carry out climate change adaptation activities independently as part of their general municipal competence. In this case, the actions must be equal for all residents and must consider the interests of all residents.

Currently, municipalities have no statutory duties in climate change adaptation in general, and therefore, there is no mechanism for the state to require them to do so. Nor can state assign targets or tasks to municipalities in National Adaptation Plans (hereinafter NAPs). However, municipalities do have sectoral statutory tasks which can be considered as adaptation activities such as municipal tasks in FRM. These are regulated in Flood Risk Act and Land Use and Building Act. In practice, the state and municipal authorities

cooperate closely in joint working groups for regional and local authorities and ad hoc -meetings and seminars.

Timeline of relevant CCA and FRM policies and recent flood events

A timeline of relevant climate change adaptation (hereinafter CCA) policies and research programmes in parallel with FRM policies and recent flood events is illustrated in Figure 4 below. Both CCA and FRM policies have developed a lot in the past two decades, as a result of a stronger institutional basis and urgency in the face of climate change. The next sections will describe the policies in more detail.

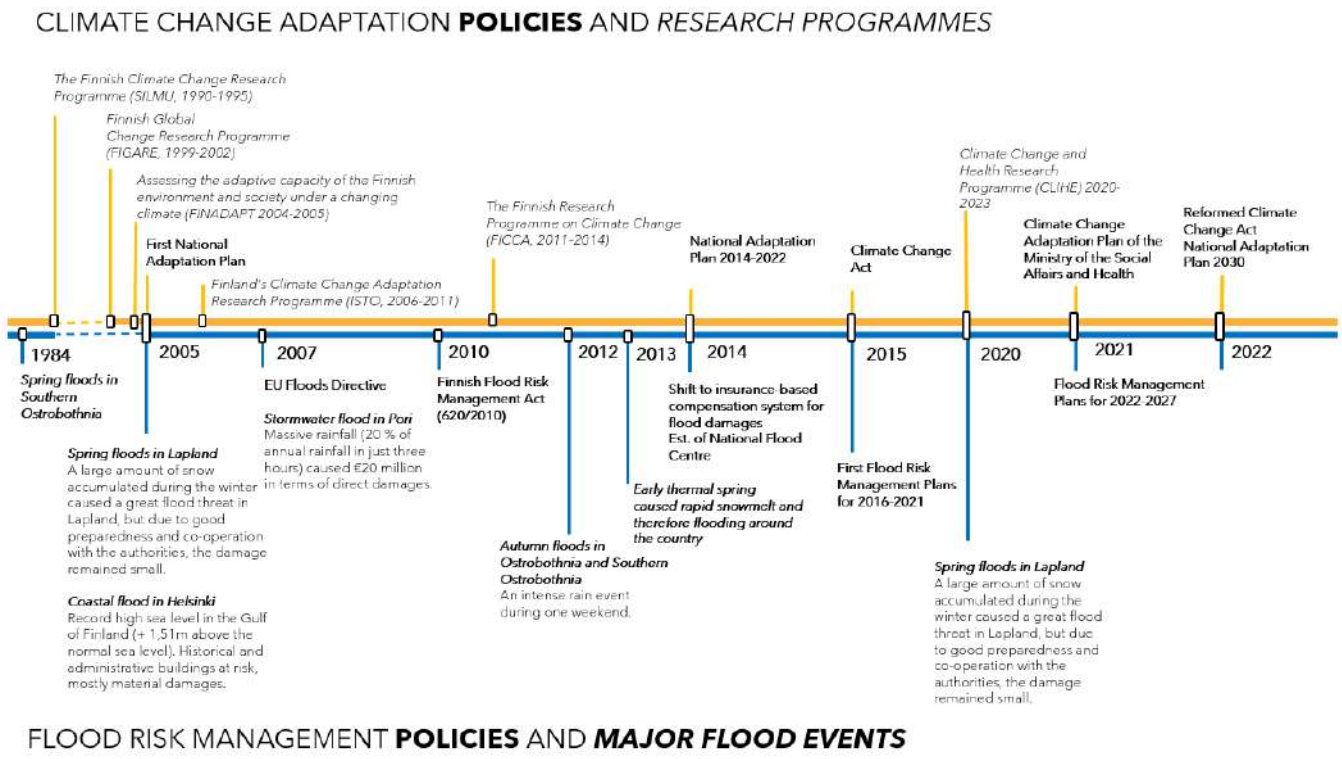

Figure 4. *Timeline showing relevant CCA and FRM policies and major recent flooding events.*

Timeline showing relevant CCA and FRM policies and major recent flooding events. Scenario-knowledge and research have influenced policy-making more than previous flood events. The yellow colour indicates activities in the climate change domain, and blue in FRM, respectively. Dotted line indicates a time-jump from the 80's to 00's.

Climate change adaptation policies

At national level, there has been interest in CCA already for two decades (see Figure 4 above). Currently, the Climate Act (423/2022) constitutes the basis for climate policy, including adaptation policy, in Finland. Climate Act requires adaptation by promoting climate change resilience and the management of climate risks. With resilience the Climate Act refers to the deliberate and proactive ability to adapt to, recover from, and plan for changes in weather and climate (MoAF, 2023).

to Climate Act, the Finnish climate policy planning system consists of four separate plans, through which policy is realized: Long-term Climate Change Policy Plan, Medium-term Climate Change Policy Plan, and Climate Change Plan for the Land Use Sector, all of which focus on mitigation, and the National Climate Change Adaptation Plan (NAP).

Finnish adaptation policy has traditionally been focused on mainstreaming adaptation into all policy fields. The first National Climate Change Adaptation Plan was adopted in 2005. The previous NAP ended in 2022, and a new NAP was accepted in December 2022 and will be in force until 2030. In the new NAP, the issue of justice is identified in a much more extended fashion compared to the previous NAP with references to distributive, procedural and recognition justice. As dictated by the Climate Act, the NAP is accompanied by a climate risk and vulnerability assessment that focuses on both sector-specific risks and cross-cutting as well as international cascading risks, which will be published at a later stage.

According to the NAP, systematic preparation for weather and climate risks and development of solutions that decreases the adverse effects are the main priorities of the Finnish adaptation policy. Hence, by implementing the NAP the government aims to reduce the adverse effects of climate change on for example, human security, health and living conditions, nature and other environments, industries, infrastructure, and important societal functions.

Flood risks are dealt with in the NAP, and they are discussed to a fairly large extent. For example, flood risks are discussed in relation to the need for improving the management of cross-cutting adaptation work, and the availability of necessary risk assessment methods and data, such as flood maps. In addition to the NAP, which is a plan for the state administration, some ministries have prepared their own sectoral plans which guide further the implementation of NAP (such as the Ministry of the Social Affairs and Health).

An overall evaluation of the previous NAP (2014-2022) and the state of adaptation in Finland was published in 2022. According to the evaluation, the strengths of Finnish adaptation include a relative strong resilience in many administrative sectors. Finland also is reported to have a good general awareness of the risks and impacts of climate change, and bigger municipalities (over 50 000 inhabitants) have planned and implemented adaptation measures (Hildén et al. 2022). Challenges of adaptation include too ambiguous goals and the low extent of obligations for adaptation, coordination of adaptation work on the regional and local level, and that continuous monitoring of adaptation activities is still in its infancy.

In Finland, adaptation is essential to cope with the changing hydrological situation, especially as floods are the main weather and climate related hazard in the future affecting vital functions of society, such as water supply and the energy sector (Gregow et al. 2016). Different adaptation strategies and measures should also consider the individuals and communities who struggle the most to cope with climate change impacts. For example, even though the vulnerability of Finland's only Indigenous People - the Sámi people and their culture - to the impacts of climate change is widely recognised in Finland, the NAP addresses vulnerability almost exclusively on the level of systems (social and ecological) and sectors. Most of the weather and climate change risks and their adverse effects are experienced and managed locally. At the regional and local level, local governmental

authorities as well as Regional Councils and municipalities have prepared their own adaptation plans and they implement measures accordingly.

Although the policy discourse at national level has favoured adaptation, the situation is not balanced at regional and local level. Currently, adaptation planning in municipalities is based on voluntary actions and there is no direct steering on adaption policy from the national level to lower levels of government. However, sectoral legislation assigns municipalities tasks that can influence adaptation, such as tasks assigned in the Flood Risk Act. Yet, while the National Land Use Planning Guidelines promote adaptation in regional and local land use planning, the only legal obligation for municipalities to adapt in planning land use and building is the obligation to take flood risk into account when considering the suitability of a building site. The assumption is that municipalities will use the best available information on flood risks in the area to assess the suitability.

Although it is widely recognised that climate change will pose significant risks for the municipalities and municipal economy, activeness in taking adaptation measures varies greatly between different municipalities. Resources vary at regional and local levels, affecting the capacities of regions and municipalities to invest in adaptation planning (Gregow et al. 2021; Hildén et al. 2022). This variation may generate inequalities if smaller municipalities lack resources and capabilities to address climate risks. By 2021, half of the regions had prepared voluntary regional adaptation plans (Lounasheimo et al. 2021, 86). Often in larger cities, adaptation measures have been considered during strategic development of the city. 16 cities or regions in which population covers 40 % of Finland's total population have joined the Global Covenant of Mayors for Climate and Energy (CoM). The CoM requires that the cities report their climate and energy measures including adaptation measures. This has improved knowledge of adaptation measures at the city level.

From the point of view of Finland's SOLARIS case studies, the Helsinki Metropolitan Area has come far in their work on adaptation (see section 2, case study 1). The area has its own adaptation strategy, "Helsinki Metropolitan Area Climate Change Adaptation Strategy", which was adopted in 2012. Multiple reviews of the state of adaptation have been published since the start of the strategy. All the individual cities of the metropolitan area (Helsinki, Vantaa, Espoo, and Kauniainen) are members of the CoM, which means that they have taken on adaptation as a strategic goal and developed means to address adaptation. Smaller rural towns and municipalities often have fewer resources and are not necessarily at the forefront of developing adaptation plans. In our second case study area, the city of Huittinen has prepared a climate roadmap which also addresses adaptation. Kokemäki has a climate change mitigation plan under development.

Flood risk management policies

FRM in Finland has a long tradition and is currently based on extensive, cross-sectoral, and cross-administrative cooperation between central, regional, and local authorities and other actors. Cooperation is not based on complicated bureaucratic hierarchies, but instead on regular communication between the policy makers and local actors and flood managers. Cross-sectoral cooperation is manifested e.g., in the regional Flood Groups in each of the significant flood risk areas, which are responsible for drawing up Flood Risk Management Plans (FRMP) and monitoring the implementation and follow-up of the planned measures. These

groups are made up of representatives of the regional and local authorities and expert members, such as land use planners.

The policy domain of the FRM has a strong institutional basis. After the major floods in Central Europe in the 1990's and 2000's, a study on the impacts of major floods was launched in Finland by Ministry of the Agriculture and Forestry (hereinafter MoAF) (Ollila et al. 2000). The study was completed in 2000. This was followed by the work of the Major Floods Task Force, which produced its report in 2003. It proposed measures to reduce the damages caused by major floods and examined different responsibilities. Regional plans were also drawn up, e.g., flood prevention action plans. A working group was then set up in 2007 to prepare the implementation of the EU Floods Directive. The report of this Flood Risk Working Group was published in 2009, laying the groundwork for the preparation of national legislation.

The Finnish Flood Risk Act (620/2010) was implemented in 2010. The aim of the Act is to manage flood risks through multiple strategies to reduce the likelihood and potential harmful consequences of flooding on people's health and security, critical infrastructure, economic activities, environment and cultural heritage. MoAF is responsible for guidance and follow-up of the implementation of the law. The MoAF chairs also the National Flood Risk Management Steering Group constituting of representatives of different ministries and the main stakeholders.

In the framework of the European Floods Directive, risk potential is assessed nationally every six years. Where flood risks are significant, the law obliges the preparation of flood maps and FRMPs for significant flood risk areas (see Figure 2). FRMPs are the key policy documents in the Finnish FRM policy domain. The management plans, prepared by the regional Flood Group, set objectives and measures to reduce flood risks in designated significant flood risk areas. According to the Flood Risk Act, a public consultation must be organised during preparation of the FRMPs. Regions outside significant flood risk areas, and in particular municipalities, can draw up their own flood plans or strategies. Within the six-year planning cycle, the operational activities are carried out by regional authorities of the state, as well as municipalities and other local actors, who will participate in regional Flood Groups and carry out more detailed operational planning where necessary.

In addition to the Flood Risk Act, the regulatory framework for FRM includes also other laws regulating water use, civil protection and rescue services, environmental protection, and climate. The Water Act (587/2011) and the Act on the Organisation of River Basin Management and the Marine Strategy (1299/2004) are central to the FRM activities. According to the latter Act, all FRM measures must be coordinated with water management objectives and water permits are only granted for flood defence measures which meet the requirements of the law. Water management measures refer to measures aimed directly at surface and groundwater and their catchment area, which reduce the negative effects of human activity on both surface and groundwater. Land Use and Building Act (132/1999) promotes safe and sustainable planning and construction including avoiding construction in flood-prone areas. Public participation in decision making and the right to appeal is also provided for, for example in the Local Government Act.

The obligations imposed by Flood Risk Act are fulfilled by several different actors, each with their own areas of responsibility. In simple terms, fluvial and coastal flood management is the responsibility of the regional authorities (ELY Centres), and pluvial (run-off and stormwater floods) flood management is the responsibility of the municipalities. To date, river and coastal FRM is more advanced and systematic due to historical flooding. Furthermore, no significant areas of pluvial flood risk have been appointed to date, which means that no municipality is yet required by law to map detailed pluvial flood risks and prepare a pluvial FRMP. However, this situation may change in the future as the climate changes. Many municipalities, such as those in the metropolitan area, already have detailed plans for managing pluvial flooding. Pluvial flood mapping is being developed at the Finnish Environment Institute.

The funds used for FRM are almost entirely public funds. Most of the FRM tasks are carried out by public officials, in addition to which the MoAF funds various projects each year (including flood protection, usually with a 50% contribution from the municipality). However, detailed information about the costs and funds of FRM is not directly available which makes it difficult to assess the share of private funds used for flood risk management.

Implementation of flood risk management policies

In Finland, the FRM measures are divided into different categories in the plans to describe the stage of the risk management cycle (Figure 5). Hence, the Finnish FRM highlights the processual nature of risk management. This differs from the approach suggested by Hegger et al. (2014) who emphasise five flood risk strategies (defence, prevention, mitigation, preparation and response, recovery). However, the stages of the risk cycle applied in Finland correspond fairly well to the five strategies of Hegger et al. (2014). Finland also has a separate category for measures implemented during a flood, which includes measures e.g., to improve preparedness and flood warnings. Responsibilities for different actors and activities under FRM are either defined in the Finnish Flood Risk Act and Governmental Decree or in the FRMPs (responsibilities are described in Figure 5 in italics for each activity).

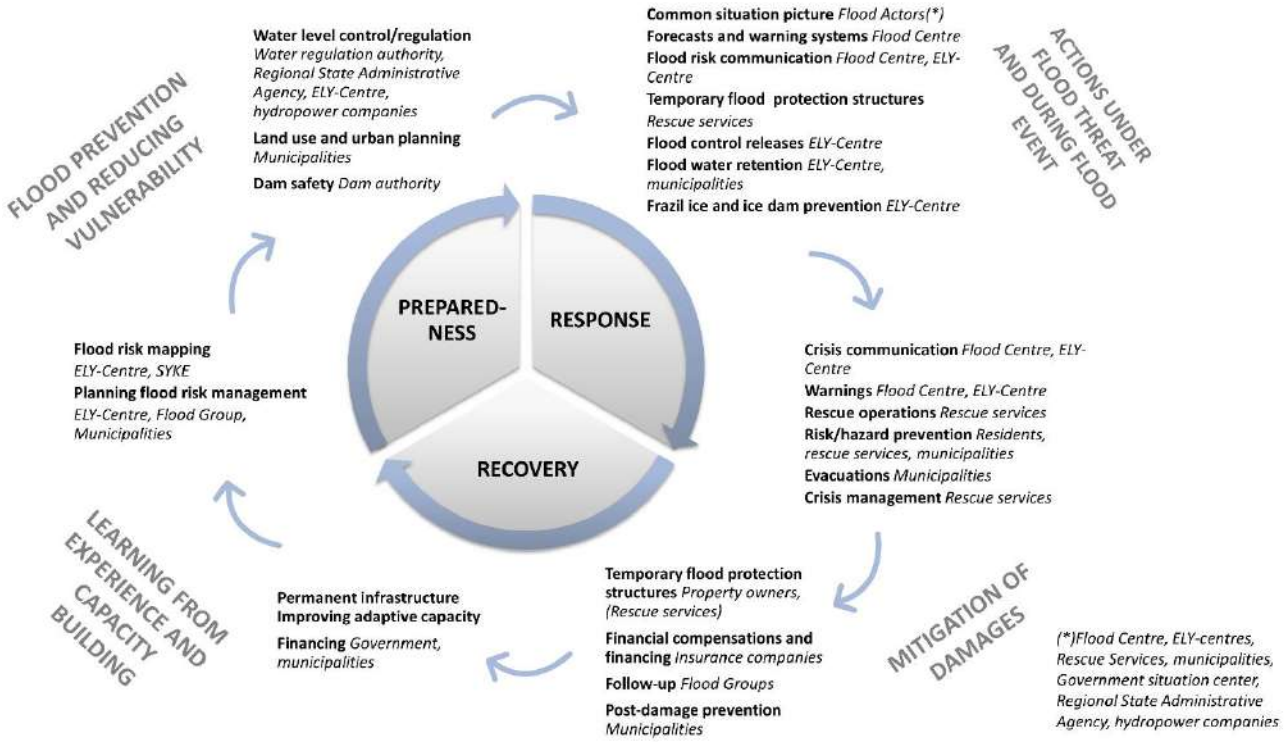

Figure 5. *Illustration of the Finnish FRM cycle and the division of responsibilities of different activities between authorities and other actors.*

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.

In the following section, the Finnish FRM policy domain is described in relation to the five flood risk strategies (Hegger et al. 2014). The Flood Risk Act actively promotes the use of different FRM strategies and alternatives to the use of traditional flood defence solutions wherever appropriate and justified in terms of impacts. Figure 6. shows the proportions of the number of planned measures under each category in the Finnish FRM in the second cycle of FRM plans for 2022-2027, according to the FRM cycle. The proposed measures are included in the FRMPs that were adopted in 2022. The graph's classification of the number of measures does not indicate how much resources or working time is available for the measures, nor how they will be implemented. The new plans have sought to increase the number of non-structural measures.

Impact assessment and selection of appropriate measures is done by the regional Flood Group[1], which is responsible for drafting and implementing the FRMPs in each significant flood risk area. Despite this, flood defence is still a strong pillar of the Finnish FRM system. The proportion of the number of measures categorized as flood defence (or flood protection) measures out of all measures has nationally remained stable both in the first FRM plans (Finnish Environment Institute & ELY Centres 2015) and in the second round of plans (Finnish Environment Institute & ELY-Centres 2021), being almost 17 per cent of all proposed FRM measures (Figure 6). Flood protection/defence measures are often project-based, which is why almost two-

[1] Regional River Basin and Coastal Flood Groups coordinate FRM planning in areas of high flood risk. The Flood Groups include representatives of the regional councils, ELY Centres, municipalities, rescue services, and other authorities and stakeholders. The group is set up by the MoAF when designating significant flood risk areas. The minutes of the meetings of the groups are available on the vesi.fi website.

thirds of the measures proposed in the first period have been completed (Finnish Environment Institute & ELY-Centres 2021). This is unlike the other strategies, where several measures are continuous in nature (i.e., they are implemented, for example, as part of official duties such as measures related to the operations of rescue services and are thus hard to measure).

In the Finnish system, flood risk mitigation is not addressed as a separate category. However, every third FRM measure in the new FRM plans corresponds the description of mitigation measure (Finnish Environment Institute & ELY-Centres 2021, Hegger et al. 2014). Most of these are categorized under the category "decreasing flood risks", while some are under the flood defence / flood protection category. Examples of the former include e.g., increasing the capacity to tolerate flooding, and the latter e.g., natural catchment-level water management measures, respectively. Figure 6 summarizes the proportions of the number of measures under each category in the Finnish FRM as reported in the FRM plans, loosely corresponding the five FRM strategies by Hegger et al. (2014).

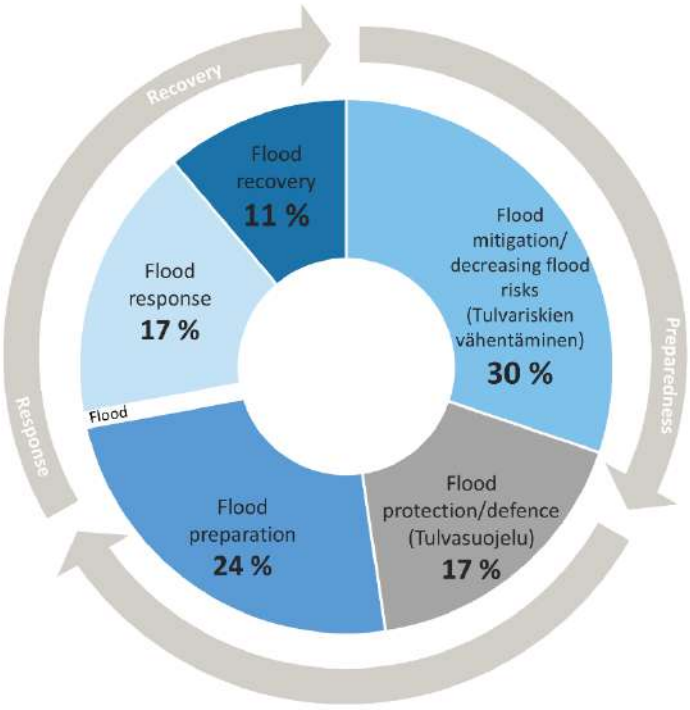

Figure 6. *Proportions of the number of planned measures under each category in the Finnish FRM in the second cycle of FRM plans for 2022-2027, according to the FRM cycle (Finnish Environment Institute & ELY-Centres 2021)*

Note that in the Finnish system, flood risk mitigation is not addressed as a separate category and is thus translated here as measures aiming to 'decrease flood risks' (e.g., flood water retention, land use planning including planning of nature-based solutions, risk communication, and other preventive measures). Also note that the classification of the number of measures does not indicate how much resources or working time is available for the measures, nor how they will be implemented. The new plans have sought to increase the number of non-structural measures.

While the overall categorization of the Finnish FRM measures might differ from the ones proposed by Hegger et al. (2014), and despite regional and local differences in the application of the five FRM strategies, all five FRM strategies are addressed in the current FRMPs analysed, indicating that the current Finnish FRM promotes a variety of objectives and measures.

Flood Defence

Flood defence strategy has been the traditional pillar of Finland's FRM, and it remains important despite growing emphasis on flood mitigation and preparation. Measures include planning and operating technical solutions to reduce the likelihood of flooding. In Finland, the defence strategy applies to all three types of floods: coastal, fluvial, and pluvial.

Coastal and fluvial flood defence are mainly implemented in a top-down manner. The Flood Risk Act, Water Act and Environmental Protection Act create the main legal framework for defence measures. The MoAF is the main national actor in governing flood defence. Cooperation with other authorities such as other ministries, research institutes and ELY Centres is regular and based on institutionalised forms of cooperation such as joint working groups and performance management. MoAF also allocates financing for coastal and fluvial flood defence measures.

Coastal flood defence relies on the construction and maintenance of permanent and temporary flood defence structures such as dikes and embankments. Coastal flood defence is governed at the central-regional level by the governmental authorities: ELY centres plan the measures in cooperation with municipalities and private operators, and the AVI issues water permit decisions to the operators of the defence structures.

In Finland, there is a long history in regulating the water levels of rivers and lakes as a fluvial FRM measure. Regulation measures are classified as preparedness measures because of the ad hoc- nature of their use in water run-off and retention. However, regulation requires building of permanent structures such as dams which also work as flood defence structures. Furthermore, water regulation is an ongoing, regular activity even if it is done on basis of flood forecasts. Like coastal flood defence, regulation of water bodies is also governed at central-regional level by the governmental authorities. Water permit procedure is used for ex-ante control of regulation structures, actions, and their impacts. Both coastal and fluvial flood defence rely on systemic analysis of floods and flood risks and common knowledge management body the Flood Centre.

Private hydropower companies have a role in regulating floods, and are required to e.g., allow water runoff during flood situations, which decreases energy production. This role is institutionalised in many binding acts such as the Water Act (587/2011) and Environmental Protection Act (527/2014).

Stability of flood defence strategy is maintained by centrally managed and legally institutionalised decision making, knowledge production and financing structures as well as by the old and indefinite water permits held by most of the dam operators. Quite recently, the stability of flood defence has however been challenged by the environmental policy domain (Räsänen 2021, Albrecht 2023). Draining, maintaining existing ditches and dredging outside urban areas are of interest in many different policy fields. The negative environmental and biodiversity impacts of draining create tensions between FRM, natural resource use and environmental protection needs. Stringent environmental regulation and strong level of protection in Natura 2000 areas have created constraints e.g., for planning cut-offs and reservoirs and operating of dams (Räsänen 2021). In addition, EU's new biodiversity strategy promotes Do No Significant Harm (DNSH) principle that creates increasing pressure to prioritise biodiversity values when political interests are in conflict and biodiversity is

under threat. In our second study, we will explore the justice implications of a political dispute that undermines the stability of the flood defence institution.

Pluvial flood defence differs from the governance of two other flood types because of its decentralised governance. In urban areas, pluvial floods are governed mainly by the municipalities. General objectives for the pluvial flood management are given in the Flood Risk Act, Land Use and Building Act and some further guidance is given in the National Land Use Guidelines. Organising water services and sewerage is a strongly institutionalised municipal activity. According to the Water Services Act (119/2001), municipalities must provide water services and sewerage including sewerage for runoff water in urban areas. Otherwise, the municipalities have a strong autonomy in organising and planning of urban surface water management.

Flood Risk Prevention

Flood risk prevention is another key FRM strategy in Finland. Whereas coastal and fluvial flood defence are governed mainly at the national-regional level, flood risk prevention is governed mostly at the regional-local level. Although decentralised, flood risk prevention in Finland is strongly institutionalised as a municipal task and a local land use planning activity.

Land Use and Building Act regulates safe and sustainable land use and construction in municipalities and promotes flood prevention when planning suitable building sites. Municipalities have the ultimate operational responsibilities for planning and controlling construction in their territory. However, there is active cooperation between the actors at different levels of administration. FRMPs, including prevention measures, are prepared in joint working groups composed of representatives of municipalities and regional authorities. ELY Centres promote and support the planning activities of municipalities and issue recommendations on the lowest building elevations, and the Finnish Environment Institute SYKE has prepared a guide for determining the lowest building elevations.

In addition to several established or official actors, citizens have also an important role in municipal decision making and they are allowed to participate in planning processes from the very beginning. Hence, flood risk prevention is not only decentralised but also the most democratically organised flood risk strategy in Finland due to the large municipal mandate in planning and the legal requirement to engage citizens in the planning processes. The justice implications of this are however somewhat unclear because it appears that municipalities have had difficulties in integrating local experiential knowledge to planning with technical tradition (Amani Fard et al. 2023, Faehnle et al. 2014). Resources of different groups of citizens to participate are not equally divided, shedding critical light on the level of recognitional and procedural justice. There is also a risk that potentially conflicting public and private interests, political pressures, and the four-year electoral cycle politicise local level planning decisions.

Prevention of environmental damage is regulated by the Environmental Protection Act. Regional State Administrative Agency (AVI) evaluate the flood risk when issuing environmental permits.

Flood Risk Mitigation

It appears that mitigation strategy is currently the least institutionalised flood risk strategy in Finland. The Flood Risk Management Cycle (Figure 5) does not address mitigation explicitly. This could explain why mitigation discourse is not very well identifiable in the Finnish FRM system and discussion. However, especially nature-based solutions (NBS) in improving water retention in urban areas is growing in importance (Paloniemi et al. 2019). Due to the lack of regulation and other rules, implementation of NBS is still largely based on experiments and active pioneering of individual urban planners and landscape engineers (Paloniemi et al. 2019). Despite local variation in attention to NBS and voluntary based actions, informational guidance including tools for planning green infrastructure in cities has been produced in recent years improving the knowledge base and general awareness of planning experts (Paloniemi et al. 2019; Inkiläinen et al. 2014).

There are also financial mechanisms supporting the application of flood risk mitigation strategy. ELY Centres grant funds for restoration of riverbeds and embankments and establishing or restoring a wetland according to the Act on the Organisation of River Basin Management and the Marine promoting restoration and management of watersheds and rivers.

Flood Preparation and Response

In Finland, responsibilities for flood preparation and response are shared among several, mainly regional and local level actors. Division of duties is strongly institutionalised and planned in FRMPs which follow the regulations of Flood Risk Act and Rescue Act. Operational readiness is based on regular exercises, evacuation, rescue and safety plans as well as forecasts and warning systems. National Flood Centre prepares flood forecasts and gives warnings, Rescue Services take care of operational emergency management and municipalities are responsible for communicating to citizens. In 2023, Rescue Services and health care services will be transferred from the municipal responsibility to a new level of regional administration: the Welfare Counties. Current administrative reform which also affects the stability of FRM has been justified with an argument for securing public resources. However, the operational readiness for floods is not expected to change due to the reform.

Also, NGO's such as Red Cross and voluntary fire departments have a role in preparation and response, but their role is not formally acknowledged. The NGO's supplement public services in major emergencies on a request of a Rescue Service, safety authority or health care provider. Citizens and private property owners are responsible for preventing an emergency, protecting their property and for warning and helping others in a flood emergency.

The operational water regulation decisions are made according to flood forecasts and warnings. Hence, the Finnish system classifies the weather-dependent regulation actions as response measures although the physical structures such as dams are according to the Hegger et al. (2014) framework classified as defence measures.

There are only few participation opportunities for the citizens in the implementation of flood risk preparation and response strategy. Preparation of FRMPs include participatory processes, but these remain at the

consultation level. Preparation plans of the cities are still difficult to access as some of them include confidential elements.

Flood Recovery

In the amendment of Flood Risk Act in 2010, flood recovery was significantly restructured by introducing a private flood insurance mechanism. Until 2013, the state paid compensations for building damages caused by fluvial floods to private citizens. Since 2010, there has been two different compensation systems: private insurance mechanism provided by insurance companies to their customers and public system covering the costs of damage caused by floods for public property. The only exception to this is damage caused for private roads. For this the government allocated specific funding.

A full insurance-based compensation policy was introduced at the beginning of 2014. Since 2014, compensation has been paid through the flood insurance included in the home and property insurance, which covers most residents but only compensates for damage caused by exceptional floods (floods occurring more seldom than once in 50 years). In more frequent flooding situations, compensation is not provided. The information of compensations is provided by the insurance company once a year through the Financial Services Industry Association.

Evacuations, cleaning, and other recovery actions are on the municipal responsibility. ELY Centres are responsible for the evaluation of FRM system. The Ministry of Agriculture and Forestry monitors the implementation of the Flood Risk Act and is responsible for reporting to the European Commission on the implementation of the Floods Directive.

Links and dynamics of FRM and CCA policies and governance

In Finland, CCAP is a general policy framework which includes also FRM measures. FRM has a long history in Finland, and hence there is also an existing governance tradition in the field of FRM. On the contrary, CCAP is a relatively new policy area (see Figure 4). The main difference between FRM and CCAP is in their political mandate. CCAP is legally based on Climate Change Act which represents general framework legislation and does not include substantive legislation nor can assign duties for the autonomous municipalities. Hence, the impact of NAP at the local level is based on indirectly supporting voluntary actions and capacity building through knowledge production. FRM is an exception to this. The Flood Risk Act gives a strong legal mandate for different authorities to act in flood risk measures.

In Finland, FRM and national CCAP are both nationally coordinated by MoAF. MoAF directs, monitors, and coordinates the implementation of the Flood Risk Act and other FRM, as well as the operations of the Flood Centre, the main information provider in flood situations. MoAF also coordinates the monitoring group on the implementation of the national adaptation plan. The role of MoAF is hence critical in both policy processes. It has substantial political power in the legislative process of FRM and CCAP through allocation of resources to and performance management of other governmental authorities implementing FRM and CCAP measures, such as local and regional governmental authorities and research institutes.

In addition to the MoAF, also the Ministry of the Environment (hereinafter MoE) and the Ministry of Social Affairs and Health have important responsibilities in both FRM policy and adaptation policy (including land use policy). MoE, for example, coordinates the implementation of the EU Water Framework Directive. Inter-ministerial cooperation groups (e.g., Adaptation Monitoring Group, National Steering Group on Flood and Drought Risk Management) coordinate administrative responsibilities, some of which overlap or cross-over.

Local authorities have substantial political power in both FRM and CCAP. While regional state authorities and municipalities are formally mandated and responsible for FRM, the planning of climate change adaptation measures at the municipal level is voluntary and falls under the general competence of autonomous municipalities (see chapter 'Public policies'). Consequently, there are no sanctions if the municipalities would not prepare their own CCAP. The mandate and responsibilities of municipalities in FRM are therefore not officially justified by adaptation policy but are conferred under specific legislation on FRM. Moreover, the prevailing approaches to flood risk management have conditioned local adaptation in a way that has missed opportunities for flexible and participatory governance of adaptation (Klein 2016).

Although local and regional authorities have stable roles and responsibilities in FRM and they are increasingly involved also in R&D projects (e.g., flood mapping and modelling, pilot studies) and financing of FRM measures, flood risks are very unevenly distributed across Finnish municipalities, causing potential mismatch between responsibilities and municipalities' capacities to meet them, also in financial terms. Resource constraints are also the biggest bottleneck in municipalities' activity in CCA measures.

The role of private sector and individual citizens has increased in FRM since the Flood Risk Act was adopted in 2010. While authorities carry most of the political power in FRM, private property owners are sharing the financial risk of flood damage with the public authorities. With the end of the state's liability for flood damage in 2014 the importance of insurance provided by insurance companies and thus the role of the private sector in reactive adaptation has grown significantly. Citizens are responsible for protecting themselves and their property, i.e., managing the residual risk. Residents are advised to find out for themselves the flood risks in the area and to take care of the preparedness themselves. There is evidence that dissatisfaction of the citizens towards FRM measures has resulted in erosion of trust of their trust towards the FRM system and kept the level of self-preparedness low (Räsänen 2021). On the other hand, legislation obliges citizens to be consulted in significant flood risk areas as well as during land use planning processes. However, during the FRM process, citizen activity has been relatively low. Citizen activity is often higher in areas with experience of flooding. Hydropower companies have had an important role throughout of history of FRM in Finland. Today, their role is changing because climate change and ecological considerations are challenging old practices (See more in Case study 2). CCAP covers a wide range of sectors and hence the role of citizens varies between them.

Monitoring systems and scientific knowledge are important resources for both FRM and CCAP. In FRM, knowledge production has been institutionalised into the system. Since 2014, the Finnish Meteorological Institute and Finnish Environment Institute have together managed the Flood Centre, which is responsible for

monitoring and communicating the national hydrological situation, producing water and flood situation maps, giving flood forecasts and warnings, and maintaining a national flood situation. CCAP has not institutionalised its own knowledge production system, but at the national level, a key activity of the CCAP has been the financing of research and scientific activities in the field (see Figure 4).

Answering SOLARIS research questions from a national/regional level perspective

Justice and equality in public policies

The welfare state model in safeguarding equality

In Finland, social equality has been high on the political agenda from national to local levels since the WWII. Currently, this is institutionalised in the Constitution of Finland (731/1999), according to which, no one should be treated differently from another person on the ground of sex, age, origin, language, religion, opinion, health, disability or other reason concerning the person. After WWII, Finland's economic and social model was gradually developed, through various political conflicts and compromises, into a large welfare state representing the Nordic model with progressive taxation, a generous level of support and the provision of universal services (Kettunen, 2001; Esping-Andersen & Korpi 1986). Since the recession in the 1990's, the Finnish welfare state system has been gradually reformed by developing more means-tested benefits and supportive actions encouraging for individual responsibility (Kangas & Kalliomaa-Puha, 2019, Jutila, 2011). Currently, the Finnish government finances approximately half of social expenditure while the other half is paid by employers and other stakeholders (Kangas & Kalliomaa-Puha, 2019). In the European comparison, Finnish welfare state system is still large and social security universal despite recent developments and increase of the share of means-tested subsidies (Kangas & Kalliomaa-Puha, 2019). In society and among political parties, there is also a strong consensus concerning the need to prevent social exclusion and reduce income disparities as well as the fundamental principles of the Finnish welfare model (Saari 2023).

In international and EU-level comparison, Finland has succeeded in taking relatively good care of the most vulnerable people. At the moment, income disparities in Finland are significantly higher than the levels in the early 1990's but still well under OECD average (Fleischer & Stokenberga 2023). More recently, income inequality growth has stagnated and has not improved since the early 2000s (Fleischer & Stokenberga 2023). In reduction of homelessness, Finland has succeeded well. Due to an effective national strategy, number of homeless people has declined significantly (Prime Minister's Office, 2020). There is however a concern related to structural inequalities related to gender, level of education, political efficacy and loneliness that appears to perpetuate health, employment, educational and political participation disparities among the Finnish population (Fleischer & Stokenberga 2023). Climate change could exacerbate this trend directly or indirectly. Direct impacts will affect the already disadvantaged, who are already inherently weak in terms of resources and resilience. These include, for example, the poor and marginalised, and those whose neighbourhoods have a one-sided economic structure and are vulnerable to climate change. Indirectly, the impacts may be felt, for example, in the form of an increased need for social support, particularly in the social and health sectors (Fleischer & Stokenberga 2023).

Although equality is a constitutionally protected right in Finland, political interest towards issues of justice have increased quite recently within the climate policies. According to Juhola et al. (2022), Finland performs well in procedural justice, moderately well in distributive and regontional justice and poorly in restorative justice. The Finnish Climate Change Panel have outlined the meaning of concepts of justice in the Finnish context and from the perspective of the legal system (Kivimaa et al. 2021). In the discussion paper, Kivimaa et al. (2021) argue that climate policy cannot solve the existing inequalities alone. Instead, the discussion paper promotes climate policies which strives to prevent worsening current inequalities without adequate compensation. The Finnish Climate Panel has also prepared tools for evaluating climate policy justice for decision making (Kivimaa et al. 2023).

Mainstreaming social sustainability as a response to concerns about rising inequalities

So far, the administration seems to be following sectoral boundaries when dealing with issues related to social inclusion and equality and to climate policy. For example, climate change impacts and management, such as flooding and FRM, and social inclusion and equality issues are addressed in separate policy areas and in sectoral strategies, which rarely show links between climate change and social inclusion and equality issues.

However, sustainable development policy is breaking down administrative silos. Finland has been a forerunner in promoting sustainable development in the society at different policy levels. Finland has been ranked among the top countries in the international comparison of the implementation of the Sustainable Development Goals (SDGs) (Sachs et al. 2022). According to the report (Sachs et al. 2022), Finland has already achieved the goals for social sustainability. Also, in the Government Report on the 2030 Agenda for Sustainable Development (Prime Minister's Office, 2020b), social responsibility to take care of the most vulnerable people is stressed. The report refers to the Constitution of Finland, which upholds the rule of law and provides strong protection for the dignity and integrity of every individual and other fundamental rights. According to the Report, attention is already paid to the role of different groups of people in preparing for disasters and climate change (ibid., 27). The additional measures include improving social care by targeting services specifically at (adult) risk groups and developing universal services for children such as early childhood education and extending compulsory education (ibid., 28). Adaptive capacity or resilience of families is strengthened through developing preventive services for families and paying attention to minimum staffing level for protection of the most vulnerable children (ibid. 28). The Government's target is to halve homelessness by 2023 and eradicate it by 2027 (ibid., 70).

However, the evaluation of the Government actions on sustainability shows that there is no complete consensus on success in achieving the social sustainability measures. The Government has assessed that it has achieved the objective of considering the situation of different groups of people when improving society's preparedness for climate change and disasters (Prime Minister's Office, 2020a, 106). However, inequalities and social exclusion still seem to accumulate and extend across generations (ibid., 124). According to civil society's evaluation, the government has been too optimistic in its assessment of the progress in tackling social deprivation. In its evaluation, the Civil Society Panel states that the risk of poverty or exclusion and inequality have not been reduced as much as the government estimates (ibid., 107 and 125).

Recent work to implement the Agenda2030 has paid particular attention to mainstreaming issues of justice and equity across society. Planning of the implementation of the Agenda2030 has been continued in the Strategy of the National Commission on Sustainable Development 2022–2030 (Prime Minister's Office, 2022). The Strategy is guided by six areas of change, and it includes also five cross-cutting principles: ensuring fairness, equity, and gender equality; facilitating the inclusion and participation of society at large; paying special attention to the most vulnerable (leaving no one behind); ensuring long-term commitment and policy coherence; and taking global responsibility.

Promoting sustainable development is a government tool to improve society's foresight. Parliament also has a similar foresight mechanism, the Committee for the Future, which addresses sustainable development issues through cross-sectoral and long-term foresight work at parliamentary level. The Committee's recent report on well-being in Finland (Committee for the Future of the Parliament, 2023) discusses social inequalities as a driver of many acute welfare challenges. It identifies climate change as a potential driver of inequalities, and enhanced mitigation and adaptation as a solution.

In the recent report of OECD, it is highlighted that despite fairly good level of equality in Finland, distributional impacts of climate change and climate policies should be analysed in more detail to address different needs of people and to ensure legitimacy of climate policies (Fleischer & Stokenberga 2023).

Justice in FRM policies (RQ 1)

In Finland, the issues of justice have not gained particular attention in the FRM policies. It appears also that there are currently no specific or institutionalised policy mechanisms at the national nor regional levels for managing the differences in human vulnerabilities in floods and flood-related emergencies. We suggest interpreting this 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 - has worked well and there has been no acute need to explore vulnerability disparities further.

In the FRM documents analysed, there is a strong discourse of human interest. FRM policies aim at decreasing probability of flooding and decrease harmful impacts of floods including harmful impacts on people's health, security and property, and critical infrastructure. This is explicitly addressed in the Flood Risk Act. In other FRM documents analysed[2], the social dimension is reflected in references to 'people', 'inhabitants', and 'population'. Also, the Governmental Decree on Flood Risk Management requires that for each designated significant flood risk area the number of 'inhabitants' are mapped, without distinguishing between different groups and how they are impacted by floods. At the same time, in the FRM system based on risk modelling and mapping, the social dimension is also addressed as an infrastructural and spatial factor. This is evident

[2] Helsinki and Espoo Coastal Flood Risk Management Plan 2022–2027 and Kokemäenjoki Flood Risk Management Plan 2022-2027

from references to locations of societal infrastructure such as hospitals, schools and kindergartens that require special attention in emergency response (i.e., are hard to evacuate). Special rescue needs are discussed mainly at the level of properties and their characteristics rather than in terms of profiles of individuals, as the following excerpt shows.

> *The flood risk assessment presented in the flood risk assessment of the coastal areas of Helsinki and Espoo has not revealed that the elderly centres, hospitals, health centres, kindergartens, schools, etc. that are difficult to evacuate from the flood area are protected or whose evacuation would be more challenging than usual. (*Helsinki and Espoo Coastal FRMP 2022–2027, p. 34.*)*

In addition to spatial mapping of flood risks, socio-economic impacts are evaluated while considering and prioritizing flood risk measures. In the FRMPs, costs of potential flood damages are evaluated as part of the risk analysis. The measures promoted in plans are assessed in terms of their social and environmental impacts (see RQ3-section). In Finland, forecasting flood risks is based on cost-benefit analysis of FRM investments. The risk potential is defined as the economic impact and the number of people at risk from flooding (Parjanne et al. 2018).

Even though human interest is at the core of Finnish FRM, the analysed laws and FRMPs rarely address inequalities or differences in people's vulnerabilities (e.g., Flood Risk Act (620/2010), Helsinki and Espoo Coastal FRMP 2022–2027 and Kokemäenjoki FRMP 2022-2027). Inequity, inequalities or (in)justice are not explicitly mentioned in any of the analysed legal or policy documents. Instead, we find references to groups of people whose health or safety requires specific attention or action during FRM process. In this sense, the FRM sector is a typical example of an environmental policy that protects universal environmental rights and the public interest in a good living environment for all citizens. This discourse is also enshrined in the environmental article of the Constitution of Finland.

In the law, differences between different groups of people are not mentioned. The Flood Risk Act refers to "people" and "residents" as a single entity and does not distinguish any specific groups of people. FRMPs refer to buildings and sites that would require special attention in emergency response as mentioned above. Reference is also made to people who are exposed to flooding because of the location of their homes or the roads they use ('*residents of Suomenlinna Island*' and '*users of the road network*') and people who are disabled from protecting themselves because of their health or age ('*people with reduced mobility*' and *'elderly people dependent on home care*'). These specific vulnerabilities are mainly referred to in the context of flood risk preparedness and response.

Vulnerability is directly addressed in FRMPs analysed as well as in a report describing a flood risk forecasting methodology. However, the concept seems to lack a clear meaning in the policy context. In the FRMPs analysed, vulnerability is presented as a flood risk factor alongside probability and flood hazard. The plans do not include specific measures to reduce people's vulnerability but instead address it as part of risk management and physical exposure reduction. In contrast to the way vulnerability is understood in the policy context, in a report describing a flood risk forecasting methodology, vulnerability is defined as "sensitivity to a potentially

damaging or dangerous phenomenon" (Parjanne et al. 2018, 48). The report acknowledges the social impacts of vulnerability which are however difficult to model partly because of their situational nature (ibid, 13). These two approaches to vulnerability are not contradictory, but rather reflect a situation where the concept of vulnerability is not institutionalised and where different interpretations coexist.

The FRMPs mention the varying abilities of people to protect themselves in an emergency. Preparedness and response measures addressed to manage varying vulnerabilities during a flood event can be divided into two categories: 1) public governance and more detailed flood risk governance planning at the municipal level and 2) responsibilisation of private property owners and other actors. According to the FRMPs, the property owners should privately protect their property such as houses from floods. Property owners have also been assigned responsibilities in helping their neighbours in protecting their property from floods or giving shelter or other help in an emergency. Public authorities are responsible for communicating effectively on potential flood risk and building capacities of private property owners.

From 2014, private insurance companies have provided property insurances covering insurance against flood risks. Sharing burden of responsibilities among different stakeholders in preparation and recovery is also about sharing economic risks. Public spending is allocated for centrally managed flood defence measures such as dams and embankments as well as rescue service and knowledge production. Residual risk after public interventions is left for residents. So far, with moderate flood damage, the residual risk has also been relatively low, and there is little public discussion on legitimacy of the compensation system and use of private insurance mechanism.

Justice in CCA policies

The analysis of the main CCAP documents reveals similarities and differences between CCAP and FRM domains in the way justice issues are approached. In the national NAP, which guides national level authorities, social issues are discussed at a general level and the location of groups of people is not considered on a site or property basis in the same way as in FRM documents, in which the locations of people guide local operational activities. However, in the social and health sector, the structural aspects of individual vulnerabilities are more widely noted, but this is not yet reflected in FRM.

The new National Adaptation Plan (MF, 2023) is the first NAP to implement the Climate Act (432/2022). One of the objectives of the Climate Act is that all climate measures must be prepared in accordance with the principles of equity, both in process and content. The new NAP complies with this by paying particular attention to the unequal distribution of climate change impacts and by requiring an evaluation of the justice aspects of adaptation policies (Hilden et al. 2022). A wide range of stakeholders, including vulnerable stakeholders, were involved in the preparation of the NAP. An evaluation by Juhola et al. (2022) found that adaptation policies implement procedural, distributive and recognition justice as opposed to restorative justice, although adaptation policies are deficient in all dimensions of justice.

In the social and health sector, The Climate Change Adaptation Plan of the Ministry of the Social Affairs and Health (Meriläinen et al. 2021) focuses on the adaptation in health sector and on direct health impacts of

climate change. In addition, the Plan recognises that climate change changes the context in which health and social protection is delivered including changes in individual vulnerabilities. For the public social and health care system, understanding changes in individual vulnerabilities is critical for the system's resilience (e.g., the amount of help needed may change and new groups of people may need help and people's trust towards the system may decrease if they face vulnerabilities). The performance of the general infrastructure will also be reflected in the ability of the health care system to fulfil its role in the face of climate change. The Plan suggests, that while social services will reach vulnerable groups, they could be used more for adaptation. In particular, the role of home-based services is seen as important. This approach to vulnerabilities is very different from the FRM or national climate change adaptation policies. It is however, acknowledged that there are still significant knowledge gaps in relation to individual vulnerabilities.

Justice implications of flood risk management are not directly addressed in policy evaluations

In Finland, fairness and justice issues are rarely discussed in relation to floods or their management. Policy evaluations are not an exception to this. 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 FRMPs 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 it did not include any obligations on households. In the proposal it was stated that the Act would improve FRM 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. According to our interviews in our second case study area, social impact evaluation of the FRMP of Kokemäenjoki is based on the results of an expert workshop. Hence, it appears that no specific criteria have been applied in social impact evaluation within the FRM.

Climate policy evaluation is carried out in Finland, but so far it has focused on assessing the effectiveness of policies and policy objectives. Currently, the evaluation of social and health impacts of climate change is underdeveloped also in the field of climate policy in general (Järvelä et al. 2018, 25 and 28). The tools for climate justice assessment developed by the Finnish Climate Panel (Kivimaa et al. 2023) are also applicable in the context of flood risk management, but so far there is no experience of their use. However, Kivimaa et al. (2023) emphasise in their assessment tool report that the climate justice issue cannot be solved solely within climate policy but requires cross-sectoral solutions. So far, however, the social impacts of flood risks have not been assessed in other policy areas either.

Floods and their social impacts have received increasing media attention

In the Finnish debate on the impacts of climate change, the side effects of climate change mitigation measures, which are perceived as excessively harmful (overreacting policy responses), have been highlighted, rather than concerns about the negative welfare impacts that climate change may cause (underreacting policy responses) (Järvelä et al. 2018, 25-26). Floods are not an exception to this. In recent years, news about needs to adapt to extreme weather events and their impacts such as floods have gained increasing attention,

especially after the devastating floods in the Central Europe in 2021. The focus of the news has been on the planned FRM measures or on new research results in Finland. During the second case study research, we have encountered several newspaper articles which tell about flood events in Huittinen. In the articles, local people have been interviewed about their experiences. In Huittinen, also the conflict related to building of the channel in Säpilä Peninsula has gained media attention.

We have interviewed altogether around 40 stakeholders in the Helsinki Metropolitan Area (HMA) and discussed with local residents and stakeholders in outdoor living rooms in Kokemäki and Huittinen. From the interviews, we learned that most of the interviewees had not considered issues of equity and inequality in the context of the floods. However, in the HMA, the most vulnerable groups and their representatives raised the issue that climate change and flooding will further complicate their daily lives if there will be more risks in their living environment, potentially increasing their vulnerability and creating new inequalities. The authorities responsible for planning and developing FRM in the region argued that, as the situation in Finland is currently quite good and serious flood damage is very rare in the future, inequality is not a major concern (see more in Case study 1 and 2 chapters.)

Role of participation (RQ2)

Participatory culture in Finland - tensions behind the benefits and the introduction of new methods

In Finnish political culture, participation is considered to have both intrinsic and instrumental value. Citizen participation in decision-making is a constitutional principle and a civil right that implements the ideals of democracy and equality. Consequently, democratic environmental policies, including FRM, should also be based on the idea of citizen participation and inclusion. The instrumental value of participation refers to the benefits of participation for the effectiveness of environmental policy making. In practice, there are also tensions between participation and policy effectiveness (Järvelä et al. 2018).

Relatively high political trust among citizens in Finland indicates that democracy is working well and that there is social cohesion in the society (OECD 2021). At the societal level, high social trust is explained with extensive welfare state system and small income disparities (Fleischer & Stokenberga 2023). However, in recent decades, political participation of citizens in society has become disparate. Furthermore, at the individual level, the decline in political engagement and civic competence has been found to undermine political trust in Finland (Bäck & Kestilä-Kekkonen 2019).

Lobbying and power imbalances may also create problems for achieving democratic ideals through participation. The Finnish political system is often described as corporatist, as different interest groups have relatively high power in decision-making, including environmental policy making (Vesa et al. 2020 and 2018). In Finland, specific features of ‘routine corporatism’, as distinct from ‘peak corporatism’ referring to the tripartite bargaining on the income level, are 1) lobbying of extra-parliamentary decision-making bodies and 2) public administration, 3) dominant position of economic interest groups, compared to 4) the citizen groups which have been partially integrated into the corporatist arrangements and 5) hierarchical system of interest groups where resources define the position and access of a group in decision-making (Vesa et al. 2018). Vesa et al. (2018)

argue that persistent corporatism, which has taken new forms in new circumstances rather than disappearing altogether, distinguishes Finland from, for example, the pluralist UK. In climate policy, the strong role of economic interest groups is associated with low political ambition in climate policy rather than the inclusiveness of climate policy networks (Gronow et al. 2019). Furthermore, the corporatist culture has allowed economic interest groups to influence in climate policies behind the scenes in a way that has also made it more difficult to discuss their influence in the media (Vesa et al. 2020). In the FRM domain, role of economic interest groups such as hydropower companies have not been studied although they cooperate closely with the regional and local authorities in the flood groups of the most significant flood risk areas.

The instrumental value of citizen participation and the idea of inclusion which serves the effectiveness of decision making has been criticized also by the social policy research and advocates of social rights. In Finnish, the words inclusion and inclusiveness (in Finnish: '*osallistaminen'* and '*osallisuus'*) are very similar to the word participation (in Finnish: '*osallistuminen'*) which often leads to confusion and vague use of concepts without paying attention to the important conceptual differences between them. In contrast to the often top-down led participatory processes serving policy making, from social policy perspective, inclusion that respects individual agency is an essential precondition for well-being and individual and collective empowerment, and thus primarily serving individuals and their communities (Hirvilammi & Helne 2014). This perspective creates specific demands for the political strategies which employ participation as a tool for improving political effectiveness. The Finnish Climate Panel has stated in its report that, from an inclusion perspective, it is important that participatory processes 1) have real impacts that participants can identify, 2) provide feedback on how listening to citizens' perspectives has been used, and 3) provide a role for NGOs in policy processes (Järvelä et al. 2018). Otherwise, it is difficult to commit people to decisions made which may undermine legitimacy of decision making (ibid.). These perspectives would require attention also in FRM.

Due to the tensions, criticism of the quality of current methods of participation has also increased (Järvelä et al. 2018, 8). The Finnish Climate Panel has promoted the use and development of knowledge co-production and action-oriented research methods to enhance the social and political legitimacy of climate policy, which - like FRM - is often based on complex scientific knowledge which is often difficult to translate into everyday language (Järvelä et al. 2018, 11). However, action-oriented research practices are still based on individual experiments, and they have not been mainstreamed into the Finnish participatory culture. In the Finnish FRM domain, action-oriented research practices have not been experimented.

Formal rules for participation in flood risk management

Formal regulation in law ensures a minimum level of participation. However, as the Finnish Climate Panel report notes, also other public measures should be taken to complement the minimum participation requirements. Still, legal requirements are highly valued by the stakeholders (Järvelä et al. 2018).

In FRM, national 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 FRMP and their background documents, and to give them the opportunity to comment on the proposals in writing or via internet. The announcement for

public consultation is often publicised through the social media of the ELY Centres, newspapers, and information boards in public buildings such as libraries, and where possible, various events for residents and stakeholders are organised. The previous consultations for the FRMPs 2022-2027 took place during Covid-19, so no face-to-face meetings were organised.

As there are no significant pluvial flood risk areas currently in Finland, public consultations only concern the significant coastal and fluvial risk areas. Comments to FRM proposals and plans often come from other authorities and municipalities to which a separate request for an opinion has been sent. In addition, comments come from local actors, organizations, and citizens in the region. Citizens' feedback has been rather limited. The low level of citizen participation in FRM may partly be explained by irrelevance to majority of citizens due to lack of flood experiences. All feedback is responded to and published openly. The decisions to take the feedback into account when finalizing the plans are then made by the regional flood group constituting of regional and local authorities.

The Land Use and Building Act, guiding flood risk prevention measures, aims at ensuring everyone's opportunity to participate in planning. In the beginning of the planning process, the planners must prepare a participation plan which describes participatory activities and those who are involved by the plan. However, the law protects one group of people in particular, landowners, who must not be unduly disadvantaged by local planning. Throughout the law's existence, the real opportunities for public participation in the planning process have been called into question (Bäcklund & Mäntysalo 2010; Leino & Laine 2012; Yli-Pelkonen & Niemelä 2005). Studies have also identified how this has led citizen activists to reject institutional modes of participation and opt for a different route of direct urban activism (Leino 2012; Leino 2005). The government prepares a new Land Use Act while this report was written.

At the local level, all municipal decision making is organised in Local Government Act which regulates citizens' opportunities to participate and exert influence on the activities of the municipality. According to the Act, each resident and service user have broad rights to participate in and influence the municipality's activities. A municipality must listen residents' opinions before making decisions.

In FRM domain, there are participatory requirements regulated by the existing law. It appears, however, that even the minimum level of participation is not very ambitious. Currently, there are no studies on participation in FRM in Finland and no systematically collected data on the subject. 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 yet driven by efforts and framings by the authorities. The documents do not explicitly focus on the social engagement of particular vulnerable social groups or other targeted groups.

Knowledge and capacity-building on social inequalities (RQ3)

Research and scenarios have guided the direction CCA and FRM policy more than realised risks

Research-based knowledge has strongly guided the development of Finland's climate and FRM policies in a proactive way, especially in relation to extreme weather events and their impacts. In other words, research, foresight, and scenario information have guided the direction of CCA and FRM policy more than actual risks. As shown in Figure 4, Finland has implemented several multiannual research programmes on climate change. In addition, the Joint Research and Analysis Activities of the Government (VN TEAS), coordinated by the Prime Minister's Office, and the studies carried out by the National Climate Panel provide information to support decision-making. Information is made available to the public online at climateguide.fi.

Information is plenty but underutilized

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. The system maintained by the Finnish Environment Institute continuously compiles information on flood maps, floods that have occurred, FRM measures and their progress, as well as reports to be submitted to the EU in accordance with the EU Floods Directive.

Flood maps form the basis for FRM measures and damage assessments. Flood maps are also widely used in flood situations and as a tool for land use planning, giving these maps a lot of power as the basis of decision making. Furthermore, flood maps and estimations of the flood intensity by the Finnish Environment Institute and Flood Centre also form the basis for compensation for flood damage from insurance companies.

Flood maps are produced by ELY Centres and the Finnish Environment Institute. Flood mapping is required by law in the areas with significant flood risk, and they are updated on a yearly basis. The Governmental Decree (659/2010) requires that the flood risk maps show the inundated areas, the water level and water depth during the flood and, where appropriate, the flow during the flood and the flow velocities. For stormwater flooding, the maps should also show the probability of rainfall. For identified floodplains, maps should show 1) the estimated number of inhabitants; 2) specific sites that are more vulnerable to floods, such as hospitals, schools and kindergartens; 3) infrastructure such as roads, energy networks, telecommunications networks and water supply facilities; 4) economic activities essential to safeguard the vital functions of society; 5) industrial facilities potentially causing environmental damage; 6) cultural heritage sites and 7) knowledge of locations where ice jams, erosion or environmental damage could occur. Currently there are over 100 maps with different scenarios (also climate change scenarios), compiled in a web-map service[3] and available as open data.

In Finland, the Climate Panel has collected research based on the latest knowledge on how flood risks will change in the future at a regional level (Gregow et al. 2021), and this information has been used in the regional FRMPs The Finnish Environment Institute has also modelled how the flood risk will change in the future, using

[3] https://www.vesi.fi/vesitieto/tulvakarttapalvelu/ (In Finnish)

both climate (RCP's) and socio-economic development scenarios (Shared socio-economic pathways, SSP's) (Parjanne et al. 2018).

FRMPs describe the effects of the measures from different perspectives. Traditionally, the selection of measures, i.e., the selection of a flood strategy, is based on a cost-benefit analysis. The most recent plans also evaluate e.g., the effects of measures on the achievement of water management goals, the effect of climate change on the implementation of measures, socio-economic effects, and many others. In Finland, multi-criteria decision analysis (MCDA) has also been used in the selection of FRM objectives 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.

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. The Finnish Statistical Office also annually publishes neighbourhood-level statistics on the residents' income and education level, as well as other socio-economic indicators. In FRM, only information on the number of residents and the type of residential buildings is currently used. There is therefore a lot of potential for using other data in FRM, as the information would be relatively easily available to government institutions (Finnish Environment Institute, ELY Centres) that carry out FRM. In other words, the available information is currently underutilized.

Empirical knowledge on social vulnerabilities is needed

To date, only the direct effects of floods on human health and safety have been assessed, and only in terms of the number of potentially exposed population and vulnerable sites, such as schools and hospitals. Less weight has been given to the identification of the indirect impacts of floods, such as the social and health impacts. 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. It is not clear to what extent there is qualitative empirical data on the matter, and how it is currently used in the context of FRM and CCA. Some resident surveys have been conducted, but their utilization in policymaking is unclear.

So far, one social vulnerability assessment has been carried out in Finland using spatial data on socio-economic characteristics. In 2015, the Helsinki Region Environmental Services (HSY) commissioned an analysis that examined social vulnerability of the Helsinki Metropolitan Area (i.e., SOLARIS Case Study 1 in Finland) to floods and heat waves (Kazmierzcak 2015) (Figure 7). The analysis is based on the social vulnerability mapping method developed in the UK, University of Manchester (Lindley et al. 2011). Social vulnerability was defined as the level at which a person's health and well-being will be negatively affected if they find themselves in a flood situation (or heat wave). By combining various socio-economic datasets with statistical methods, indicators were formed to describe social vulnerability to climate change. Flood data was combined to see which places are more socially vulnerable to floods. The resulting maps reflect the socially vulnerable areas of the Helsinki region. The challenge in interpreting and utilizing the results is that they lack

local validation, and the input indicators have not been weighted prior to forming the index. Therefore, no direct conclusions can be drawn from the results, and the author of the study also recommended deepening the analysis by weighting the variables and combining qualitative data (Kazmierzcak 2015). According to the expert at the HSY, there has been very little utilization of the data and results, e.g., for planning purposes, partly due to the sensitivity of the data protection issues of the raw data, but possibly also due to poor practicality of the results. The analysis was also based on information from the current state (in 2015).

Social vulnerability is not static in time and place, especially in growing cities with dynamic population where new residential areas are built, patterns of economic and social segregation change and people move, so studying current vulnerabilities does not help in medium- or long-term policymaking (Jurgilevich et al. 2021; Jurgilevich 2021). In addition, the results of computational vulnerability analyses can differ greatly depending on the scale of the analysis, which further complicates the preparation and interpretation of reliable vulnerability analyses (Räsänen et al. 2019).

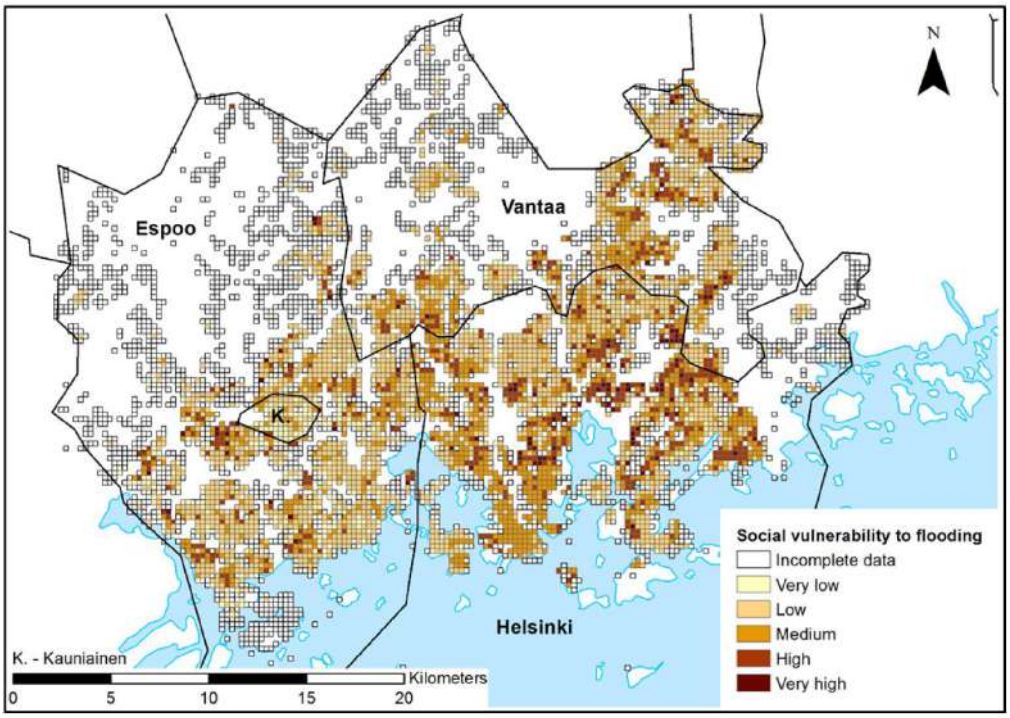

Figure 7.*Social vulnerability to flooding in the Helsinki Metropolitan Area based on an analysis carried out by Kazmierzcak (2015) at the Helsinki Region Environmental Services.*

Recently, more qualitative and participatory methods have been applied in adaptation research to study the dynamics of changing population vulnerability (Jurgilevich 2021). In other words, the knowledge base is getting stronger. In order to fill the gap of lacking knowledge on social vulnerability in FRM, this research knowledge should also be accessible to flood risk managers, i.e., cooperation between technical flood managers and adaptation and risk scientists should be strengthened. It is also noteworthy, that there are currently no studies on how the input from citizen participation is used in FRM processes.

There are probably many reasons why knowledge of social vulnerabilities and inequalities is lacking in FRM. One key explanation might be path dependence, as the history of environmental management in Finland has its deep roots in hydrological measurements and analyses. Equally, to date, floods have not caused such severe harms in Finland that would have required an overhaul of the current technical system.

Section 2: Helsinki Metropolitan Area (Case 1)

Case description

Case study area

Introduction

The Helsinki Metropolitan Area (HMA) is the area surrounding the capital city of Finland. Located in the Gulf of Finland, the area consists of four municipalities: Helsinki, Espoo, Vantaa, and Kauniainen. The population of the area is 1,2 million (Statistics Finland 2021) with Helsinki being the largest urban agglomeration. The area is densely populated and faces significant growth pressures. The population in the area is growing with a few percent positive change in recent years, drawing people from other parts of Finland. Many of the nationally important political, economic, and cultural activities are concentrated in the area. The area has been adapting to climate change for a long time compared to the rest of the country, and is subject to various flood risks, which are described in more detail in the next section.

A large and diverse population, combined with the intensification of extreme weather events as a result of climate change, will increasingly pose challenges for the metropolitan area in terms of risk management and adaptation. As a case study of the SOLARIS project, the Helsinki metropolitan area is of particular interest from the perspective of how social vulnerability is conceptualised and how vulnerable groups are considered in FRM. By exploring these perspectives, we seek to understand the challenges of the current system in the HMA region from the perspective of different dimensions of justice, with a particular focus on the justice of recognition: whose vulnerabilities are managed by the system, and whose justice is secured.

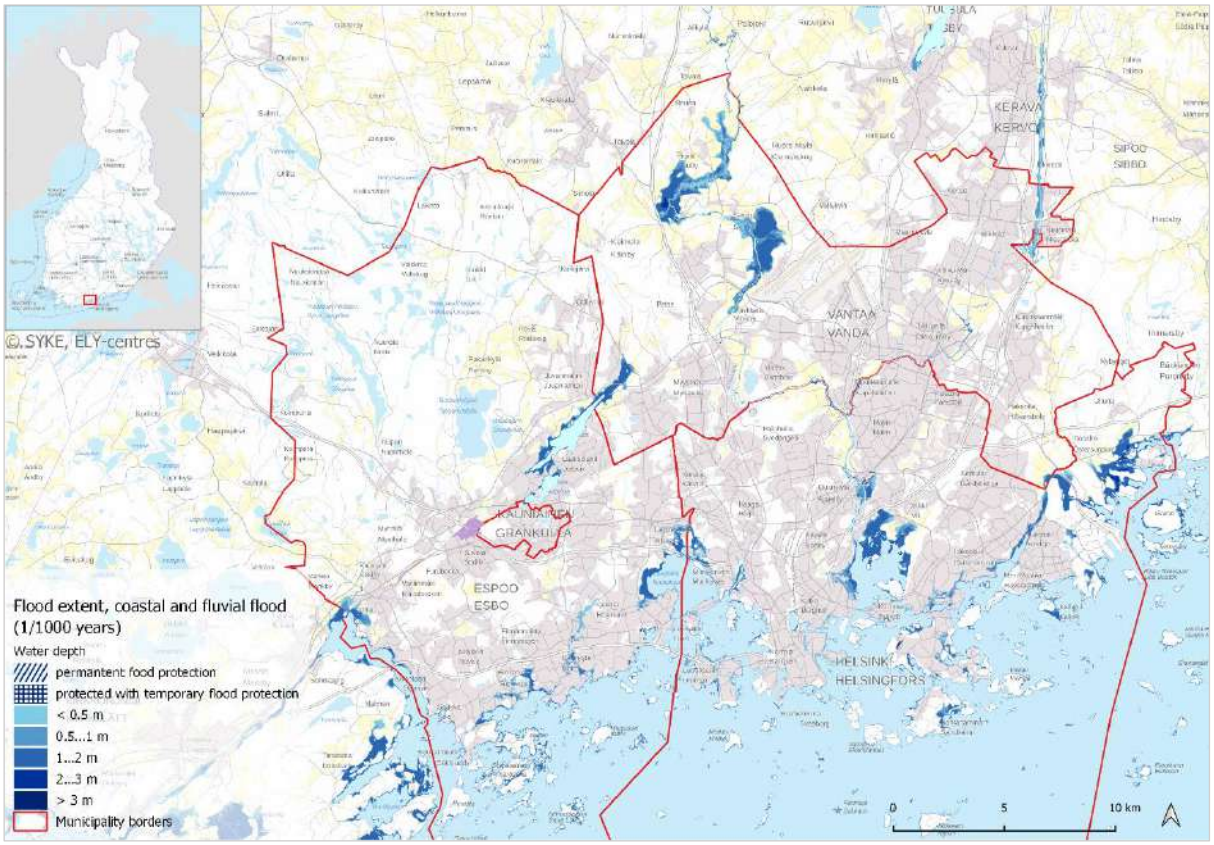

Figure 8. *Location of the Helsinki Metropolitan Area and its municipalities (Helsinki, Espoo, Vantaa and Kauniainen), and coastal and fluvial flood maps in the area for flood occurring once in a 1000 years.*

Maps are produced by the Finnish Environment Institute SYKE and the regional ELY Centre.

Flood risks

Floods is the HMA are mostly stormwater and coastal floods, with occasional river floods occurring in springtime. As a result of great potential damages, the coastal area of Helsinki and Espoo has been named as an area of potentially significant flood risk by the Ministry of Agriculture and Forestry in 2018. It is one of the five coastal flood risk areas in Finland. Due to the dense population and the high number of paved surfaces, there is also a risk of stormwater flooding. For example, in the summer of 2019, heavy rainfall caused significant damage in the centre of Helsinki, including to underground facilities. Flood risk is significantly affected by land use planning and construction in flood risk areas. Especially the capital city Helsinki has many seaside districts, and new ones are being built. Water is a valuable element and living on the seashore is valued.

In the metropolitan area, a lot of valuable infrastructure is concentrated near water bodies. For example, during the coastal flood of 2005, important administrative buildings such as the Presidential Palace were at risk of flooding (Figure 9). In addition, the central area has a large amount of underground infrastructure and tunnels, including the metro, which is unique to the metropolitan area in Finland.

Figure 9. *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. Photo credits: Esa Nikunen.

Relatively few people live in flood-prone areas and the value of property is high. According to the flood maps updated in 2021, approximately 3200 residents are at direct flood risk in an extreme flood (once in 1000 years) in the current climate conditions. There are around 2000 buildings at flood risk, of which 430 are residential. Current exposure and vulnerabilities to extreme events are today small but will potentially be great in the future (Parjanne et al. 2018). In the coastal flood risk area of Helsinki and Espoo, the expected value of damages is around 4.0 million €/year (Parjanne et al. 2018).

The main climate and weather-related risks in Helsinki are flooding and extreme winter conditions (Pilli-Sihvola et al. 2018). Extreme weather events are expected to intensify as a result of climate change. Recent research predicts the risk of pluvial floods to increase significantly in the region (Gregow et al. 2021). Climate change will influence risk of coastal floods as well, although at a slower pace. The average sea level in the coast of Helsinki is rising due to the combined effects of thermal expansion of the oceans, melting of the ice sheets, winds from the Baltic Sea, and land uplift. Currently, the best estimate of the change is a rise of 30-40 cm by the end of the century (Kahma et al. 2014) (Figure 10). Increasing risk of flooding creates more need and pressure for managing the increased amount of risk by engaging stakeholders and clarifying their responsibilities, as well as to assess effects of flooding from multiple sectors.

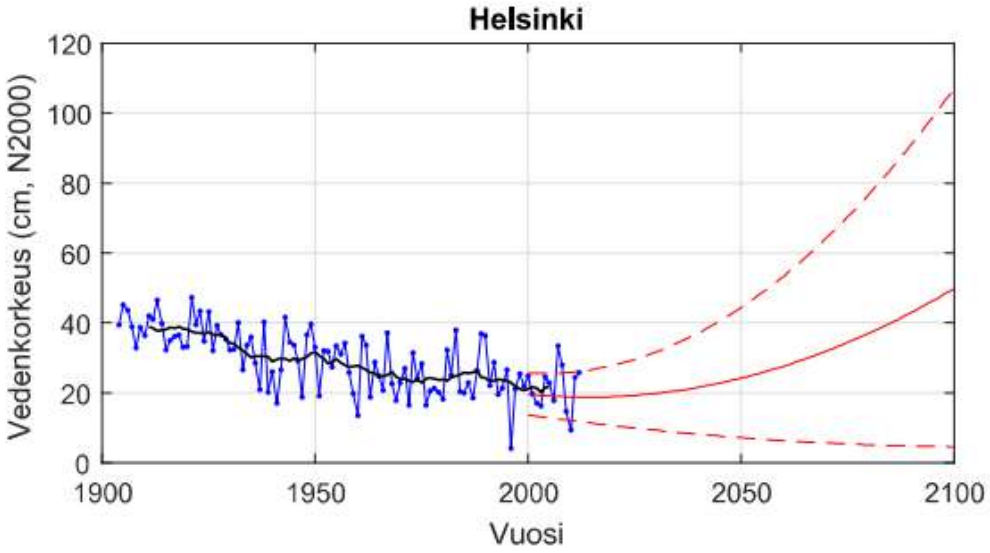

Figure 10. *Observed and projected sea level in Helsinki.*

The blue curve shows the observed annual mean water level values along the Helsinki coast, the black curve the long-term average of observations, and the red curves the average sea level under future scenarios with 5-95 % uncertainty limits (dashed lines) (Kahma et al. 2014).

Socioeconomic and demographic characteristics

The HMA is socioeconomically and culturally diverse. The share of foreign citizens of total population is 11,6 % in Helsinki and 12,6 % in Vantaa. In Kauniainen, almost a third of the population speaks Swedish as their mother tongue, the second official language of Finland in addition to Finnish (Statistics Finland 2021). Unemployment is largest in Helsinki (9,1 %) and Vantaa (8,5 %) (Statistics Finland 2021).

The average age of the Finnish population is expected to grow, which will increase the average vulnerability of citizens to flooding. Even more important is the concentration of housing in large cities, especially in the metropolitan area. The coastal areas of Helsinki and Espoo are already one of Finland's major flood risk areas. Population growth means that by 2100 the metropolitan area could account for up to half of Finland's flood risk (Parjanne et al. 2018).

Certain social problems are also concentrated in the metropolitan area. Housing development is actively assessed in the municipalities of the metropolitan area. The capital city Helsinki is characterized by relatively low level of residential segregation compared to international levels, high standard of welfare services, and a generally high housing quality (Saikkonen et al. 2018). Preventing segregation has been one of the goals of housing policy in Helsinki for decades, based on ‘social mixing’ (i.e., mixing owner-occupied and rental housing in the same neighbourhood). Attention was first drawn to this issue in the 1960s, and since then, work has been systematically carried out in Helsinki to promote segregation prevention. However, despite this work, ethnic segregation is increasing and this trend is expected to continue (Kortteinen & Vaattovaara 2015, City of Helsinki 2020). The widening income and wealth gaps in society are undermining the position and development prospects of socio-economically disadvantaged regions. The absolute level of deprivation has not increased significantly in any particular neighbourhood, but is more stratified, meaning that low income, unemployment,

and low educational attainment, for example, are more clearly concentrated in the same areas (City of Helsinki 2020).

Homelessness is also a social problem relevant to climate change adaptation and flood risks. In Finland, homelessness is concentrated in large cities. Some of the cities, such as Helsinki, are situated in flood-prone areas, but floods are not a driver of homelessness. In 2021, there were 4000 persons experiencing homelessness in Finland, out of which almost half in the HMA (Housing Finance and Development Centre of Finland (Ara) 2024). Homelessness is concentrated in the Helsinki Metropolitan Area where 43 % of homeless people live. In relative terms, Turku has the highest number of homeless people, with 2.1 homeless people per 1,000 inhabitants. In Helsinki, the proportion has decreased and is now 1.3[4]. Work with homelessness in Finland is guided by the principle of 'housing first', which means that all work for people experiencing homelessness starts from the premise that the first support a person can get is their own home. Finland compares well with other European countries, and Finland is the only European country where homelessness has been on decline in recent years (Y-Foundation 2017). Yet this does not diminish the seriousness of the problem, as homelessness always comes to a head in crises. Homeless people are a particularly vulnerable group in society, whose vulnerability and 'invisibility' are accentuated in emergencies and crisis situations that affect the basic services, such as floods.

FRM and CCA background

Flood Risk Management strategies

In the HMA, FRM follows the broader Finnish context and framework. Regional and local stakeholders involved in the FRM planning in the region include the Uusimaa ELY Centre who is responsible for coastal and fluvial floods, and the municipalities who are responsible for pluvial flooding and urban planning. In addition, rescue services, some NGOs, and private citizens play a role in FRM.

Two FRMPs (2016-2021 and 2022-2027) have been developed in the metropolitan area in accordance with the national flood risk legislation. These plans cover the coastal areas of Helsinki and Espoo and are used to manage coastal and fluvial flooding. Flood risks on the river Vantaa, which flows through Helsinki and Vantaa, are managed in the river Vantaa FRM Plan. The plans define the objectives of FRM and the measures, responsibilities and impacts corresponding to these objectives. The cities are responsible for managing stormwater flood risks, for which they have developed various assessments, guidelines, and strategies.

Given the characteristics of the metropolitan area (dense housing, growing population, construction pressure), the prevention and reduction of flood risks is a key element of managing flood risks. The management plan identifies land use planning as the single most important measure to reduce flood risks (Helsinki and Espoo

[4] Helsinki specified its statistical method in 2018, which is why the figures are not fully comparable to previous years (The Housing Finance and Development Centre of Finland (Ara) 2024)

Coastal Flood Group 2021). In principle, new areas will be built on higher ground, while old, lower-lying buildings will be protected as well as possible. The management plans also place emphasis on improving and maintaining the flood knowledge and preparedness of different sectors of society, from responsible authorities to citizens.

Flood risks in the HMA are projected to increase in the future (Parjanne et al. 2018; Gregow et al. 2021). Based on the FRM objectives and measures, the key strategies are prevention and mitigation. Flood risk mitigation is reflected, for example, in the City of Helsinki's Climate Roadmap, which highlights the importance of increasing green spaces to reduce urban flood risk (City of Helsinki 2015). As no major floods have been experienced in the metropolitan area so far, most of the measures in the preparedness, response and recovery strategies have not been implemented, and therefore their impact and success cannot be fully assessed. However, plans are in place.

Regional risk management emphasizes and relies on flood exposure management (rather than social vulnerability) as the primary method, and this is reflected in the conducted SOLARIS-interviews for the case study (see below section RQ1). It could be argued that the current approach to FRM is not flexible enough to cope with changing climate and societal developments because it cannot incorporate sufficient recognition (particularly of vulnerable people, different human capacities, different perceptions of fair management, etc.).

Climate Change Adaptation policies

The Helsinki metropolitan area had a climate change adaptation strategy for 2012-2020 (HSY 2012). HMA aims to be a pioneer in adaptation. The adaptation strategy focused on the urban and built environment. The adaptation strategy sees mitigation as a priority, but adaptation and preparedness are also seen as necessary. Although the strategy is not binding and does not have a guiding influence, the evaluation of the adaptation strategy shows it has promoted cooperation between officials in adaptation issues and supported cities in their own adaptation work (Häkämies et al. 2021). For example, in Vantaa the strategy measures were directly translated into the city’s adaptation measures, in Helsinki the strategy served as a basis for adaptation policies, and in Espoo the strategy was used in the Sustainable Energy and Climate Action Plan.

Municipalities have a monopoly on planning, through which they have great potential to implement both their mitigation and adaptation objectives. In the Helsinki metropolitan area, the cities in the region (Helsinki, Espoo, Vantaa and Kauniainen) are mainly working on adaptation in a city-specific and city-oriented way. However, there are differences in the progress of adaptation work between cities, which can lead to inequalities between cities and residents in terms of progress towards adaptation. For example, in Helsinki, adaptation work is already routinely done as part of the city's own programmes, while in Vantaa, adaptation work is challenged by, among other things, a lack of resources and more mitigation- than adaptation-focused work (Häkämies et al. 2021).

Helsinki has an adaptation policy for 2017-2025, which has been implemented and reviewed by a climate working group and an adaptation team (Kankaanpää 2017). The adaptation policy of the City of Helsinki

outlines, among other things, climate risk preparedness, risk mapping, identification of climate risks and vulnerabilities, and comprehensive management of stormwater during increased rainfall (City of Helsinki 2019). Policies aim to reduce the negative impacts of land use change, e.g., through zoning, green roofs, green infrastructure, etc. Adaptation is also included in the Helsinki Climate Roadmap (City of Helsinki 2015), which envisages Helsinki as carbon neutral by 2050, and where residents are adapted to a changing climate with a warming limited to 2 degrees. In Vantaa, adaptation guidelines were included in the city's environmental policy for 2012-2020, and adaptation issues have been added to the sectoral contingency plans in the updates. In Espoo, instead of a separate adaptation strategy, adaptation has been addressed in several municipal programmes and policies. In Kauniainen, adaptation is addressed in various plans focusing on natural management, including in connection with building permits for stormwater management (Kankaanpää 2017).

In summary, the HMA has been progressive in promoting adaptation policies in municipalities. All cities of HMA regions have prepared their adaptation plan showing their interest in the topic although there are differences between cities, primarily due to insufficient resources. However, there is still a lot of underused potential in adaptation planning in coordinating the use of public resources efficiently and by seeking synergies between sectoral silos and by engaging the citizens is, which could also benefit flood risk management and governance.

Data collection

For the case study, residents' associations in the capital region, social security, rescue and emergency organizations and NGOs, as well as authorities responsible for FRM tasks (operational and planning) were interviewed in semi-structured focus group and individual interviews. In total 37 interviewees were interviewed during the spring and summer 2022. In addition, analysis of relevant documents was done, including the FRM and adaptation plans of the Helsinki Metropolitan Area.

Table 1. *Interviews made in the HMA and the interviewees*

Interviews	Interviewees
Interview 1	a. representative of a residential association
Interview 2	a. rescue service official
Interview 3	a. rescue service official
Interview 4	a. representative of a residential association b. representative of a residential association
Interview 5	a. municipal or regional land use planner b. municipal storm water planner
Interview 6	a. social and health sector official
Interview 7	a. municipal or regional land use planner b. municipal or HMA adaptation planner c. municipal or HMA adaptation planner
Interview 8	a. water supply official
Interview 9	a. municipal storm water planner

Interview 10	a. representative of a disability NGO b. representative of a disability NGO
Interview 11	a. representative of a disability NGO b. representative of a disability NGO
Interview 12	a. representative of a residential association
Interview 13	a. representative of a residential association b. representative of a residential association
Interview 14	a. representative of a residential association
Interview 15	a. representative of a residential association b. representative of a residential association c. representative of a residential association
Interview 16	a. representative of an emergency volunteering NGO b. representative of an emergency volunteering NGO
Interview 17	a. representative of an emergency volunteering NGO
Interview 18	a. representative of a residential association
Interview 19	a. governmental official b. municipal or regional land use planner c. municipal or regional land use planner
Interview 20	a. social and health sector official b. municipal or HMA adaptation planner c. water supply official
Interview 21	a. representative of an NGO working with homeless people b. representative of an NGO working with homeless people c. representative of an NGO working with homeless people

The interview questions were built around all three SOLARIS research questions. All three interview groups (residents, authorities, and organisations) were asked questions related to their experiences of flooding, cooperation with authorities, opportunities for participation, groups of people vulnerable to flooding, access to information on flooding, and views on what justice means in FRM. The main objective was to gain new insights into people's experiences of flood vulnerability and FRM, and to understand the challenges related to justice, in particular recognition justice.

A total of 11 residents' association representatives from different parts of the capital region were interviewed. The associations were chosen so that as diverse a group as possible could be interviewed. The criteria for choosing the areas were, for example, the location in the flood risk area, the population and income distribution of the district, and the age of the building stock. To the best of our knowledge, residents' associations in the districts of the capital region have not previously been interviewed for similar research projects.
Authorities interviewed included regional and municipal experts working with FRM and climate adaptation, city and land use planners, and representatives of the rescue services and social & health sector. Third group of

interviewees included representatives from different NGOs involved in preparedness and emergencies as well as advocacy organizations of minorities and the most disadvantaged people. These included a local branch of the Finnish Red Cross, the Finnish association of people with physical disabilities as well as NGOs for organizing housing and services for the homeless.

Results

Public Policy Analysis

In the Helsinki Metropolitan Area, risk of coastal flooding is significant and therefore, management of coastal (and fluvial) floods is strongly institutionalised and managed according to the FRMP. The coordination of the plan is led by the ELY Centre of Uusimaa. In the implementation of the plan, the task division between the actors is relatively clear. Furthermore, we observe that the discourse of equal protection of human health, safety and property is also shared between different authorities operating in the coastal flood management. However, the private and public responsibility have been renegotiated since the abolition of the state flood insurance scheme and the transfer of insurance to private insurance companies. Since then, municipalities have been responsible for public communication on flood preparedness and responsibilities. We notice, however, that it is unclear how well communication has reached citizens. According to our initial analysis, it appears that there is a strong confidence in the system and its effectiveness among the different stakeholders, which could be explained with only a few flood experiences in the area so far.

At the same time, climate change is expected to exacerbate the risk of pluvial floods in the highly urbanised Helsinki Metropolitan area. Compared to the governance of coastal and fluvial FRM, governance of pluvial FRM is much more decentralised, networked and involves a wider range of actors from different sectors. The division of duties and share of responsibilities in pluvial FRM is often institutionalised within the municipalities but the system lacks similar horizontal coordination as coastal FRM. The municipalities responsible for pluvial FRM represent a wide and varied range of expertise. We notice also varying interpretations of justice among the authorities. Technical expertise is an important resource in pluvial flood management and the idea of equality in risk reduction dominates the views of authorities responsible for pluvial FRM. At the same time, municipal authorities also recognise the varying capacities and resources of local residents and acknowledge procedural and recognition aspects of justice.

In the Annex 1., we present the roles and responsibilities, power and resources and justice discourses of different authorities operating the FRM of the Helsinki Metropolitan Area. The Figure 5. illustrates different phases where different stakeholders can influence FRM policies. Citizens can influence on FRM primarily through municipalities and by giving opinions to public Flood Risk management plans.

Attention paid to social justice and inequalities (RQ1)

The Helsinki and Espoo Coastal FRMP (Helsinki and Espoo Coastal Flood Group 2021) does not address inequality and equity as such but discuss the concept of vulnerability. Vulnerability refers to the susceptibility to adverse consequences that can be managed through flood protection, prevention, and preparedness measures. Recovery measures refer to mental and physical damage. The plan defines the conditions and limits of liability for official and compensatory damages. It can be said that 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. Similarly, the River Vantaa FRMP (Seppälä et al. 2021) mainly defines the terms and limits of liability for public authorities and damages, without specifying people.

According to the interviews conducted in the HMA case, social vulnerabilities are understood differently by different actors and policy sectors. There also seem to be inconsistencies between regional and local level adaptation and FRM planning in the way they address social issues, related to the division of administrative tasks and the stronger role of local government in, for example, preparedness and recovery and direct contact with citizens through, for example, citizen engagement in land use planning. According to the interviews, issues of equity and social vulnerability are of interest, but have not been thought about and are not well understood by the actors, which is in line with the perception of the issue in previous research literature. Questions related to justice and social vulnerability arouse interest, but there is little information about them available to actors.

Different actors perceive the FRM objectives, vulnerabilities, and justice differently. According to the interviews, public authorities manage flood risk to protect the "big picture", i.e., the public interest and to protect human health, safety, and property as effectively as possible with the given resources. In the interviews, many were surprised by the social aspect, which had not occurred to them before in their work which usually relies on technical solutions.

Some interviewed authorities working with the more technical FRM domain even appear to neglect or ignore the relevance of social aspects, as the technical solutions have been well-functioning (see quotes below, translated from Finnish by authors):

> *"It seems a little difficult, at least from the point of view of land use planning, to start thinking about what kind of people are located where, and people, residents change, etc., so that may not be the starting point. But I understand that there are probably differences between people in how they can respond to it."* (Municipal land use planner, 19b)

> *"I don't see this as a question of any group of people at all, but just what kind of property someone has. "* (Municipal stormwater planner, 9a)

Vulnerabilities remain uncertain as the system has not been tested in extreme situations (no actual major floods). When asked about vulnerable groups of people, interviewed authorities talk about the vulnerability of property. The voices of the most vulnerable and quieter people may not be picked up by the system. However,

some interviewees also identify groups excluded from social services and question whether the FRM system also pays enough attention to marginalised groups.

On the other hand, adaptation experts recognize the importance of social issues, such as differences in social vulnerability, to also be considered in adaptation policies. It can therefore be said that the adaptation domain is challenging or disrupting the historically very technocratic and egalitarian discourses of the FRM domain. In the interviews it also emerged that the impacts of climate change have not yet been sufficiently considered, even from an engineering perspective (particularly in the case of stormwater flooding).

Interviewed resident associations see the protection of property and real estate as the ultimate objective of FRM. However, the work done by the authorities to manage flood risks is invisible to residents: many have not even heard of it. Confidence in the ability of authorities to solve flood risks as a technical problem is high, but the ability to listen to residents' needs is questioned. Interviewed residents are uncertain about the adequacy of the information used to make decisions e.g., in land use planning and zoning, as this information often does not reach them, or the process is not viewed as transparent enough. It also seems that residents and property owners are not very aware of their responsibilities in the FRM system, which are – as described in Section 1 – relatively big. Residents' perceptions of FRM as a system that protects property reflect a somewhat elitist view of the system where they do not consider themselves as vulnerable, show trust towards the effectiveness of the flood risk management system but at the same time, expect more attention to their concerns.

Emergency preparedness and rescue organizations provide official assistance, including to rescue authorities. Their role is highlighted during and after crisis situations. Social service organisations, for their part, provide advocacy, mobile support or other complementary third sector service provision. Representatives of the interviewed organisations emphasise people's ability to adapt. Their views reveal that they do not feel that the current FRM system protects the most vulnerable people. They do not have the information available for foresight, so they are reactive to the information that is available in each situation. Their role in the FRM system, but also in adaptation, has been recognised but is not yet sufficiently visible.

The primary objective of emergency and various advocacy organisations is to safeguard the position of the most vulnerable people, and they very strongly emphasise sensitivity to social vulnerabilities, such as the different capacities of people to act and adapt to challenging circumstances and thus inequalities as a structural problem of society. The way they speak is therefore very different from the way public authorities and citizens speak (quotes from interviews with advocacy organisations for disabled and homeless people):

> *"Healthy people can escape and get to dry land, but let's say there's someone in a wheelchair who can't even roll themselves, it's not much of a laugh. There you stay, the flood rises. I for one am worried about things like this."* (Representative of a disability NGO, 11a)

> *"[…] I could not find the rescue department's evacuation plan, where would be this thing, but I would be interested to know whether they have thought about, for example, people living homeless, how to get them out from under the rising water. It is a group that can be considered particularly vulnerable*

and, unfortunately, also invisible, so that they are easily left out of such general contingency plans." (Representative of an NGO working with homeless people, 21a)

The interviews suggest that actors' perceptions of justice differ in terms of the way in which inequalities are viewed. The perceptions of authorities and residents emphasise the protection of property and real estate and the equal distribution of material benefits and disadvantages. Representatives of NGOs, mostly involved in crisis management and disaster relief, 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 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. The action plan of the adaptation strategy for the metropolitan area (HSY 2012), pays attention to justice as recognition. In the action plan, 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. However, there are no direct references to whether this was achieved, and no further references to justice and inequality issues. It is however noted that 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.

Role of participation (RQ2)

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 and to evaluate whether the feedback is such to be considered. The authorities interviewed also reported on residents' evenings to inform residents about flood risks and how to manage them. Voluntary rescue services support officials and complement them in information sharing by organising safety walk events for private housing companies and associations. One of the municipalities in the HMA has invested in the development of participation by setting up a participation network. According to the authorities interviewed, more attention is now being paid to participation in municipalities:

"[…] And I have a feeling that, in general, this [has], let's say, over the last couple of years, [become] more awakened [...] - there has been such a participation network, for example, in our city, through which we have tried a lot to involve residents. [...] I have a feeling that it is somehow now just over the last couple of years, somehow increased much more." (Municipal storm water planner, 5b)

However, in the interviews, the stakeholders criticised the success of participation and information sharing. So far, flooding is mainly discussed in the context of risk and flood communication by municipalities was not considered particularly successful. According to the interviews, low public awareness of flooding may increase the social risks associated with flooding:

> *"If it doesn't happen for many years, you don't... or it happens to you on average once every 20 years, how seriously do you take it at that moment, do you start to prepare for it, or is it more when we are told that the sea water is rising, is that when it starts to happen."* (Rescue service official, 3a)

Also, the participation processes were criticised in the interviews. Interestingly, the active participants who were most aware of the process were most critical towards participatory processes and their outcomes. The social and health NGOs interviewed were not aware of participatory processes and had not been engaged in the planning of FRM or adaptation. The NGO's representing homeless people and providing floating support for those who live on the street brought out that the climate change impacts are not discussed in their current networks. Their experience was that they were excluded from forums discussing the issues:

> *"The networks I'm in, I feel that we discuss other factors more. Not so much, perhaps, just these extreme phenomena that are influenced by the climate, and how they are visible to our target group. Very rarely, if at all, at least so far it is discussed in any way."* (Representative of an NGO working with homeless people, 21b)

In the interviews, participatory knowledge and its use in the decision-making process was also discussed. One official pointed out that it is difficult to use the knowledge of citizens. He was also sceptical about how much participation will improve the outcome of the decisions. The comment reflects a worry on the instrumental value of participation and on what impact participation has on the effectiveness of the decision-making:

> *"It's probably the public participation that is a bit of a grey area. In some matters, it is asked, and, in some matters, it may be asked a little less. But the fact that... that finding the philosopher's stone, that how much help it is that we would get a lot of public opinion. Will there be something in every issue that the bureaucracy has not noticed or understood? Of course, there are comments that this area of ours should be the first to be protected [...] But sometimes I wonder, even in these big consultations, whether it is possible to get from the public any content to the plans, for example, so that the content would change. But as they react to it with such a small number of people, it is terribly difficult to draw any conclusions."* (Governmental official, 19a)

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 efficiency due to participation. The actors interviewed did not discuss power imbalances in participation other than in terms of ignoring social and health NGOs. Thus, we have not found evidence of advocacy or lobbying related to FRM in the HMA.

Knowledge and capacity-building on social inequalities (RQ3)

There is a lot of data from the Helsinki Metropolitan Area and information processed from it for various needs. The HMA is the most populous and diverse region in Finland, with a huge amount of infrastructure of different ages and a growing population, hence the need for up-to-date data. In addition to the comprehensive national

databases, the HMA also has other more detailed databases, including those produced and maintained by HSY, municipalities, universities, and research institutes. In addition, the Rescue Service makes extensive use of various data sets for risk management. However, there is no information on to what extent, for example, the municipalities responsible for managing pluvial flooding have access to all data sets and resources to analyse them. Previously, an analysis of social vulnerability to flooding and heat waves has been carried out for the metropolitan area (Kazmierzcak 2015, see Section 1 and RQ3), but this knowledge has not been used in planning.

According to the interviews, neither citizens nor organisations are fully aware of flood risks, FRM by public authorities or citizens' responsibilities in FRM. This is in strong contradiction with the authorities' objectives, which emphasise the responsibility of citizens in personal preparedness and in managing the so-called residual risk.

The lack of flood-related knowledge among residents may be due, on the one hand, to a lack of experience of flooding, i.e., the lack of information and the need for preparedness in everyday life, and, on the other hand, to a high trust in the authorities to manage flood risks. This was well reflected in an interview with a resident living on the seafront:

> *"I mean, I don't know where to [look for information about floods] [...] I can say that my flood preparedness is very weak because I have no idea. ... But they're not really the kind of risks you think about in everyday life, frankly speaking. They're more like those risks, it's a bit like [...] an interesting mind game. […] I don't have any worries. [...] I trust that things are under control here. I don't know, but I have a kind of basic confidence."* (Representative of a residential association, 12a)

Special groups, such as the disabled and the homeless, have a higher level of preparedness and understanding of the risks due to their situation. On the other hand, preparedness and emergency organisations feel that they do not have enough information to take proactive measures (e.g., about the location of vulnerable groups), which means that they must rely on a very reactive, authority-oriented approach:

> *"At the moment there's no direct access to any [information on the various vulnerabilities]. Then only when the authority contacts us and says we've established the situation and there are X number of people who need this and that, then we start to act. (It's very unfortunate) but it goes like this, privacy, health (protection) and all that kind of stuff prevents action."* (Representative of an emergency volunteering organisation, 16a)

Overall, the HMA has produced a lot of technical information on flooding by different actors, which is used extensively in FRM and land use planning. However, little information on the social vulnerability of different groups of people is currently available to planners. Given the growing and diverse population of the region and the increasing flood risks, generating and using this information for climate risk management is of paramount importance in reducing inequalities in impacts and designing equitable policies and measures.

Section 2: Kokemäenjoki River Basin, Huittinen and Kokemäki (Case 2)

Case description

Case study area

Introduction

This case study focuses on a FRM dilemma between the upstream and downstream of the Kokemäenjoki river in rural South-West Finland, and a contested FRM measure potentially involving issues of justice and inequality. The Kokemäenjoki river (*joki* translates to *river* in Finnish) is 121 kilometres long and it flows through some of the most important agricultural areas in Finland. The inhabited areas in focus are Huittinen and Kokemäki, both of which are neighbouring cities located in the middle section of the river. Kokemäenjoki river is the tributary of the fifth largest river basin in Finland, the Kokemäenjoki river catchment area (27,100 km^2).

Figure 11 shows the Kokemäenjoki river and the significant flood risk areas along the river. The power potential of the river has been utilized to a full extent and the river and the water levels of upstream lakes are regulated. The four power plants close to the case study locations are marked in Figure 11. As the map shows, the Kokemäenjoki river catchment area has two flood risk areas: Pori and Huittinen. Although the flood risks in Pori are much larger than in Huittinen, the focus of this case study is on the middle section of the river due to the contested FRM measures (see Figure 11 and the area inside the red rectangle). Even if the municipality of Kokemäki is not a flood risk area, Kokemäki has a strong interest in the management of flood risks in the area.

The current situation seems to have socio-spatial inequalities, leaving some people and their livelihoods (e.g., farmers) vulnerable to more intense and frequent flooding and other to the possible negative impacts of the planned FRM measure. Negative consequences of flooding include the leaching of fall crops, while a planned channel could increase river flow potentially releasing heavy metals bound to bottom sediments. Climate change has affected the flooding patterns and frequency of the Kokemäenjoki river, and these changes need to be addressed (Kokemäenjoki Flood Group 2021). Fair adaptation, however, requires considerations of justice and equality in such manner that the stakeholders upstream nor downstream are not overlooked. Similarly, this case study gives a possibility to analyse FRM practices in a large body of water and focus on rural areas in the context of climate change adaptation and different conflicting interest, meaning that this case study enables us to study FRM from the viewpoints of different stakeholders. Unlike the HMA case study, which focuses on an urban area, this case study portrays the situation in a more rural context and at catchment level.

Thus, the Kokemäenjoki river basin and the planned adjustment channel portrays a situation of varying benefits and burdens, making it an interesting example of whose interests are heard while planning FRM in the context of climate change adaptation.

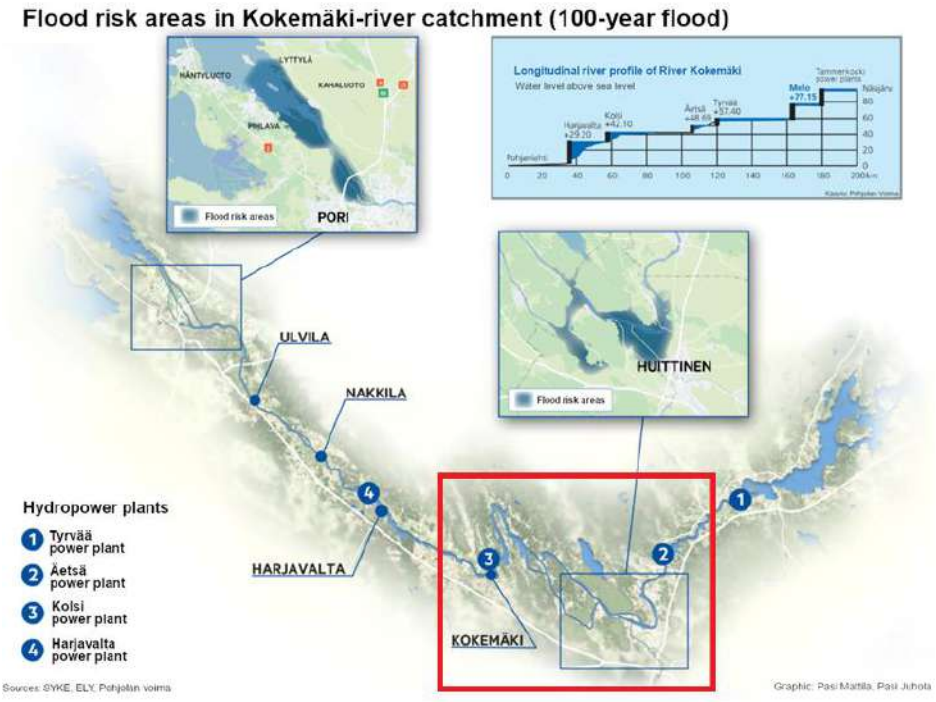

Figure 11. *Map of the Kokemäenjoki river, and a closer look at the significant flood risk areas in a 100-year flood (Pori and Huittinen) as well as the hydropower plants.*

Longitudinal river profile is on the right up corner. The area of interest of the case study is in the middle section of the river, i.e., between the Kolsi and Äetsä power plants (area inside the red rectangle on the map), where the cities Kokemäki and Huittinen are located. Map: Pasi Mattila and Pasi Juhola (translated into English by authors).

Study area

Typical to Finnish rural landscape, the area around Huittinen and Kokemäki is a mix of rural and built environment, dominated by agriculture and fields. Topographically the area is rather flat. Historically, spring flooding has occurred frequently in Huittinen, which is a significant flood risk area (Finnish Environment Institute & ELY Centres 2021). While the fluvial flooding of the river can cause damages to farmers, households and agriculture, the area and specifically agriculture has also benefitted from the river as it increases the resilience of the area towards i.e., drought and has ensured nutritious farmland. The fields in the area are some of the most expensive in Finland and farming has a long history in the area. Both Huittinen and Kokemäki are old centres of population.

The Kokemäenjoki flows through the centre of Kokemäki, and the river Loimijoki, which flows through Huittinen, joins it just south of Kokemäki. The Kokemäenjoki river makes a small loop in the north-western part of Kokemäki, around **Säpilänniemi peninsula** (Figure 12). In addition to agricultural and residential areas, a national park (Lake Puurijärvi-Isosuo) is located nearby, spreading over the municipalities' borders (Figure 12). The national park is a part of the European Union's Natura2000-network and is therefore strictly protected. Within the park there is a rare, flooded forest area and the lake Puurijärvi, which is important for bird nesting.

As such, the national park has significant implications to FRM, as the **natural state is dependent on the flooding of the river** and the area is protected by the EU Habitats Directive.

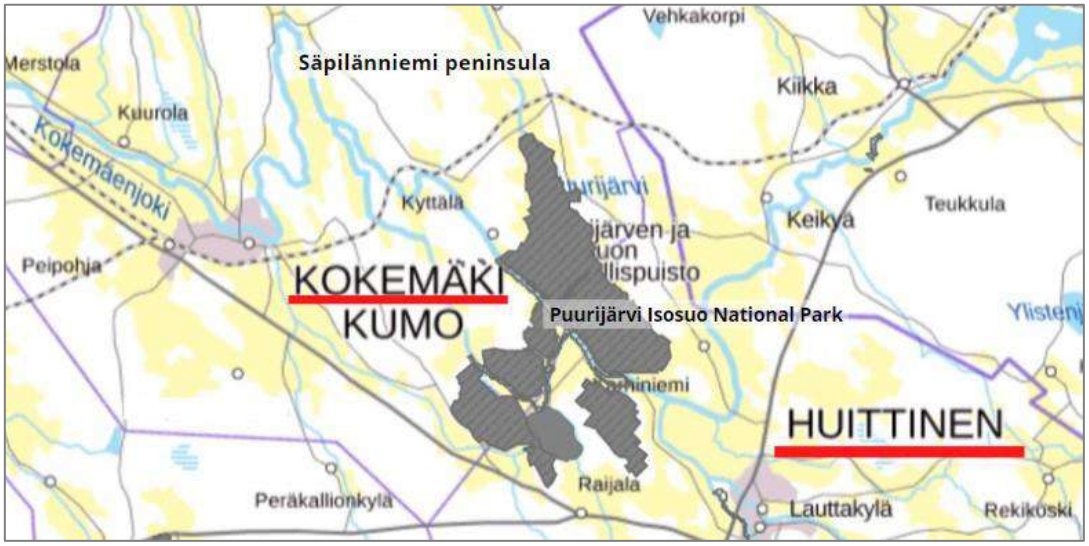

Figure 12. *Map of Puurijärvi Isosuo National Park is marked on grey, Kokemäenjoki river on blue, and municipality borders on purple, respectively.*

The Säpilänniemi peninsula, at the top left on the map, is visible as a 'loop' made by the river. Source: Finnish Environment Institute.

Demographic and socioeconomic factors

Both Huittinen and Kokemäki represent small and rather rural cities that are quite typical to Finnish countryside. The population is little less than 10 000 inhabitants in Huittinen and 7000 in Kokemäki, respectively. According to Statistics Finland, the population trend has been steadily decreasing in both cities since the end of 1980's. The demographic decline has been steeper in Huittinen, and the trend is expected to continue. The decline in population is caused by both migration loss and ageing of population. In the whole region around the two cities, the proportion of people aged over 64 is higher than the national average. The declining trend in population has affected the access to and availability of local public services, and some services are shared with several municipalities, while more specific services (such as hospitals) are centralised in regional centres (such as Pori, 65 km from Huittinen).

Population of both cities is mainly homogenic and Finnish speaking. The area is culturally important landscape, dominated by agricultural land use. As mentioned, agriculture is an important source of income. Huittinen is important for Finnish pork production and the city has the largest amount of pig farms in Finland. There are also a significant number of henhouses and cowhouses within the area. Lot of the employment opportunities in the area are bound with the agricultural industry and are involved with further processing. Neither city offers higher education.

Flood risks in Huittinen

Several factors contribute to the significant fluvial flood risks in Huittinen. The flood situation varies according to the rainfall and regulation of water flow upstream, but spring floods typically occur every year (Figure 13). Therefore, FRM focuses on flood defence, flood risk mitigation and flood risk preparation. Also, flood risk prevention is an important flood risk strategy in the area, and it is addressed in the FRMPs. In addition to the low topography of the area, the risk of flooding is increased by the tributaries, such as river Loimijoki, which flows through Huittinen and joins the Kokemäenjoki river south of Kokemäki. Flood situations in the tributaries can vary from year to year. According to the latest flood risk assessments, especially frazil ice and ice jams in the tributaries and the main Kokemäenjoki river increase the flood risks in Huittinen (Figure 14). As mentioned, the river forms a loop around Säpilänniemi peninsula at Kokemäki, the neighbouring city downstream from Huittinen. This increases the flood risks upstream, as the discharge of the river is considerably slowed down by the loop. The Säpilänniemi adjustment channel could increase the discharge of the river, which would reduce the flood risk upstream.

In Huittinen, an extreme flooding would affect 1200 inhabitants, cause disturbances in electricity and heat supply and cut roads. Flooding of fields is common in springtime (Figure 15). Climate change is expected to increase winter flooding of fields with many harmful impacts on the environment. Flooding of fields would increase nutrient and solid run-off from the fields to the river. Thus, flooding could also cause eutrophication in the river and contaminate domestic water and cause damage to agriculture and farms located in the flood risk area. Prolonged flooding can also cause crop losses both due to delayed sowing and through the leaching of autumn sowings. Several large-scale pig, chicken and cow farms are in the flood risk area. Evacuation of livestock due to a flood has already caused difficulties. However, the main threat from flooding is caused to property.

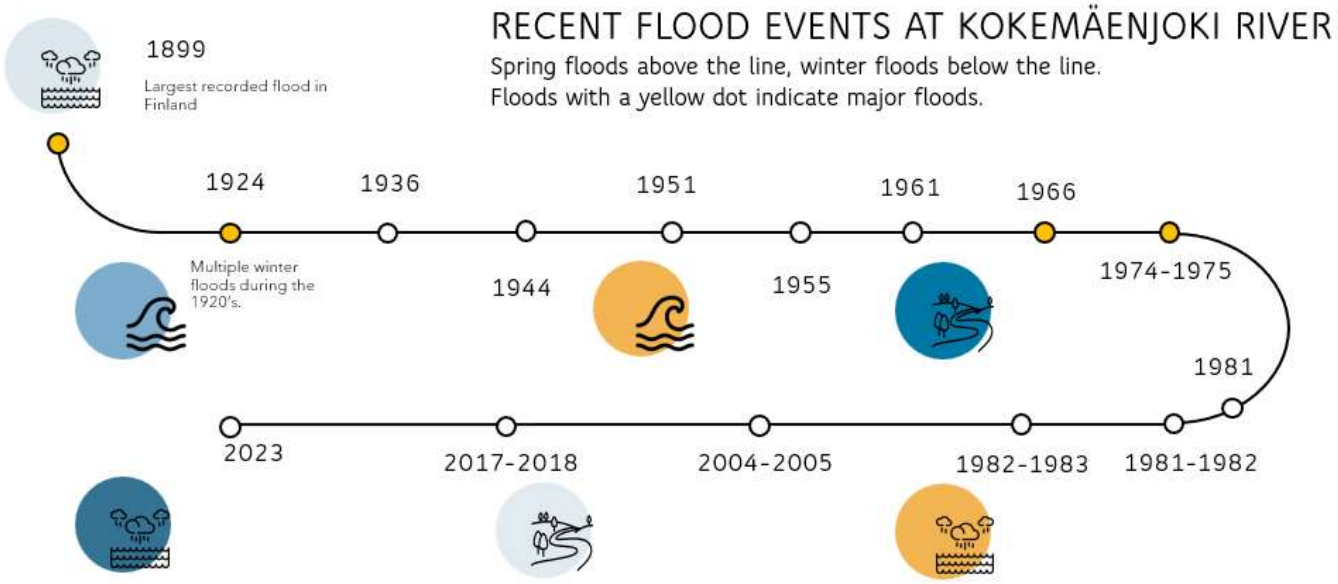

Figure 13.*Timeline of major flooding events on Kokemäenjoki river since 1899.*

Floods with a yellow dot are described as great floods. Spring floods are above the timeline, and winter floods below the timeline, respectively. The largest flood on record was in 1899. At the time the lake Päijänne upstream the river was up to 193 cm higher than average. The flood was estimated to occur once every 100-150 years. (Applied from Environment Institute of North-West Finland, 2006; Rajala, 2013; City of Pori, 2024)

Figure 14.*An ice jam in Kokemäenjoki river in 2015. Picture by Varsinais-Suomi ELY Centre.*

Figure 15. *Spring flood in Huittinen in 2020. Picture by Varsinais-Suomi ELY Centre.*

The contested flood risk management measure: Säpilänniemi adjustment channel

Different parts of the Kokemäenjoki river have varying levels of risks in terms of potential damage, as well as different interests to use the river (e.g., water regulation officers, farmers, conservationists', urban citizens, etc.). The differing situations can be illustrated through the cities of Huittinen and Kokemäki, where Kokemäki

holds the keys to manage the severe flood risks of Huittinen. The SOLARIS-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 (Figure 16). The proposed channel could help farmers in Huittinen area, but potentially have negative consequences on nature tourism and other rural livelihoods in Kokemäki area.

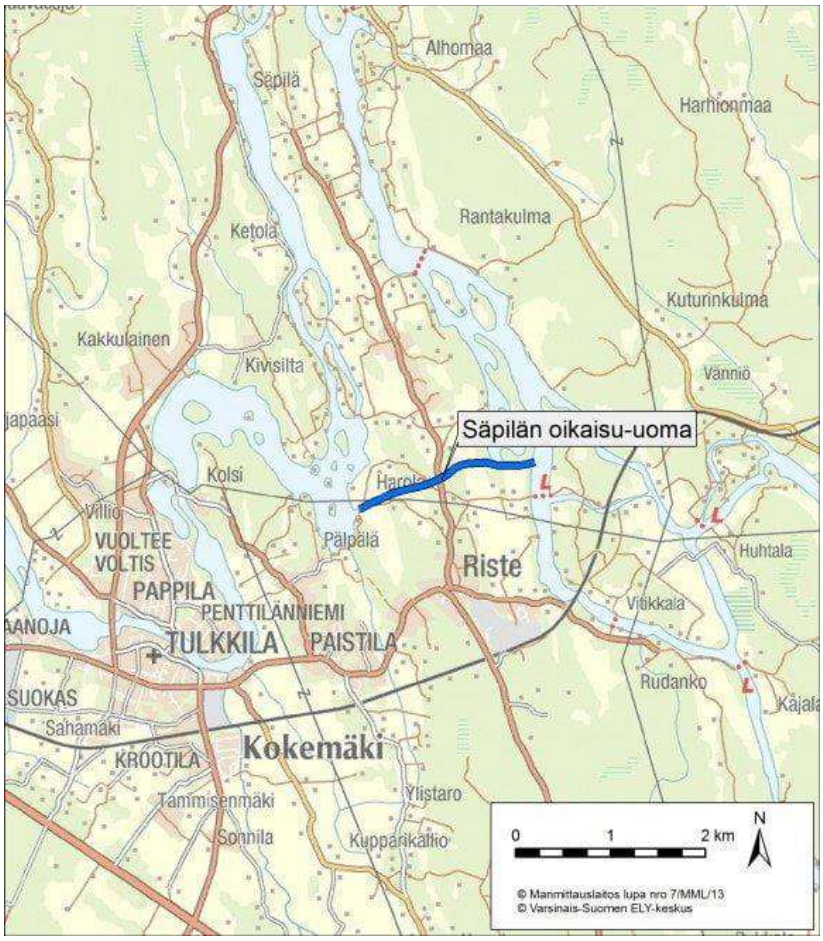

Figure 16. *The proposed Säpilänniemi adjustment channel (oikaisu-uoma). The channel would cut through the peninsula in Kokemäki. Source: Varsinais-Suomi ELY Centre.*

The latest FRMPs for Kokemäenjoki river highlight the Säpilänniemi adjustment channel as a necessary solution and list the channel as one of six priority outcomes of the FRMP for 2022-2027 (Kokemäenjoki Flood Group 2021). According to the plans, the channel is needed because it is expected to benefit FRM for the whole catchment area, and as such is the most cost-efficient way to reduce flood risks in the area. The cost of the channel is said to be around eight million euros. Climate change is mentioned in the FRM documents as a major justification for the channel, as climate change is expected to increase flooding during the winter. According to the plans, there is no other alternative with similar results. The Säpilänniemi channel would also benefit Pirkanmaa region in the upstream, as more water could be run in the river and there would not be a need to hold the water in the lakes upstream. According to a 2014 proposal (ELY Centre of Varsinais-Suomi 2014), the channel would also help with forming an ice sheet during the winters, thus preventing frazil ice and ice jams.

However, even though proposed in the two last FRMPs as a measure, the adjustment channel is not supported by all. In the most recent statements of stakeholders issued in 2021 during the consultation of the draft versions of the FRMPs, the opinions of the two city councils on the adjustment channel varied (ELY Centre of Varsinais-Suomi 2021). While the city of Huittinen strongly supported the adjustment channel in its statement, the city of Kokemäki was more cautious. In addition to these cities, various stakeholders, such as The Central Union of Agricultural Producers and Forest Owners (MTK) and the Finnish Association for Nature Conservation (SLL), expressed strongly divergent opinions on the adjustment channel during the consultation process the FRMPs.

FRM and CCA background

Flood risk management in Huittinen and Kokemäki

Kokemäenjoki river and its catchment area are both highly regulated. According to the regional ELY-centre, the regulation of the river has originally aimed to manage the flow in such a manner that it would benefit i) hydropower production, ii) wood floating, iii) flood defence, and iv) fostering water transportation. Historically dredging and terracing have been popular in the 1920's. The latest plan (2022-2027), that will be discussed in more detail below, shares its focus between the flood risks in the significant flood risks areas - Pori and Huittinen - and more generally the whole watershed. Some measures cross municipal administrative borders and for example Säpilänniemi adjustment channel that is designed for the specified flood risk area of Huittinen is mentioned to have benefits for the FRM for the whole watershed.

The FRMPs for 2022-2027 include the preliminary assessment of flood risks, flood mapping, assessment of flood damages in different flood scenarios, and the objectives and measures to manage or decrease the flood risks in the area. As described in the Helsinki metropolitan area case study, FRMPs in Finland are developed in a participatory manner with local and regional authorities and private stakeholders. In Kokemäenjoki river area, the regional authorities (I.e., ELY Centres) coordinate the preparation and implementation the FRMPs. Rescue services, municipalities, regional environment authorities, hydropower companies, regional experts and several experts of multiple fields are involved in the process through the regional Flood Group and have their own areas of responsibility in a case of flooding. The responsible party for the FRMPs in Kokemäenjoki river is the ELY Centre of Varsinais-Suomi region. The ELY Centre of Pirkanmaa region, where the river originates from, is also included in the region's Flood Group (see Figure 11 for the longitudinal river profile).

Flood risk prevention in the FRMP for 2022-2027 consist of requiring considering flood risks in spatial planning and building permits as well as taking flood risks into account in environmental permits decisions. Also, critical infrastructure, such as electricity need to be located outside flood risk area or protected otherwise. As the area faces a lot of flooding and the phenomenon is not new to the area, FRM relies on flood defence and flood preparation. The flood defence strategies include technical measures, including Säpilänniemi adjustment channel, in the case of given permit and financial situation. Other measures include maintenance of the riverbed and other locally taken measures within the significant flood risk areas, mostly Pori. Flood risk preparation strategies listed on the FRMP include both contingency measures and measures taken in flood

hazard and flood situations. As mentioned, the area has a long history of flooding, and most are already in place, which is why a significant portion of the goals listed in the 2022-2027 FRMP are statements of continuation or securing cooperation of important parties. These are emphasized especially in the preparatory strategies. The FRMPs also include an assessment of social impacts of all the measures. However, the social impact assessment is very general and based on expert judgement, with little explanation of the assumptions or methodology behind the assessment. Similar assessment of impacts to nature and biodiversity is also included.

Many of the main objectives included in the FRMP for 2022-2027 both for the whole area and the significant flood risk areas focus on mitigation, preparation, and flood defence. The plan has two sets of goals: general goals for the whole basin area and specific for the significant flood risk areas. The general objectives aim to mitigate harmful consequences in the whole basin area and prevent developing new flood risk areas. The role of knowledge and know-how is emphasized: the objective is that people who live within a flood risk area are aware of the flood risk and have independently prepared for a flood event and flood know-how is secured within the most central stakeholders. Adaptation to climate change is mentioned in the objectives, as is the impact of climate change on the hydrological cycle, for example in terms of increasing winter flooding.

The objectives for the flood risk areas (namely Pori and Huittinen) focus on flood preparation. Key objectives for flood risk areas include that the permanent settlement is secured against even severe and rare flood events in such a manner that the floods will not pose a threat to health or security of people; electricity, heat and water can be supplied outside the flood risk area in case of such event. In addition, there should be no buildings (such as hospitals, schools, etc.) in flood risk areas that are difficult to evacuate, referring to the high potential number of people at any one time and to vulnerable groups), and the rupture of important traffic connections should be bypassed by using alternative routes. Floods should not cause permanent harm to culturally or environmentally important locations. Lastly, the aim is to have the construction of the Säpilänniemi channel underway within this planning period (2022-2027), depending on the permit situation that is required due to the Natura2000–area.

Climate change adaptation policies

The two latest FRMPs (2016-2021 and 2022-2027) underline climate change and its effects on the Kokemäenjoki river catchment area. The effects of climate change are already visible in the Kokemäenjoki river basin. An increase in flood risks in winter has already been noticed and is expected to continue to increase (Kokemäenjoki Flood Group 2021). For example, heavy rainfall and river discharges have been significantly larger in recent years, even larger than the average climate scenarios for 2100. Warmer winters increasingly cause snow to fall as rain, which increases the magnitude of winter flows. As a result, the ice cover of rivers is becoming increasingly difficult to form. Intensified precipitation can cause severe flood risks locally, especially in urban areas. Warmer winters also create circumstances for frazil ice to form, creating ice dams on the river which contribute to flooding. Climate change is expected to lessen spring flooding and increase autumn and winter floods, which is why Säpilänniemi adjustment channel could help the area to adapt to the changed flood

risk situation as it would increase the flow capacity of the river. The FRMPs underline the Säpilänniemi adjustment channel as a significant measure to adapt to climate change both in the Huittinen flood risk areas as well as in the whole river basin.

Neither of the cities has so far developed own adaptation plans. However, Huittinen has a climate and resource road map to 2030, published in the spring of 2022 (City of Huittinen 2022). In the strategy, flooding has been recognized as a climate risk and adaptation is needed to mitigate this risk. The city of Kokemäki is planning their own climate strategy and has included climate targets as one of the four main areas of focus to their current city strategy (2022-2025). However, the city strategy does not mention adaptation (City of Kokemäki 2022). The wider region of Satakunta has its own climate strategy through the regional council of Satakunta (Satakunta Regional Council 2021a; Satakunta Regional Council 2021bse), developed as part of EU led CANEMURE scheme. The strategy emphasizes fair transition and ties FRM and flood protection to climate change adaptation. One of the goals of the climate strategy of Satakunta regional council is to "execute FRM in the Kokemäenjoki river watershed", aligning the climate goals and adaptation of the region to FRM of the Kokemäenjoki river.

Data collection

For the case study, we conducted a participatory data collecting method. Outdoor living rooms, which have been developed by a US based artist Matthew Mazzotta, were conducted in cooperation with the artist in Huittinen and Kokemäki during August 2022. For the events a living room was set up in an open public place and passers-by were welcomed to join the discussion based on a semi structured questionnaire. One outdoor living room was held in both cities, with the same pattern of questions. Both events were also advertised in local newspapers. The advisement influenced the stakeholders participating notably in Huittinen, where several members of a local flood committee attended. During the outdoor living rooms, the questionnaire compiled was based on SOLARIS-research questions combined with Mazzotta's questionnaire, based on the method he has developed.

Alongside the collected data, the outdoor living rooms helped to make connections in the area and to find relevant stakeholders for the upcoming focus groups interviews. The focus groups formed based on the data from the outdoor living rooms include i) parties responsible for regulating the water, such as regional authorities and representative of hydropower companies, ii) municipal experts and politicians, and iii) other local stakeholders, such as people who encounter flooding and farmers. Altogether, 12 people were interviewed in this phase of the data collection process. These semi-structured group interviews were conducted during the autumn of 2022.

Table 2. *Interviews made in Kokemäki and Huittinen and the interviewees*

Interviews	Interviewees
Interview 1	a. governmental official b. representative of a hydropower operator

	c. governmental official
Interview 2	a. municipal official (Kokemäki)
Interview 3	a. municipal official (Huittinen)
Interview 4	a. resident of Huittinen b. resident of Huittinen
Interview 5	a. resident of Huittinen, farmer
Interview 6	a. resident of Huittinen b. resident of Kokemäki, farmer
Interview 7	a. resident of Kokemäki b. summer resident of Kokemäki

The interview questions were built around questions of the FRM executed in the area and the SOLARIS research questions. Like the HMA case study, all interview groups were asked about their experiences of flooding in the area and views on what justice means in FRM. In addition, as this case study deals with themes of socio-spatial justice, one of the main objectives was to gain information about the experienced solidarity towards others or to where the possible feelings of solidarity were headed to.

As mentioned, city politicians, city experts and residents from both cities were interviewed. The interviewees were chosen so that representatives of both cities were involved. An emphasis was given to people who live on flood risk areas or are affected by flooding and/or FRM. The authorities included both city council representatives, city experts and regional authorities and a representative of a power company in charge of regulating the dams in Kokemäenjoki river.

Results

Public Policy Analysis

The Kokemäenjoki river case focuses on river flooding and its management in a large catchment area. Climate change is expected to increase winter flooding in a way that will create pressure for implementing more effective FRM measures. Currently, the governance of fluvial FRM is well institutionalised and coordinated by the ELY-centers operating in the catchment area. Compared to the HMA case study, FRM of the large catchment area of the Kokemäenjoki river involves a large network of actors (see Annex 2), with authorities and other stakeholders such as hydropower companies involved both upstream and downstream. Furthermore, the sometimes conflicting (private) interests of the actors in relation to the river make it difficult to fairly allocate flood risks and their management. Agriculture has traditionally been practiced right next to the river, once benefitting from close proximity to water resources for irrigation and transportation purposes, but recently increasingly suffering from winter flooding. In addition to unequal flood damages, it is also unclear how the benefits of flooding and FRM are equally distributed along the river between the benefiters such as nature conservation and, to some extent, hydropower. We notice that the centralised governance of the fluvial FRM has a limited capacity to address the local concerns related to the impacts of flood risks and their

management. In order to ensure legitimacy of the centralised management system there are pressures to strengthen participation of local level stakeholders while planning the FRM measures.

In the Annex 2., we present the roles and responsibilities, power and resources and justice discourses of different authorities operating the FRM of Kokemäenjoki river. As a large river basin with very high flood risks, the network of actors is also extensive, with potential conflicts over flood solutions due to diverging interests and uses of the river. The tradition of technical management is strongly reflected in FRM of the Kokemäenjoki river. Discourses on adaptation and social vulnerability are still very much in their infancy, although the challenges posed by climate change are very much at the heart of FRM in the region.

Attention paid to social justice and inequalities (RQ1)

Current FRM appears to perpetuate socio-spatial inequalities in the area, which are recognized to some extent by the FRM policies (plans for Säpilänniemi adjustment channel to decrease flooding in Huittinen) and by the local citizens (expressions of solidarity towards the affected people and frustration of the affected). In the FRMPs, climate change is also recognized as a phenomenon that will potentially increase the experienced inequalities in terms of flood damages.

The FRMPs of the Kokemäenjoki river emphasise the Säpilänniemi adjustment channel as a solution for managing the (increasing) flood risks of the entire Kokemäenjoki river and the city of Huittinen. The plans seem to compensate for the social and spatial inequalities caused by the floods between Huittinen and Kokemäki by building the channel, but this is problematic as the social impact assessment has been limited in principle in both the more detailed channel plan and the FRMPs, as the plans do not address the social and spatial inequalities caused by the floods. The approach to FRM is highly technocratic and thus dominated by both technical language and solutions. Implementing the 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. Although varying opinions about the measures of FRM can be found from the interviews, a strong consensus of the need to share and mitigate the flood risks in a fair and just manner is apparent. This is illustrated, for example, by the following excerpt from an interview with an authority managing flood risks:

> *"We can somehow relativize this suffering and after that we will have to figure out, how much we can require […] resilience toward floods and then for the parts it cannot be required, and it is too much [the suffering], we will need to prevent it from happening and be as just to all as much as we can."* (Municipal officer, Kokemäki, 2a)

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.

In the interviews with local stakeholders, farmers in the flood risk areas are recognized as the most vulnerable groups by all interviewees, including the citizens and authorities at all levels. From the interviews, it can be

concluded that flood vulnerability refers above all to susceptibility to financial loss due to floods. This is illustrated, for example, in the recognition of farmers and their livelihoods' vulnerability towards flooding events and how social justice and inequalities refer mostly to risk of financial loss and interference to livelihoods. In addition, the interviewees who have encountered floods are worried about the costs caused by floods or flood risks:

> *"Farms that are located there, there are not that many, but a few. And they are in the worst position. -- These farms that were build decades ago that were for no reason placed too close [to the river] or too low."* (Municipal official, Huittinen, 3a)

> *"Of course, [our] neighbours have little bit of similar problems, the water encircling the houses and the yards, and it is difficult to go when there is so much water.--. There are farms right there in danger, and pigs, they've had to terrace the walls of the piggery. It's been very close, that [the pigs] needed to be evacuated. Just a bit more than a kilometre from here [name]'s piggery has been really [close], they protected the piggery, the animals were in danger to get wet."* (Resident of Huittinen, 4b)

The FRMP emphasizes the objective of the Flood Risk Act to minimize harms to people caused by floods. The FRMPs include an evaluation of the impacts on social issues. However, the evaluation is very general. The evaluated impacts do not necessarily identify all relevant stakeholders, or at least it does not mention them. As it also came out in the interviews, the evaluation of the social effects of the construction of the channel takes place above all through possible financial losses (for example, a possible decrease in the value of the property due to a change in the environment during or after construction). The assessment does not deal with vulnerability or social inequality in more detail. Similar problems can be observed in the evaluation which include nature and biodiversity. This is related also to knowledge on social inequalities (see RQ3).

The data collected in the outdoor living rooms indicate that residents in both cities who have been personally affected by floods are dissatisfied with the authorities and feel neglected. Expressions of frustration were more present in Huittinen than in Kokemäki. This is mainly explained by the fact that Kokemäki is not a flood risk area and thus personal experiences are rare. In Kokemäki, people who had not experienced flooding expressed solidarity and a sense of empathy with other cities along the river, especially those which are situated in the significant flood risk areas. This became apparent also during the interviews with residents. However, during the conducted interviews, people experiencing flooding in Huittinen expressed feelings of solidarity and empathy towards those who might be affected by the changes in the environment in the planned FRMPs, even though the FRM measures are expected to lessen their exposure to flooding:

> *"I am quite sceptical about the Säpilänniemi adjustment channel and think it a bit unnatural. ---. Because in my opinion, the Säpilä peninsula is, for once, a very beautiful area, our strawberries grow there, how would it affect [there], the Säpilänniemi peninsula, to the lives of those people [living there]."* (Resident of Huittinen, 4a)

Similarly, some actors in Kokemäki and Huittinen expressed concern about the adjustment channel and its potential adverse effects on ground water, Natura2000-sites, surface water quality, none of which are matters of social justice alone, but also environmental health and heritage concerns. Thus, this case study raises not only questions of social justice, but also concerns related to environmental protection. Concern for the environment is mixed with conflict over flood risk management in a way reminiscent of a similar case in Rovaniemi, where disappointment with strict environmental policies was eventually followed by local withdrawal from self-preparedness when flood risk management through water regulation failed (Räsänen 2021). The negative impacts of Säpilänniemi adjustment channel to the Natura2000-area are well documented in the FRMPs. However, the adjustment channel is presented as the only alternative for FRM in the region. In the interviews with the stakeholders, different stakeholders have talked about their thoughts on possible alternatives. It appears that there are alternatives for building the adjustment channel but not all of them have been systematically assessed in terms of their impacts. When asked about the potential impacts of the channel in the interviews, many were concerned about the environment. Environmental concerns were expressed from several points of view: some felt that the condition of the river environment is already being weakened by the nutrients leaching from the field, some were worried about the old bottom sediments, which could move and pollute the water when the canal is dredged. The interviews reveal a concern for the environment downstream of the Kokemäenjoki River, where flooding is not an issue for residents. However, further interviews would be needed to understand the potential risk of mistrust and solidarity in the upper reaches, as identified by Räsänen (2021) in Rovaniemi, and its implications for flood risk management in the Kokemäenjoki River.

> *"I, as an environment person, think it is also quite a big problem, -- that there is currently stuff [nutrients from the field due to the floods] flowing into the Kokemäenjoki river and that way to the Baltic Sea."* (Resident of Kokemäki, farmer, 6b)

> *"Knowing the history of the river, what lays at the bottom there [old, contaminated sediments] and I know that for damn sure, nutrients are going to flow downstream if such a stream would be built."* (Municipal official, Kokemäki, 2a)

Role of participation (RQ2)

As in the first case study (HMA), the Kokemäki area is subject to the same legal obligations for public participation. Both regional state authorities (ELY Centres) and municipalities are required to involve stakeholders in the decision-making processes. However, the use of participatory tools or their outputs are not widely known or understood. The technocratic orientation of FRM may suggest that not all stakeholders may have the opportunity to influence FRM because they may not have the resources or knowledge to participate. The collected data suggests that local people are well informed about the potential benefits and trade-offs of different FRM solutions, such as the Säpilänniemi adjustment channel. However, communication between different stakeholders along the river seems to be lacking (see RQ3), although some of the stakeholders, such as cities of Kokemäki and Huittinen and the hydropower companies, are involved in FRM as members of the

Food Group led by the ELY Centre (including the municipalities of Huittinen and Kokemäki). It may be that the technocratic nature of FRM creates an epistemic community to the FRM domain and accidentally ignores the residents affected by 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. Furthermore, the voice of specific interest groups such as farmers and environmentalists are more likely to be heard than the voice of private citizens. There might be a lack of participation and underutilization of knowledge of the people who are affected by flooding which is also articulated by the citizens. More profoundly was articulated the lack of information given by officials to deal with and prepare for the flooding:

> *"[Municipal] Environmental secretaries or whatever they are, I am not aware of the name of the positions now, --, they should provide with guidance, how to act and how to prepare, in my opinion."* (Resident of Huittinen, 4a)

> *"That is the deal, when the building permits have been given in the distant past, communal building control has given the permits, and so these should be safe and good places to live. But then in the end it feels like all the responsibility is left to the resident. Somehow, they should guide the builders or others that such flood risk exists so if one is going to build [the building] would be built high enough. ----. A little bit more presence and participation of society [in this] would be desirable. "* (Resident of Huittinen, 4b)

Similarly, people facing floods seemed to have some problems identifying which actors are responsible for FRM in the region, as shown for example by the low number of comments from private citizens on the latest FRMP. A lot of suspicion was also raised towards private hydropower companies, which play a role in the water runoffs and water regulation. Such suspicion was, however, not expressed towards authorities, who were widely trusted in the interviews. From the interviews a trend of trusting officials can be found, and private citizens seem to trust and hope for state led FRM systems and technocratic orientation is seen as a just way of FRM. Both the authorities as well as citizens view the issue of flood risks to be both regional and shared between communities. As such, FRM is seen as a responsibility of the state. There is also a great trust in expert knowledge, in all the citizens, municipal experts and decisions makers as well as the representatives of ELY-centres themselves.

> *"You asked how one citizen can impact, hopefully nowhere in Finland could a singular citizen affect regulation, because this water regulation cannot be done from the viewpoint of one person. The issue must be perceived from the perspective of common good."* (Governmental official, 1a)
>
> *"And then I trust that those people who make these plans, I mean, we must trust their work."* (Resident of Kokemäki, 7a)

Knowledge and capacity-building on social inequalities (RQ3)

The Finnish approach to FRM is characterized by the collection of a large amount of data from the region, and FRM is based on data, information and scenario building. In the interviews, stakeholders acknowledge the potential negative and positive impacts of the Säpilänniemi adjustment channel, express worry over the property owners at Säpilänniemi, loss of Natura2000-area and the river environment in general while still expressing compassion to those, who suffer currently due to the flood risk situation in Huittinen.

Based on interviews and discussions in the outdoor living rooms, many residents have a certain resilience to flooding due to the long history and experiences of flooding in the area. Despite the fact that flooding is considered as a serious climate risk in the climate strategy of Huittinen, FRMPs and the interviews, cities and citizens may lack information and knowledge on how climate change can affect, create, and reinforce social inequalities. Same might be true also within the regional authorities who recognize the inequalities reinforced but who lack knowledge and understanding of the social vulnerabilities per se. The data suggests that the authorities have a significant amount of knowledge of the technical side of FRM but lack information about the social impacts, although these are generally assessed within the FRMPs:

> *"[Assessment of social impacts] is built into the [FRMP], or in the workpiece in my opinion, I mean flood risks were discussed, meaning what there is, how many people are affected and how many residential buildings and what types of damages and such [---]."* (Governmental official, 1c)

The FRMPs rely on technical information and solutions, leaving vulnerabilities and social inequalities vaguely addressed. One interviewee justifies the construction of the channel purely on the basis of economic efficiency:

> *"A fantastic scheme [the channel] in my opinion, if you consider that by just altering a riverbed without even causing any significant environmental damage, I don't know why it is so difficult there. Of course, it costs probably 10 million currently, the scheme, but if one considers that there could be damages of three billion in Pori in the other side of the scale, in that case it is quite cost effective if the adjustment channel serves us few hundred years, for example."* (Governmental official, 1c)

People facing flooding have also expressed a need for more information to protect private property in flood situations. Currently, the protection of private property is mainly the responsibility of the owner. However, increased winter flooding would require more informational guidance to help them adapt. The new situation will make people who live close to the river or whose livelihood is dependent on the river such as agriculture more vulnerable to the effects of climate change.

References

Albrecht, E. (2023). Changing Winters and Adaptive Water Governance: A Case Study on the Kemi River Basin, Finland. Water, 15(11), Article 11. https://doi.org/10.3390/w15112024

Amani Fard, F., Riekkinen, K., & Pellikka, H. (2023). Evaluating the Effectiveness of Land-Use Policies in Preventing the Risk of Coastal Flooding: Coastal Regions of Helsinki and Espoo. Land, 12(8), Article 8. https://doi.org/10.3390/land12081631

Bäck, M. & Kestilä-Kekkonen E. (eds.) Poliittinen ja sosiaalinen luottamus Polut, trendit ja kuilut. (Political and Social Trust Pathways, Trends and Gaps) Valtiovarainministeriön julkaisuja – 2019:31.

Bäcklund , P. and Mäntysalo , R. (2010) Agonism and institutional ambiguity: ideas on democracy and the role of participation in the development of planning theory and practice—the case of Finland . Planning Theory , 9 (4) : 33 – 350 .

City of Helsinki (2015). Helsingin ilmastotiekartta. Kohti hiilineutraalia ja ilmastoon sopeutunutta kaupunkiamme. Available at: https://dev.hel.fi/paatokset/media/att/c0/c08ed49dbad17914212107a8242a3f17c462f6b4.pdf. [In Finnish]

City of Helsinki (2019). Climate change adaptation policies in Helsinki 2019-2025. Helsingin kaupungin keskushallinnon julkaisuja 2019:27. [In Finnish]

City of Helsinki (2020). Asumisen ja siihen liittyvän maankäytön toteutusohjelma. Helsingin kaupunginkanslian julkaisuja 2021:1. [In Finnish].

City of Huittinen (2022) Roadmap for Climate Responsibility until 2030. City of Huittinen. https://www.huittinen.fi/files/11917/Resurssiviisas_Huittinen_Ilmastovastuullisuuden_tiekartta_vuoteen_2030.pdf, retrieved in 30 Aug 2023, [In Finnish].

Committee for the Future of the Parliament. (2023). How can Finland now and in the future? Perspectives on the development of well-being, ill-health and public health? [In Finnish]. Publication of the Committee for the Future of the Parliament 6/2022.

Esping-Andersen, G., & Korpi, W. (1986) From Poor Relief to Institutional Welfare States: The Development of Scandinavian Social Policy. International Journal of Sociology, 16(3–4), 39–74. https://doi.org/10.1080/15579336.1986.11769910

Faehnle, M., Bäcklund, P., Tyrväinen, L., Niemelä, J., & Yli-Pelkonen, V. (2014). How can residents' experiences inform planning of urban green infrastructure? Case Finland. *Landscape and Urban Planning*, *130*, 171–183. https://doi.org/10.1016/j.landurbplan.2014.07.012

Finnish Environment Institute & Centres for Economic Development, Transport and the Environment (ELY-Centres) (2015). Summary of Flood Risk Management Plans for 2015-2021. December 2015. Available at: https://www.ymparisto.fi/fi-FI/Vesi/Tulviin_varautuminen/Tulvariskien_hallinta/Tulvariskien_hallinnan_suunnittelu/Tulvariskien_hallintasuunnitelmat/Yhteenveto_tulvariskien_hallintasuunnite(36240). Referred 8.9.2022. [In Finnish].

Finnish Environment Institute (2019) Preliminary flood risk assessment in Finland (Updated). Available at: https://www.ymparisto.fi/en-US/Waters/Floods/Flood_risk_management/Flood_risk_management_planning/Preliminary_flood_risk_assessment. Referred 28.2.2022.

Finnish Environment Institute & Centres for Economic Development, Transport and the Environment (ELY-Centres) (2021). Summary of Flood Risk Management Plans for 2022-2027. December 2021. Vesi.fi. Available at: https://vesi.fi/aineistopankki/yhteenveto-tulvariskien-hallintasuunnitelmista-vuosille-2022-2027/ [In Finnish]. Referred 28.2.2022.

Fleischer, L., & Stokenberga, L. (2023). Well-being in Finland. OECD Papers on Well-being and Inequalities, No. 14, OECD Publishing, Paris, https://doi.org/10.1787/ecf06a58-en. 14. https://doi.org/10.1787/ecf06a58-en

Environment Institute of North-West Finland (later: Finnish Environment Institute) Lounais-Suomen ympäristökeskus (2006). Porin tulvat – hallittuja riskejä? (Toim. Koskinen, M.). Suomen ympäristö 19/2006 .Available: https://helda.helsinki.fi/bitstream/handle/10138/38788/SY_19_2006.pdf?sequence=3&isAllowed=y. Accessed: 25.10.2023 [In Finnish].

Gregow H, Carter T, Groundstroem F, Haavisto R, Haanpää S, Halonen M, Harjanne A, Hildén M, Jakkila J, Juhola S, Jurgilevich A, Kokko A, Kollanus V, Lanki T, Luhtala S, Miettinen I, Mäkelä A, Nurmi V, Oljemark K, Parjanne A, Peltonen-Sainio P, Perrels A, Pilli-Sihvola K, Punkka A-J, Raivio T, Räsänen A, Säntti K, Tuomenvirta H, Veijalainen N, Zacheus O (2016). Keinot edistää sää- ja ilmastoriskien hallintaa. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 47/2016. 42 p. Available at: https://tietokayttoon.fi/julkaisu?pubid=15406 [In Finnish]

Gregow, H., Mäkelä, A., Tuomenvirta, H., Juhola, S., Käyhkö, J., Perrels, A., Kuntsi-Reunanen, E., Mettiäinen, I., Näkkäläjärvi, K., Sorvali, J., Lehtonen, H., Hildén, M., Veijalainen, N., Kuosa, H., Sihvonen, M., Johansson, M., Leijala, U., Ahonen, S., Haapala, J., Korhonen, H., Ollikainen, M., Lilja, S., Ruuhela, R., Särkkä, J. & Siiriä, S-M. (2021). Ilmastonmuutokseen sopeutumisen ohjauskeinot, kustannukset ja alueelliset ulottuvuudet. Suomen ilmastopaneelin raportti 2/2021. [In Finnish].

Gronow, A., Ylä-Anttila, T., Carson, M., & Edling, C. (2019). Divergent neighbors: Corporatism and climate policy networks in Finland and Sweden. *Environmental Politics*, *28*(6), 1061–1083. https://doi.org/10.1080/09644016.2019.1625149

Hegger, D.L.T., Driessen, P.P.J., Dieperink, C. et al. (2014). Assessing Stability and Dynamics in Flood Risk Governance. Water Resources Management 28, 4127–4142. https://doi.org/10.1007/s11269-014-0732-x

Helsinki and Espoo Coastal Flood Group (2021). Helsinki and Espoo Coastal Flood Risk Management Plan 2022-2027. Uusimaa Centre for Economic Development, Transport and the Environment. Reports 72/2021. 50 p. Available at: https://vesi.fi/aineistopankki/helsingin-ja-espoon-rannikkoalueen-hallintasuunnitelma-vuosille-2022-2027/ [In Finnish]

Hildén, M.; Tikkakoski, P.; Sorvali, J.; Mettiäinen, I.; Käyhkö, J.; Helminen, M.; Määttä, H.; Berninger, K.; Meriläinen, P.; Ahonen, S.; Kolstela, J.; Juhola, S.; Tynkkynen, O.; Gregow, H.; Groundstroem, F.; Halonen, J.I.; Munck af Rosenschöld, J.; Tuomenvirta, H.; Carter, T.; Lehtonen, H.; Luomaranta, A.; Mäkelä, A. (2022) Adaptation to climate change in Finland : Current state and future prospects. Prime Minister's Office, Publications of the Government´s analysis, assessment and research activities 2022:55. Available at:http://urn.fi/URN:ISBN:978-952-383-118-6

Hirvilammi, T. & Helne, T. (2014): Changing paradigms: A sketch for sustainable wellbeing and ecosocial policy. Sustainability 6:4, 2160–2175, https://doi.org/10.3390/su6042160.

The Housing Finance and Development Centre of Finland (Ara) (2024) Homeless people 2023. Report 2/2024. https://www.ara.fi/en/node/8/homelessness/homeless-people-2023#more-information-about-the-report, retrieved 1.6.2024.

HSY (Helsingin seudun ympäristöpalvelut -kuntayhtymä, Helsinki Region Environmental Services) (2012). Pääkaupunkiseudun ilmastonmuutokseen sopeutumisen strategia. HSY:n julkaisuja 10/2012. Available at: https://www.ymk-projektit.fi/suunnitteluopas/files/2014/07/PK_Raportti_2012_paakaupunkiseudun_ilmastonmuutokseen_sopeutumisen_strategia.pdf [In Finnish]

Häkämies, S., M. Moisio, S. Sepponen & M. Halonen (2021). Pääkaupunkiseudun ilmastonmuutokseen sopeutumisen strategian arviointi. 4.6.2021. Gaia Consulting Oy. Available at: https://www.hsy.fi/globalassets/ilmanlaatu-ja-ilmasto/tiedostot/paakaupunkiseudun-ilmastonmuutokseen-sopeutumisen-strategian-arviointi.pdf [In Finnish]

Inkiläinen, E., T. Tiihonen & E. Eitsi (2014). Viherkerroinmenetelmän kehittäminen Helsingin kaupungille. Helsingin kaupungin ympäristökeskuksen julkaisuja 8/2014. Helsingin kaupungin ympäristökeskus, Helsinki 2014. [In Finnish]

Jutila, M. (2011). Narrowing of Public Responsibility in Finland, 1990–2010. Social Policy & Administration, 45(2), 194–205. https://doi.org/10.1111/j.1467-9515.2010.00764.x

Jurgilevich, A. (2021). Governance modes and epistemologies of future-oriented vulnerability assessments: Example of a mixed-methods approach. Futures : The Journal of Policy, Planning and Futures Studies, 128(102717). https://doi.org/10.1016/j.futures.2021.102717

Jurgilevich, A., Räsänen, A., & Juhola, S. (2021). Assessing the dynamics of urban vulnerability to climate change: Case of Helsinki, Finland. Environmental Science & Policy, 125, 32–43. https://doi.org/10.1016/j.envsci.2021.08.002

Järvelä, M., T. Lanki, I. Ratinen, T. Kortetmäki, S. Huttunen, A. Turunen (2018). Osallistaminen ilmastopolitiikassa. Finnish Climate Panel, Report 1/2018. https://urn.fi/URN:NBN:fi-fe2018092436449. [In Finnish]

Kahma K., Pellikka H., Leinonen K., Leijala U., Johansson M. (2014). Pitkän aikavälin tulvariskit ja alimmat suositeltavat rakentamiskorkeudet Suomen rannikolla. Ilmatieteenlaitos. Raportteja 2014:6. Helsinki. [In Finnish]

Kangas, Olli and Kalliomaa-Puha, Laura (2019). ESPN Thematic Report on Financing social protection – Finland, European Social Policy Network (ESPN), Brussels: European Commission.

Kankaanpää, S. (2017). Pääkaupunkiseudun ilmastonmuutokseen sopeutumisen uudet haasteet. HSY:n julkaisuja. Helsingin seudun ympäristöpalvelut - kuntayhtymä. Available at: https://www.hsy.fi/globalassets/ilmanlaatu-jailmasto/tiedostot/pks_ilmastonmuutokseen_sopeutumisen_uudet_haasteet.pdf. [In Finnish]

Kazmierczak, A. (2015). Analysis of social vulnerability to climate change in the Helsinki metropolitan area. Helsinki Region Environmental Services Authority, Helsinki.

Kettunen, P. (2001). The Nordic Welfare State in Finland. Scandinavian Journal of History, 26(3), 225–247. https://doi.org/10.1080/034687501750303864

Kivimaa, P., Huttunen, S., Lähteenmäki-Uutela, A., Heikkinen, M.; Juhola, S.; Kaljonen, M.; Käyhkö, J.; Lund, P.; Näkkäläjärvi, K. (2021) How to consider justice in climate policy? Discussion paper, Finnish Climate Change Panel. https://www.ilmastopaneeli.fi/wp-content/uploads/2021/12/Finnish-Climate-Change-Panel_how-to-consider-justice-in-climate-policy_publication-5-2021.pdf

Kivimaa, P., Heikkinen, M., Huttunen, S., Jaakkola, J., Juhola, S., Juntunen, S., Kaljonen, M., Käyhkö, J., Leino, M., Loivaranta, T., Lundberg, P., Lähteenmäki-Uutela, A., Näkkäläjärvi, K., Sivonen, M. H., & Vainio, A. (2023). Evaluation of justice in climate policy. Suomen ilmastopaneeli. https://doi.org/10.31885/9789527457214

Klein, J. (2016). Embeddedness of climate change adaptation: Established procedures and contending discourses for flood protection in Espoo, Finland. Local Environment, 21(2), 254–271. https://doi.org/10.1080/13549839.2014.945405

Kokemäenjoki Flood Group (2021). Flood Risk Management Plan for the Kokemäenjoki River Basin for 2022- 2027. Available at: https://vesi.fi/aineistopankki/kokemaenjoen-vesistoalueen-tulvariskien-hallintasuunnitelma-vuosille-2022-2027/. Accessed: 20.1.2023. [In Finnish].

Kortteinen, M. & Vaattovaara, M. (2015). Segregaation aika. Yhteiskuntapolitiikka, 80(8), pp. 562–574. [In Finnish]

Lahtinen, H., Wass, H., & Hiilamo, H (2019) Luottamus poliittisen osallistumisen sosioekonomisten erojen selittäjänä. In: Bäck, M. & Kestilä-Kekkonen E. (eds.) Poliittinen ja sosiaalinen luottamus Polut, trendit ja kuilut. (Political and Social Trust Pathways, Trends and Gaps) Valtiovarainministeriön julkaisuja – 2019:31.

Leino , H. (2005) Spaces of possibility: the participatory agenda in the Vuores planning case. Case study of public participation in territorial planning . Nordisk Samhällsgeografisk Tidskrift , 39 : 59 – 86 .

Leino, H. (2012). Boundary Interaction in Emerging Scenes: Two Participatory Planning Cases from Finland. Planning Theory & Practice, 13(3), 383–396. https://doi.org/10.1080/14649357.2012.706629

Leino , H. and Laine , M. (2012) Do matters of concern matter? Bringing issues back to participation . Planning Theory , 11 (1) : 89 – 103 .

Lindley S, O'Neill J, Kandeh J, Lawson N, Christian R and O'Neill M (2011) Climate change, justice and vulnerability. Joseph Rowntree Foundation, York.

Lounasheimo, J., Cederlöf, M., Mäntylä, I. (2021) Annual Climate Report 2021. Publications of the Ministry of the Environment 2021:19. Ministry of the Environment, Helsinki.

Ministry of Agriculture and Forestry (MoAF) (2024). Government Report on Finland's National Climate Change Adaptation Plan until 2030: Wellbeing, Safety and Security in a Changing Climate (Publications of the Finnish Government 2024:11). fi=Valtioneuvosto|sv=Statsrådet|en=Finnish Government|. https://julkaisut.valtioneuvosto.fi/handle/10024/165528

Ministry of the Agriculture and Forestry (MoAF) (2014) National Climate Change Adaptation Plan 2022. https://mmm.fi/documents/1410837/1516663/2014_5_Ilmastonmuutos.pdf/1716aa76-8005-4626-bae0-b91f3b0c6396/2014_5_Ilmastonmuutos.pdf?t=1501159291000, retrieved 1.6.2024.

Ministry of the Agriculture and Forestry (MoAF) (2021) MoAF designated significant flood risk areas 2018-2024, Press release. https://mmm.fi/-/mmm-nimesi-merkittavat-tulvariskialueet-vuosiksi-2018-2024, retrieved 1.6.2024.

Meriläinen, P., Paunio, M., Kollanus, V., Halonen, J., Tuomisto, J., Virtanen, S., Karvonen, S., Hemminki, E., Kuusipalo, H., Koivula, R., Mäkelä, H., Huusko, S., Voutilainen, L., Huldén, L., Raulio, S., Keskimäki, I., Partonen, T., Mänttäri, S., Viitanen, A.-K., … Mukala, K. (2021). Climate change in the healthcare and social welfare sector: Climate change adaptation plan of Ministry of Social Affairs and Health (2021–2031) [Publications of the Ministry of Social Affairs and Health 2021:36]. Ministry of Social Affairs and Health. https://julkaisut.valtioneuvosto.fi/handle/10024/163643

OECD (2021), Drivers of Trust in Public Institutions in Finland, Building Trust in Public Institutions, OECD Publishing, Paris, https://doi.org/10.1787/52600c9e-en.

Ollila, M., Virta, H., Hyvärinen, V .2000. Suurtulvaselvitys. Arvio mahdollisen suurtulvan aiheuttamista vahingoista Suomessa, Suomen ympäristö 441. Suomen ympäristökeskus.

Paloniemi, R., S. Vikström, A. Rekola, K. Mäkinen, M. Marttunen, T. Hjerppe, M. Sane, K. Syrjänen, I.-M. Koskela, M. Aulake, R. Hautamäki, M. Ariluoma, H.-M. Kehvola, A. Matila, M. Häyrynen, I. Hankonen, H. Tuomenvirta, K. Pilli-Sihvola, A. Votsis, R. Haavisto (2019). Kestävää kaupunkisuunnittelua - luontopohjaiset ratkaisut maakunnissa ja kunnissa. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 2019:48. Valtioneuvoston kanslia, Helsinki 2019. [In Finnish].

Parjanne, A., J. Silander, M. Tiitu, A. Viinikka, (2018). Flood risks in Finland now and in the future. Reports of Finnish Environment Institute 30/2018. http://hdl.handle.net/10138/278893.

Parjanne, A., A-M. Rytkönen, N. Veijalainen (2021). Framework for climate proofing of flood risk management strategies in Finland. Water Security, Volume 14, 100096. ISSN 2468-3124. https://doi.org/10.1016/j.wasec.2021.100096.

Pilli-Sihvola, Karoliina, Riina Haavisto, Ulpu Leijala, Sanna Luhtala, Antti Mäkelä, Reija Ruuhela and Athanasios Votsis (2018). Sään ja ilmastonmuutoksen aiheuttamat riskit Helsingissä. Kaupunkiympäristön julkaisuja 2018:6. [In Finnish]. Available at: https://www.hel.fi/static/liitteet/kaupunkiymparisto/julkaisut/julkaisut/julkaisu-06-18.pdf

Prime Minister's Office. (2020a). Voluntary National Review 2020 FINLAND: Report on the Implementation of the 2030 Agenda for Sustainable Development. Publications of the Prime Minister's Office 2020:8. Prime Minister's Office. https://julkaisut.valtioneuvosto.fi/handle/10024/162268

Prime Minister's Office. (2020b). Government Report on the Implementation of the 2030 Agenda: Towards a carbon-neutral welfare society. Publications of the Prime Minister's Office 2020:13. Prime Minister's Office. https://julkaisut.valtioneuvosto.fi/handle/10024/162575

Prime Minister's Office. (2022). Strategy of the National Commission on Sustainable Development 2022–2030: A prosperous and globally responsible Finland that protects the carrying capacity of nature (Publications of the Prime Minister's Office 2022:12). Prime Minister's Office. https://julkaisut.valtioneuvosto.fi/handle/10024/164157

Räsänen, A., Heikkinen, K., Piila, N., & Juhola, S. (2019). Zoning and weighting in urban heat island vulnerability and risk mapping in Helsinki, Finland. Regional Environmental Change, 19(5), 1481–1493. https://doi.org/10.1007/s10113-019-01491-x

Räsänen, A. (2021). Cross-scale interactions in flood risk management: A case study from Rovaniemi, Finland. International Journal of Disaster Risk Reduction, 57, 102185. https://doi.org/10.1016/j.ijdrr.2021.102185

Saari, J. (2023). Welfare State in a Fair Society? Post-Industrial Finland as a Case Study. In P. Haapala, M. Harjula, & H. Kokko (Eds.), Experiencing Society and the Lived Welfare State (pp. 325–346). Springer International Publishing. https://doi.org/10.1007/978-3-031-21663-3_15

Saikkonen, P., Hannikainen, K., Kauppinen, T., Rasinkangas, J. & Vaalavuo, M. (2018). Sosiaalinen kestävyys: asuminen, segregaatio ja tuloerot kolmella kaupunkiseudulla. (In Finnish). Terveyden ja Hyvinvoinnin Laitos, Raportti 2/2018, 172 p. Available at: <http://www.julkari.fi/bitstream/handle/10024/136125/URN_ISBN_978-952-343-084-6.pdf?sequence=1&isAllowed=y>. Accessed 30.9.2022.

Seppälä, R., M. Suomalainen, E. Mäkäläinen & M. Torkkel (2021). Vantaanjoen vesistöalueen tulvariskien hallintasuunnitelma vuosille 2022–2027. Hämeen elinkeino-, liikenne ja ympäristökeskus. Raportteja 55/2021. Available at: https://vesi.fi/aineistopankki/vantaanjoen-vesistoalueen-tulvariskien-hallintasuunnitelma-vuosille-2022-2027/. [In Finnish]

Statistics Finland (2021). Municipal Key Figures with the 2020 regional division. PxWebAPI statistical database.

Satakunta Regional Council (2021a). Satakunnan ilmasto- ja energiastrategia 2030: Canemure hankeenn (SAMK) tuottama työkalupakki ilmastonmuutoksen hillintään. Climate and energy strategy 2030 of Satakunta. Avainable at: https://satakunta.fi/wp-content/uploads/2021/04/Satakunnan-ilmasto-ja-energiastrategia-2030-_lopullinen.pdf. Accessed 27.1.2023. [In Finnish].

Satakunta Regional Council. (2021b). Alueellinen oikeudenmukaista siirtymää koskeva suunnitelma 2021. Regional plan regarding fair transition 2021. Available at: https://satakunta.fi/wp-content/uploads/2023/01/Satakunnan-TJTP.pdf. Accessed 27.1.2023. [In Finnish]

Sachs, J., Lafortune, G., Kroll, C., Fuller, G., Woelm, F. (2022). From Crisis to Sustainable Development: the SDGs as Roadmap to 2030 and Beyond. Sustainable Development Report 2022. Cambridge: Cambridge University Press.

City of Pori (2024) History of flood protection. Website. Available at: https://www.pori.fi/asuminen-ja-ymparisto/ymparisto/tulvariskien-hallinta/porin-tulvasuojeluhanke/tulvasuojelun-historiaa/. Accessed 25.1.2023. [In Finnish]

ELY Centre of Varsinais-Suomi (2021). Consultation on a draft plan for the management of flood risks in the Kokemäenjoki River. Summary of opinions and comments, including responses. Memo, 12.10.2021. Available at: https://vesi.fi/aineistopankki/kokemaenjoen-tulvariskien-hallintasuunnitelmaehdotuksen-kuuleminen/. Accessed: 20.1.2023. [In Finnish]

ELY Centre of Varsinais-Suomi (2014). Säpilänniemen oikaisu-uoma. Suunnitelma oikaisu-uoman toteutuksesta Kokemäellä. Näkymiä Toukokuu/2014. Available at:

https://www.doria.fi/bitstream/handle/10024/103429/S%C3%A4pil%C3%A4nniemen%20oikaisu-uoma_N%C3%A4kymi%C3%A4_2014.pdf?sequence=2&isAllowed=y. Accessed: 25.1.2023. [In Finnish]

Vesa, J., Kantola, A., & Binderkrantz, A. S. (2018). A Stronghold of Routine Corporatism? The Involvement of Interest Groups in Policy Making in Finland. *Scandinavian Political Studies*, *41*(4), 239–262. https://doi.org/10.1111/1467-9477.12128

Vesa, J., Gronow, A., & Ylä-Anttila, T. (2020). The quiet opposition: How the pro-economy lobby influences climate policy. *Global Environmental Change*, *63*, 102117. https://doi.org/10.1016/j.gloenvcha.2020.102117

Veijalainen, N. (2012) Estimation of climate change impacts on hydrology and floods in Finland. Aalto University publication series. Doctoral dissertations 55/2012. ISBN 978-952.

Veijalainen, N., T. Dubrovin, M. Marttunen, B. Vehviläinen (2010). Climate change impacts on water resources and lake regulation in the Vuoksi watershed in Finland. Water Resour. Manage., 24 (13) (2010), pp. 3437-3459, 10.1007/s11269-010-9614-z.

Y-foundation (2017). A Home of Your Own – Housing First and Ending Homelessness in Finland. 65p. Available at: https://ysaatio.fi/en/housing-first-finland/a-home-of-your-own-handbook.

Yli-Pelkonen , V. and Niemelä , J. (2005) Linking ecological and social systems in cities: urban planning in Finland as a case . Biodiversity and Conservation , 14 : 1947 – 1967 .

Annex 1

Table: Results of the public policy analysis based on the Flood Risks Governance Arrangement concept (Hegger et al. 2014) in the first case study area, **Helsinki Metropolitan Area**. The table summarises the most important aspects of **flood risk management (FRM**) and, below, **climate change adaptation (CCA)** in the study area from the perspectives of **actors and their roles**, **rules and regulation**, **power and resources** and, importantly to SOLARIS, relevant **justice/inequality discourses**. Note that the table is not exhaustive but based on analysed documents.

	HELSINKI METROPOLITAN AREA			
	Actors and roles[5]	**Rules & Regulation**[6]	**Power & Resources**	**Justice/inequality discourses**
FRM	**Ministry of Agriculture and Forestry** • Steers the national FRM policies and regulation • Chairs the national steering group for flood and drought risk management • Directs, monitors, and coordinates the implementation of the Flood Risk Act and other FRM, as well as the operations of the Flood Centre.	Flood Risk Act (620/2010) Water Act (587/2011)	Coordination and decision-making power in FRM measures at the national level. Financing of structural defence measures such as dams and reservoirs.	FRM regulation aims at risk reduction: decreasing probability of flooding and decrease harmful impacts of floods including harmful impacts on people's health, security and property, and critical infrastructure. Regulation does not address inequalities or social vulnerabilities. The system serves public interest and promotes FRM which treats all citizens equally.
	Centre for Economic Development, Transport and the Environment (ELY Centre) of Uusimaa Region (UUDELY)	Flood Risk Act (620/2010) Act on the organisation of water management and	Planning and implementation power in fluvial and coastal FRM measures, especially structural defence measures. Coordinating preparation	FRMP of the Helsinki and Espoo Coastal Area promotes public interest and implements

[5] Actors also include the newly established Wellbeing Services Counties responsible for organizing social and health services in Finland, however, their roles and discourses in the FRM and CCA are yet unclear.

[6] Note : includes the most relevant rules and regulations, so not a fully comprehensive list.

• Responsible for fluvial and coastal FRM • Monitoring the water situation in the area of the ELY Centre and informing about the flood threat • Expert assistance to rescue authorities in flood control work (demolition of ice dams, temporary embankments and dams, emergency run-off) • Responsible authority for water resources management (WRM) and aligning FRM objectives with WRM objectives	marine management (272/2011) Government Decree on Water Resources Management (1040/2006)	of FRMPs and including consultation of stakeholders and citizens. Knowledge production (flood risk and flood hazard maps, modelling) in cooperation with the Finnish Environment Institute Syke.	egalitarian FRM at the local level. FRMPs do not elaborate on measures to reduce people's vulnerability but instead address vulnerability as part of risk management and physical exposure reduction. FRMPs mention the varying abilities of people to protect themselves in an emergency. Technical and egalitarian discourse does not acknowledge and support usage of lay knowledge of individual citizens and their social vulnerabilities.
Helsinki and Espoo Coastal Flood Group[7] • Appointed by MoAF, and consists of representatives of regional authorities (UUDELY, rescue services, municipalities of Helsinki and Espoo, regional council, as well as experts) • Considers the studies prepared for the FRMP • Sets FRM objectives and approves the proposal for a FRMP for the Helsinki and Espoo coastal area.	Flood Risk Act (620/2010)	Planning, decision-making, and implementation power in fluvial and coastal FRM	Same as above

[7] Helsinki and Espoo Coastal Flood Group : https://www.vesi.fi/tulvaryhma-helsingin-ja-espoon-rannikkoalue

• Responsible for monitoring the implementation of the measures and objectives set out in the FRMP			
Municipalities (Helsinki Metropolitan Area) • Responsible for pluvial FRM • Protection of municipal buildings and roads • Carrying out evacuation and arranging emergency accommodation • Provide manpower and equipment to rescue authorities as needed • Participation in the fluvial and coastal FRM under the guidance of the ELY Centre • Acting as a member in the Helsinki-Espoo Coastal Flood Group (Helsinki and Espoo) Spatial / land use planners and planning authorities • Land use planning, considering floodplains and minimum construction heights in zoning • Planning nature-based solutions • Prepare local master plans and local detailed plans which guide land use and building.	Regulative framework for pluvial/stormwater flood management is not centrally governed but rather a mix of several rules and regulations: • Flood Risk Act (620/2010) • Water services act (119/2001) (Enforced by HSY, see below.) • Land Use and Building Act (1999/132) • Environmental Protection Act (1096/1996) • Chemical safety act (390/2005) • National Land Use Guidelines (2018) • National guide for determining the lowest recommended building elevations (2014) • Local preparedness plans (often classified)	Planning and implementation power in pluvial FRM and land use planning. Financial and human resources allocated for planning activities are so far stable, but the demand for resources is increasing e.g., due to increasing flood risks. Currently, the Flood Risk Act does not oblige the municipalities in the HMA to prepare an FRM plan for pluvial floods because according to the statutory flood risk assessment, pluvial floods are not significant in the area in the context of Floods Directive. Land Use and Building Act regulates organising pluvial flood management. The act promotes applying mitigation strategy but authorises municipalities and property owners to prepare operational plans and make decisions. Spatial planners have power on land use planning decisions	Technical and egalitarian discourse does not adequately acknowledge and support usage of lay knowledge of individual citizens and their social vulnerabilities. Citizen participation is active in land use planning, but low in FRM planning.

• Give building permit decisions and exceptional planning permissions also for building on shores.	• Other municipal strategies and planning documents		
Helsinki Region Environmental Services (HSY) • Joint municipal authority responsible for developing supra-municipal water services and sewerage in areas where there are several inhabitants or where environmental and health reasons require. • Responding to water supply disruptions • Communication and informing citizens about environmental issues, e.g., water outages and pollution	Water Services Act (119/2001)	Power of maintaining the water supply system and infrastructure in the Helsinki region municipalities. Producing regional data and knowledge Funding and collaborating with environment-related research	Promotes public interest and egalitarian FRM through research collaboration HSY has supported research on social vulnerability to flooding (Kazmierczak 2015) and is aware of the social dimensions of flooding.
Flood Centre • Responsible for monitoring and communicating the national hydrological and flood situation • Flood forecasts and warnings • Maintaining a national flood situation control • Defining the flood damage threshold (for insurance companies)	Flood Risk Act (620/2010) has assigned duties for public research institutes (Finnish Environment and Meteorological Institutes) which together form the Flood Centre	Knowledge	Promotes public interest and technocratic and egalitarian FRM discourse by providing real time information of flood situation
Rescue Services • General management of the flood situation • Rescue operations, protection of individual important objects • Actions on private property (road cuts, etc.)	Rescue Services Act (379/2011) Flood Risk Act defines responsibilities for the rescue services, including	Rescue Service personnel and infrastructure, knowledge	Promotes public interest and egalitarian FRM

	acting as part of a regional flood group		
Insurance companies • Compensate for flooding of buildings and contents caused by both rising water levels and sea levels and heavy rainfall • Flood damage is only covered under home insurance when the flooding has been exceptional. Exceptionality is defined in the policy conditions. • The insurance company orders a flood recurrence statement from the Flood Centre	Act on Compensation for Damage caused by Exceptional Floods (1983/284) and the Act repealing it (1001/20211). The State no longer compensates for damage to buildings and movable property caused by floods from 1 January 2014 and for damage to crops from 1 January 2016.	Financial power Knowledge	Discourses on justice/inequalities unclear
NGOs • Emergency support for authorities in flood situation and recovery (e.g., Red Cross, contract- and voluntary fire brigades) • Advocacy for special groups and minorities (e.g., homeless, people with disabilities, etc.) • Roles in FRM unclear	Rescue Services Act (379/2011) Decree of the President of the Republic on the Red Cross (827/2017)	Lay knowledge which often includes experiential knowledge Often volunteer-driven, with many volunteers but limited financial resources or decision-making power In flood context non-explicit role in FRM/flood situation, although the 3rd sector has an important role in providing emergency support for authorities.	Protect the rights of minorities and the most vulnerable people, sensitivity to social vulnerabilities as a structural phenomenon

	Citizens, property owners • Responsible for protecting themselves and their property, preparedness • Possibility to participate in FRM during public hearing process • Possibility to participate in land use planning	Flood Risk Act (620/2010) (participation and responsibilities) Land Use and Building Act (1999/132) (citizen participation in land use planning)	Lay knowledge	Elitist and conformist (towards the system) discourses Generally limited involvement in formal FRM planning, more active in land use planning
CCA	**Ministry of Agriculture and Forestry** • Responsible for preparing the NCCAP and coordinating cooperation between different administrative sectors • Coordinates the monitoring group on the implementation of the national adaptation plan.	Climate Act (609/2015)	Instead of legal power, NCCAP generates **supportive environment** for CCA and promotes local CCA planning in municipalities with their own decision-making autonomy NCCAP's have guided governmental priorities in decisions concerning **financial** allocation. Several adaptation focused **research** programmes have been established since the first NCCAP in 2005 (see Fig.4)	NCCAP's promote resilience of the human systems, but they have paid relatively little attention to the social dimension of adaptation before the latest review of the NCCAP. In the end of 2022, the new NCCAP is still under preparation.
	Municipalities • Strategic development of a municipality and its area based on municipal autonomy for self-governance	Local Government Act (410/2015) regulates municipal autonomy and local democracy.	Substantial power in **planning, implementation, and decision-making** in local adaptation activities. In the HMA, all municipalities have addressed adaptation in municipal programmes and policies.	In Helsinki, the adaptation plan addresses varying vulnerabilities of people and need to take that into account in defining adaptation measures.
	Helsinki Region Environmental Services (HSY) • Providing water supply and waste services for the HMA municipalities	No legal mandate but instead, it is based on voluntary agreement between the municipalities	**Coordinative power** in strengthening municipal cooperation in adaptation activities in the metropolitan area.	HSY has acknowledged and promoted the social dimension of adaptation by funding related research and

	• Providing information on the HMA and the environment	of HMA and subsequent rules.	Production of **knowledge** for climate adaptation purposes at the HMA level.	collaborating in several research projects on the topic. Based on the interviews, two different discourses are visible: adaptation experts are concerned about inequalities related to flood risks whereas water supply expert ignores social aspects of vulnerabilities and peoples' different abilities.

Annex 2

Table: Results of the public policy analysis based on the Flood Risks Governance Arrangement concept (Hegger et al. 2014) in the second case study area, **Kokemäenjoki river Catchment Area, Huittinen and Kokemäki**. The table summarises the most important aspects of **flood risk management (FRM**) and, below, **climate change adaptation (CCA)** in the study area from the perspectives of **actors and their roles**, **rules and regulation**, **power and resources** and, importantly to SOLARIS, relevant **justice/inequality discourses**. Note that the table is not exhaustive but based on analysed documents.

	KOKEMÄENJOKI RIVER CATCHMENT AREA, HUITTINEN AND KOKEMÄKI			
	Actors and roles	**Rules and regulations**[8]	**Power and resources**	**Justice/inequality discourses**
F R M	**Ministry of Agriculture and Forestry** • Steers the national FRM policies and regulation • Chairs the national steering group for flood and drought risk management • Directs, monitors, and coordinates the implementation of the Flood Risk Act and other FRM, as well as the operations of the Flood Centre.	Flood Risk Act (620/2010) Water Act (587/2011) Dam Safety Act (494/2009) regulates construction, maintenance, and operation of a dam	Coordination and decision-making power in FRM measures at the national level. Financing of structural defence measures such as dams and reservoirs.	FRM regulation aims at risk reduction: decreasing probability of flooding and decrease harmful impacts of floods including harmful impacts on people's health, security and property, and critical infrastructure. Regulation does not address inequalities or social vulnerabilities. The system serves public interest and promotes FRM which treats all citizens equally.
	Ministry of the Environment • Responsible for guiding the organisation of water management with the Ministry of Agriculture and Forestry • Responsible for national environmental protection, including Natura2000	Act on the organisation of water management and marine management (272/2011) Nature Conservation Act (1096/1996)	Significant power over a single FRM measure cross-cutting several political domains (FRM, water management, nature conservation): the planned Säpilänniemi channel would require a special permit because of the Natura2000 –conservation area. In addition to favouring statement from	Water Management regulation aims at ensuring good water status and maintaining ecological diversity in a sustainable way, safeguarding both natures and human well-being. The regulation itself does not consider inequalities or social vulnerabilities.

[8] Note : includes the most relevant rules and regulations, so not a fully comprehensive list.

		Environmental Protection Act (527/2014)	the Ministry, the Säpilänniemi channel requires approval of Finnish government.	
	Regional State Administrative Agency (AVI) • Responsible for giving **water permit decisions** (regulated by the Water Law) • Responsible for instructing ELY Centres (or another actor) for necessary temporary actions in case of extreme flood threatening people's health, security or causing potentially great damage to private or public goods	Water Act (578/2011) Environmental Protection Act (527/2014) Government Decree on Environmental Protection (713/2014) Government Decree on Matters of Water Management (1560/2011) Government Decree on Water Resources Management (1040/2006)	Power in admitting special permits (e.g, concerning water level regulation, building permits) to ELY Centres and hydropower companies.	Technical discourse and emphasis on rules and regulation. Not really included to the FRM planning process, as the role and power lays in authorizing. Discourses on justice and inequality unclear
	Centre for Economic Development, Transport and the Environment (ELY Centre) of Pirkanmaa Region (PIRELY) Responsible for implementing FRM measures such as lake regulation in the **upstream** of Kokemäenjoki river Prepares a preliminary flood risk assessment for its administrative region Supervises and prepares report on water regulation measures in cooperation with regulation permit holders, municipalities, and other officials	Flood Risk Act (620/2010) Act on the organisation of water management and marine management (272/2011) Government Decree on Water Resources Management (1040/2006)	PIRELY has significant power in the FRM of Kokemäenjoki due to its **mandate to operate in the upstream** of Kokemäenjoki river. PIRELY is responsible for regulation advisory board (PIRELY, VARELY, power companies), giving PIRELY power in making decisions and managing threating flood risk situations.	FRM plans do not elaborate on measures to reduce people's vulnerability but instead address vulnerability as part of risk management and physical exposure reduction, similarly as in HMA-case (Annex 1). FRMPs bring social vulnerabilities to flooding and flood risk measures, but do not elaborate which these refer to. Technical and egalitarian discourse does not acknowledge and support

	Responsible body for calling Kokemäenjoki River Basin's Flood Group in a threating flood risk situation. Steers the Flood Group of Kokemäenjoki River Basin and participates in preparing the FRM plan for Kokemäenjoki River			usage of lay knowledge of individual citizens and their social vulnerabilities.
	Centre for Economic Development, Transport and the Environment (ELY Centre) of Varsinais-Suomi Region (VARELY) • VARELY is responsible for implementing FRM measures such as river regulation and other flood defence measures in the **downstream** of Kokemäenjoki river • Prepares a preliminary flood risk assessment for its administrative region (in this case Huittinen, Kokemäki and Pori) • Coordinates preparation of the FRM Plan for Kokemäenjoki River in cooperation with the Flood Group which directs the plan • Main responsibility for the implementation and monitoring of the FRM Plan for Kokemäenjoki River • Participates in the Flood Group of Kokemäenjoki River Basin	Flood Risk Act (620/2010) Act on the organisation of water management and marine management (272/2011) Government Decree on Water Resources Management (1040/2006)	VARELY has significant power in planning FRM measures such as Säpilänniemi channel in the case study area. However, the mandate of VARELY to operate in the downstream of Kokemäenjoki River is limited due to the **lack of power in the upstream** which makes the case study area dependent on other powerful actors, such as PIRELY and AVI. VARELY has significant power as they are the responsible party for producing the FRMPs and coordinating the process.	Same as PIRELY

and in the regulation advisory board			
Kokemäenjoki River Basin Flood Group[9] • Appointed by MoAF, and consists of representatives of regional authorities (3 ELY-Centres (Pirkanmaa, Varsinais-Suomi and Häme), rescue services, many municipalities along the river, regional councils, as well as water regulation and energy companies) • Considers the studies prepared for the FRMP • Sets FRM objectives and approves the proposal for a FRMP for the Helsinki and Espoo coastal area. • Responsible for monitoring the implementation of the measures and objectives set out in the FRMP	Flood Risk Act (620/2010)	Planning, decision-making, and implementation power in fluvial and coastal FRM	Same as above

[9] Kokemäenjoki River Basin Flood Group : https://www.vesi.fi/tulvaryhma-kokemaenjoen-vesistoalue

Private companies Water permit holders, mainly power companies in both Pirkanmaa and Varsinais-Suomi regions • Responsible for running the water if needed • Participates in the Flood Group and in the regulation advisory board of FRM planning • Included in FRM in flood risk situations in coordination with PIRKELY and VARELY	Flood Risk Act (620/2010) Water Act (587/2011) Dam Safety Act (494/2009) Environmental Protection Act (527/2014) Nature Conservation Act (1096/1996) Environmental Impact Assessment law 252/2017	Holds power in operating dams in Kokemäenjoki river, however obliged by legislation to react in line with the flood situation.	Promotes egalitarian FRM, which can be obtained by technocratic solutions. Economic discourse of harms and social vulnerability. Interest for the whole water body in both Pirkanmaa and Varsinais-Suomi, rather than just one specific area. Discourse on social vulnerabilities and justice unclear
Municipalities (Kokemäki and Huittinen) • Responsible for pluvial FRM • Protection of municipal buildings and roads • Carrying out evacuation and arranging emergency accommodation • Provide manpower and equipment to rescue authorities as needed • Participation in the fluvial and coastal FRM under the guidance of the ELY Centre • Acting as members in the Kokemäenjoki River Flood Group	Regulative framework for pluvial/stormwater flood management is not centrally governed but rather a mix of several rules and regulations: • Flood Risk Act (620/2010) • Water services act (119/2001) • Land Use and Building Act (1999/132) • Environmental Protection Act (1096/1996) • Chemical safety act (390/2005) • National Land Use Guidelines (2018) • National guide for determining the lowest	Planning and implementation power in FRM and land use planning Power to affect decisions over fluvial FRM measures through the Flood Group and public hearings Currently, the Flood Risk Act does not oblige the municipalities to prepare an FRM plan for pluvial floods because according to the statutory flood risk assessment, pluvial floods are not significant in the area in the context of Floods Directive. Land Use and Building Act regulates organising pluvial flood management. The act promotes applying mitigation strategy but authorises municipalities	Technical and egalitarian discourse does not adequately acknowledge and support usage of lay knowledge of individual citizens and their social vulnerabilities. Municipalities are active in providing feedback on the FRMP (citizens less so). Citizen participation is active in land use planning.

• Responsible for providing municipal water services within the built areas Spatial / land use planners and planning authorities • Land use planning, considering floodplains and minimum construction heights in zoning • Planning nature-based solutions • Prepare local master plans and local detailed plans which guide land use and building. • Give building permit decisions and exceptional planning permissions also for building on shores.	recommended building elevations (2014) • Local preparedness plans (often classified) • Other municipal strategies and planning documents	and property owners to prepare operational plans and make decisions. Spatial planners have power on land use planning decisions	
NGOs • Emergency support for authorities in flood situation and recovery (e.g., contract- and voluntary fire brigades) • Advocacy for special groups, such as farmers and environment protection) • Roles in FRM unclear	Rescue Services Act (379/2011) Decree of the President of the Republic on the Red Cross (827/2017)	Lay knowledge which often includes experiential knowledge Often volunteer-driven, with many volunteers but limited financial resources or decision-making power Some NGOs are heard/consulted during the FRM planning process, power unclear.	Varying discourses depending on the organization Protect the rights of minorities and the most vulnerable people, sensitivity to social vulnerabilities as a structural phenomenon

Flood Centre • Responsible for monitoring and communicating the national hydrological and flood situation • Flood forecasts and warnings • Maintaining a national flood situation control • Defining the flood damage threshold	Flood Risk Act (620/2010) has assigned duties for public research institutes (Finnish Environment and Meteorological Institutes) which together form the Flood Centre	Knowledge	Promotes public interest and technocratic and egalitarian FRM discourse by providing real time information of flood situation
Rescue Services • General management of the flood situation • Rescue operations, protection of individual important objects • Actions on private property (road cuts, etc.)	Rescue Services Act (379/2011) Flood Risk Act defines responsibilities for the rescue services, including acting as part of a regional flood group	Rescue Service personnel and infrastructure, knowledge	Promotes public interest and egalitarian FRM
Insurance companies • Compensate for flooding of buildings and contents caused by both rising water levels and sea levels and heavy rainfall • Flood damage is only covered under home insurance when the flooding has been exceptional. Exceptionality is defined in the policy conditions. • The insurance company orders a flood recurrence statement from the Flood Centre	Act on Compensation for Damage caused by Exceptional Floods (1983/284) and the Act repealing it (1001/20211). The State no longer compensates for damage to buildings and movable property caused by floods from 1 January 2014 and for damage to crops from 1 January 2016.	Financial power Knowledge	Discourses on justice/inequalities unclear
Citizens, property owners • Responsible for protecting themselves and their property, preparedness • Possibility to participate in FRM during public hearing process	Flood Risk Act (620/2010) (participation and responsibilities) Land Use and Building Act (1999/132) (citizen	Lay knowledge which often includes experiential knowledge	Elitist and conformist (towards the system) discourses Identifies some vulnerable groups, but lacks sensitivity to people's different abilities

	• Possibility to participate in land use planning • Property owners in sparsely populated areas outside municipal sewer network are required to manage their own sewage	participation in land use planning) Environment protection law (527/2014) Government Decree on the treatment of domestic wastewater outside the sewage networks (157/2017)		Generally limited involvement in formal FRM planning, more active in land use planning
C C A	**Ministry of Agriculture and Forestry** • Responsible for preparing the NCCAP and coordinating cooperation between different administrative sectors • Coordinates the monitoring group on the implementation of the national adaptation plan.	Climate Act (609/2015)	Instead of legal power, NCCAP generates supportive environment for CCA and promotes local CCA planning in municipalities with their own decision-making autonomy NCCAP's have guided governmental priorities in decisions concerning **financial** allocation. Several adaptation focused **research** programmes have been established since the first NCCAP in 2005 (see Fig.4)	NCCAP's promote resilience of the human systems, but they have paid relatively little attention to the social dimension of adaptation before the latest review of the NCCAP. In the end of 2022, the new NCCAP is still under preparation.
	Municipalities • Strategic development of a municipality and its area based on municipal autonomy for self-governance	Local Government Act (410/2015) regulates municipal autonomy and local democracy.	Substantial power in **planning, implementation, and decision-making** in local adaptation activities. In Huittinen and Kokemäki, adaptation is addressed in municipal programmes and policies.	Municipal programmes and policies do not address questions related to social justice and inequalities.
	Satakunta Regional Council • Aims to develop the Satakunta area in cooperation with all of the region's municipalities,	No legal mandate (?)	All municipalities of the region are part of Satakunta regional council. However, the extent of the council's	Regional climate and energy strategy build as a part of CANEMURE-scheme to 2030 and further, including assessment of

	citizens, and private companies of the area		power to engage actors into its commitments is unclear. Power in guiding the municipalities of the region in their emphasize on adaptation plans.	social aspect, such as cultural heritage and living conditions and comfort of the region. Built environment and city planning are also included to the part of social assessment. In addition, a European commission supported document for fair regional transition discussing climate neutrality and employment. Discourse of resources and fair adaption, with emphasis on employment and sustainable economy. Language rarely refers to social inequalities and employment and economic wellbeing are emphasized as a prerequisite of social wellbeing of the region.

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