Adaptation to climate change in Finland

Current state and future prospects

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Abstract

The KOKOSOPU project has aimed at a comprehensive evaluation of the national adaptation policy with particular emphasis on the National Adaptation Plan and international policy development. In addition, future challenges related to societal development have been taken into account. Projections of climate change, Finland's Climate Act and the strengthened adaptation policy in the EU emphasise the importance of the national adaptation policy. A key objective of the National Adaptation Plan 2014–2022 was to strengthen the adaptive capacity of Finnish society. This objective is still relevant.

The conditions for reaching the objective have, however, partly changed. First, cross border consequences of climate change are increasingly emphasised. Second, issues of justice and fairness with respect to the consequences of climate change and adaptation actions are being identified as central. Third, greater weight is given to the overall sustainability of adaptation and climate action.

The changing conditions for climate change adaptation should be reflected in the allocation of resources, in improved coordination within the administration and in co-operation between the public and private sector. In addition, knowledge and education should be enhanced, and resources provided for RDI, and for monitoring and evaluation that supports continued improvement of adaptation activities.

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Keywords research, research activities, climate change, adaptation, risks, adaptation plan, adaptability, adaptation policy, multi-level management, monitoring, evaluation

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Tiivistelmä

KOKOSOPU-hankkeen tavoitteena oli tuottaa kokonaisarvio kansallisen sopeutumispolitiikan edistymisestä erityisesti kansallisen sopeutumissuunnitelman valossa ja kansainväliseen kehitykseen verraten. Lisäksi tarkasteltiin niitä haasteita, jotka tuleva ilmastollinen ja yhteiskunnallinen kehitys asettavat sopeutumistoiminnalle. Ennakoitu ilmastonmuutoksen eteneminen, Suomen ilmastolaki ja EU:n sopeutumispolitiikan vahvistuminen korostavat kansallisen sopeutumissuunnitelman merkitystä. Vuosien 2014–2022 sopeutumissuunnitelman keskeisenä tavoitteena oli suomalaisen yhteiskunnan sopeutumiskyvyn vahvistaminen. Tämä tavoite on edelleen ajankohtainen.

Tavoitteen saavuttamisen lähtökohdat ovat kuitenkin osittain muuttuneet. Ensinnäkin globaalit ja rajoja ylittävät vaikutukset korostuvat. Toiseksi ilmastonmuutoksen vaikutusten ja niihin sopeutumiseen tarvittavien yhteiskunnallisten muutosten oikeudenmukaisuus on nousemassa keskiöön. Kolmanneksi sopeutumistoiminnan ja ilmastotyön kokonaiskestävyyteen kiinnitetään aikaisempaa enemmän huomiota.

Sopeutumistoiminnan muuttuneen toimintaympäristön tulee näkyä resurssien kohdentamisena ja parempana koordinointina hallinnossa sekä hallinnon ja yksityisen sektorin välillä. Tarvitaan myös lisäpanostusta osaamiseen ja koulutukseen, tutkimus-, kehittämis- ja innovaatiotoimintaan sekä jatkuvaan edistymistä tukevaan seurantaan ja arviointiin.

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Anpassningen till klimatförändringen i Finland
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KOKOSOPU-projektets mål har varit göra en helhetsutvärdering av den nationella klimatanpassningspolitiken genom att särskilt beakta den nationella planen för anpassning samt den internationella utvecklingen. Dessutom har de utmaningar som kommande klimat- och samhällsutveckling ställer på anpassningen beaktats. Den förväntade klimatutvecklingen, Finlands klimatlag och EU:s stärkta anpassningspolitik betonar den nationella anpassningspolitikens betydelse. Anpassningsplanen för 2014–2022 hade som centralt mål att stärka det finländska samhällets anpassningsförmåga. Målet är fortfarande aktuellt.

Målsättningens utgångspunkter har emellertid delvis ändrats. För det första betonas globala och gränsöverskridande klimatkonsekvensers betydelse. För det andra lyfts frågor om rättvisa då det gäller klimatförändringens effekter och de samhälleliga förändringar anpassningen kräver fram som centrala. För det tredje fästs allt större vikt vid anpassningens och klimatarbetets hållbarhet som helhet.

Anpassningsverksamhetens förändrade villkor bör synas i resursallokeringen, i en bättre koordinering inom förvaltningen och i ett utvecklat samarbete mellan den offentliga och privata sektorn. Dessutom bör det satsas på kunnande och utbildning, forskning, utveckling och innovationer samt på uppföljning och utvärdering som stöder en kontinuerlig förbättring av anpassningsverksamheten.

Nyckelord

forskning, forskningsverksamhet, klimatförändring, anpassning, risker, anpassningplan, anpassningpolitik, anpassningsförmåga, flernivåstyrning, monitoring, utvärdering

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1 Introduction

Climate change already affects people and the environment in many ways, both in Finland and globally, and the impacts will intensify as climate change progresses. Consequently, there is an urgent need to adapt to climate change while proceeding more ambitiously with mitigation (IPCC 2022a,b).

The goal of the KOKOSOPU project has been to make an overall evaluation of adaptation to climate change in Finland and to examine how Finland should prepare and adapt to climate change in the future. The evaluation focused especially on the development after the interim evaluation (Mäkinen et al., 2019) of the National Climate Change Adaptation Plan 2022 (MAF 2014). The evaluation material consisted of 1) legislation, 2) strategies or programs and 3) other policies or decisions regarding adaptation activities, which can be considered to indicate the preparedness for the impacts of climate change and the risk management capacity of the examined sectors. In addition, attention was paid to adaptation activities on different levels of administration, resources of adaptation activities, and monitoring and evaluation of adaptation.

Adaptation to climate change requires actions at different levels of governance (national, regional and local) in both the public and private sector. The National Adaptation Plan (NAP) prepared in accordance with the Climate Act (609/2015) formally only concerns state authorities in Finland, although it seeks to influence other actors as well. The evaluation examined cross-cutting actions, which promote adaptation and sectors as identified in the NAP: safeguarding biodiversity, natural resource management, transport and data/information transmission (ICT), national defence and overall security, conservation of marine areas, rescue services, built environment, water conservation and management and protection of water resources, social and health care, and environmental protection.

The evaluation examined, based on official documents and experts' assessments, how the National Adaptation Plan, adopted in 2014, has influenced activities. Challenges and hopes related to the future development were also examined. With the help of documents and an analysis of the resources used, it was examined how regulation and other guidance have promoted adaptation activities and how sector-specific capacities for adaptation/preparedness have been supported. Other sources of information included a survey directed at municipalities as well as regional and national workshops. The workshops focused on future developments and ways to improve adaptive capacity.

In the mid-term evaluation of the National Adaptation Plan (Mäkinen et al., 2019) it was noted, for example, that all sectors should take climate risks into account when developing policy instruments, guidelines and practices. This evaluation examines how this has been reflected in goals, regulation and other guidance, as well as resources and monitoring that promote adaptation to climate change. One of the aims of the evaluation was also to examine how practical implementation of adaptation goals has been promoted in different administrative sectors. Cross-sectoral risks and transboundary impacts and their management have also been identified as important perspectives. The evaluation furthermore considered the policy coherence of plans, strategies and (planned) legislation, i.e., the consistency between the policy actions of different administrative fields.

Adaptation action in Finland has been examined in several recent research projects. For example, the SUOMI project of the Finnish Climate Panel explored the state of adaptation action and strategies in the regions (Gregow et al., 2021), the KUITTI project produced a national preliminary cost estimation of the economic consequences of the impacts of climate change (Perrels et al., 2022), the Academy of Finland's program Climate change and health – CLIHE (2020–2023) will contribute to new information on health risks caused by climate change and the social consequences of health impacts, and the CLIMINI project will examine the adaptation questions concerning Finland's Arctic region and reindeer husbandry, which is important for the indigenous Saami. These and other research publications have been utilized to get an overall picture of the current state and challenges of adaptation.

The report is structured as follows. Chapter 2 presents the methods used. Chapter 3 presents an overall evaluation of the recent development of adaptation and actions guiding adaptation in Finland. Chapter 4 outlines ongoing developments affecting adaptation policy and adaptation activities and development prospects in sight. Chapter 5 identifies the development needs of adaptation actions in Finland in the light of the findings of this evaluation. Chapter 6 presents recommendations derived from the results of the evaluation, and chapter 7 presents a general conclusion about the prerequisites for strengthening Finland's adaptive capacity.

2 Material and methods

2.1 Multi-level governance and classification of adaptation policy areas

This report applies the concept of multi-level governance and the classification of adaptation policy areas to analyse adaptation policy. The concept of multi-level governance allows the current administrative structures and their development to be understood (Hooghe and Marks 2003). In addition, it can be applied to understand and interpret the development of administrative structures of the European Union (Tortola 2017).

When examining adaptation policy, the theory of multi-level governance has been applied to study the vertical division of governance at the national and regional/local level (Braunschweiger et al., 2018; Ishtiaque et al., 2021; Eissa and Khalil 2021) and the division of horizontal governance of adaptation at the national or supranational regional level in different sectors and across sector boundaries (Smucker and Nijbroek 2020; Paloviita and Järvelä 2019). The analysis explores how the goals and actions of the EU adaptation strategy are connected to the planning and implementation of Finland's adaptation policy. The impact of international adaptation policy on Finland has been evaluated to a limited extent thus far, except for few preliminary analyses (Glaas and Juhola 2013). Similarly, the impact of EU adaptation policy on Finland has been only narrowly discussed as part of more comprehensive evaluations (Morgan et al., 2019; Leiter 2021; Leitner et al., 2021).

Policy planning and contents can be examined in more detail by classifying the different areas of adaptation policy. Howlett and Cashore (2009) divide politics into two different dimensions, in each of which three different levels can be identified. First, a division can be made between policy goals and actions (policy means). Policy goals defines the broad goals towards to be striven for, and policy means defines the ways to reach them. The contents and assumptions can be examined for both policy goals and actions, as well as the concrete contents at the program and implementation level. Lesnikowski et al., (2021) have applied this framework to adaptation policy. This report examines the different areas of adaptation policy, emphasizing policy actions and their implementation (Table 1).

Table 1. Classification of adaptation policy areas and their review. Adapted from Howlett and Cashore (2009) and Lesnikowski et al., (2021).

	Policy contents and assumptions	Program level	Implementation level
Policy goals	Definition of climate risk and the purpose of adaptation (the Climate Act Section 2.4)	Strategic policy goals (vision and goals of the National Adaptation Plan)	Operationalisation of goals in application of policy instruments (Goals set at different levels of governance, see Ch. 3.1 of this report)
Policy actions (chapters 3.2–3.5)	Desired approach to adaptation policy (e.g., who has the responsibility over adaptation, how agents/parties should be steered in general?)	Chosen policy instruments (e.g., incentives, decrees/ orders or planning)	Detailed solutions for policy steering and implementation of actions (e.g., strictness of responsibility, amount/share of support, content requirements of plans)

This report utilises the concept of multi-level governance as an analytical framework. The administrative levels in Finland are the central, the regional and local administrations, with different administrative units responsible for adaptation to climate change. In addition, the EU Adaptation Strategy influences national adaptation planning, and it is used to analyse the change in adaptation governance (Tortola 2017). Moreover, the classification of adaptation policy areas is utilised to examine the content, strategic goals and implementation of adaptation policy of both Finland and the EU. By examining policy goals, the new areas or challenges that arise from the EU adaptation strategy for the direction of Finland's national adaptation policy can be determined. By studying policy actions, it is possible to deduce what the goals and actions related to the international dimension of the new EU strategy will require from the implementation at the national level.

2.2 Document analysis and analysis framework

The development of adaptation has been examined in policy documents from six different perspectives

1. Institutional development after the interim evaluation: have new structures, processes and practices emerged?
2. Integration of adaptation between sectors and policy coherence: has adaptation thinking become mainstream? Do different policies consistently support adaptation?
3. The substance areas of climate change addressed and the level of treatment: are adaptation goals general, or is adaptation concretely promoted, is fairness strengthened in risk management?
4. Short-term (reactive management of disruptive situations) vs. long-term adaptation: Is the focus on the ability to react to sudden, disruptive situations or is there preparedness to adapt to long-term climatic development?
5. Definitions and levels of agency: Are there clear responsibilities and procedures to ensure adaptive capacity?
6. Monitoring and evaluation: Are data collected on adaptability and is development evaluated?

Institutions, hereby understood as organizations, regulations and established practices, are essential in promoting adaptation actions (Averchenkova et al., 2021). The objective of the KOKOSOPU project has been to identify how they have evolved after 2017 in order to promote adaptation activities.

The amount of regulation created specifically to foster adaptation to climate change remains scarce thus far. Consequently, it is essential to examine how other policy areas discuss and treat activities relevant to adaptation. The integration or mainstreaming of adaptation into different sectors means internalisation of adaptation concepts and principles in policy areas that have not originally been established to promote adaptation (cf. Underdal 1980). In contrast, policy coherence means consistency between different policy areas and ensures that the public sector does not give actors conflicting messages about the desired action (Carbone 2008).

Policy implementation involves different levels ranging from the set goals to policy measures and their concrete consequences (Vedung 1997). One way of measuring the progress of adaptation activities is to find out how concrete they have become. For example, compensations for the consequences of extreme weather events require detailed regulation, while setting general adaptation goals can be (a) sufficient (change) to increase the awareness of actors.

To evaluate the development of adaptation activities, it is essential to take into account the time span of the activities. In rescue services and general risk management, the focus is primarily on the near future and sudden events (UN 2015), while adaptation to climate change also concerns gradually developing and long-term phenomena (IPCC 2022a). The differences in focus can be seen in the development of institutions. For example, in order to prepare for gradually evolving adaptation challenges, a systematic analysis of scenarios concerning long-term development is needed, while the preparedness for disruptive situations can be based, for example, on situation room exercises that emphasise short-term operational activities.

Active actors are needed to implement adaptation activities. Adaptation can mean a spontaneous reaction or anticipation, but the National Adaptation Plan aims at systematic preparedness, in which authorities have a significant role. Consequently, the roles and responsibilities of the different parties should be clearly defined (Biesbroek et al., 2010, Juhola 2019). The division of responsibilities is essential when activities and interaction at different levels of government are needed (Di Gregorio et al., 2019).

Monitoring and evaluation are essential for the development of adaptation activities (Dinshaw et al., 2014). In Finland, monitoring of adaptation activities has been based on the evaluation of the Adaptation Strategy (MAF 2009, 2013) and the NAP (Mäkinen et al., 2019). The Climate Act (2015) requires that the implementation of the NAP is monitored. The EU Monitoring Regulation (Monitoring Mechanism Regulation (EU) 525/2013) required a general evaluation of adaptation action, which has been specified by the administrative regulation that replaced it ((EU) 2018/1999 on the Governance of the Energy Union and Climate Action). The EU Climate Law (Regulation (EU) 2021/1119) emphasizes the obligations of member countries to monitor and report on the progress of adaptation measures. Correspondingly, reporting may be required from different sectors and regulatory entities. In addition, research can be employed to independently evaluate progress in the field of adaptation.

2.3 Workshops

Challenges in adaptation action and factors promoting adaptation action were examined in national and regional workshops organised in the spring of 2022. The aim of the workshops was to collect the views of actors working at different administrative levels on the current state of adaptation work, goals, challenges and measures that could help in promoting adaptation action. Workshops were organised at the regional and national level.

2.3.1 National workshops

The aim of the national workshops was 1) to clarify what the concretisation and deepening of adaptation activities would mean at the national level in a five-to-ten-year time frame, and 2) to present goals and identify actions and paths for progressing towards these goals. Two consecutive events were organized in April and May and the participants were encouraged to attend both events.

The invitees included individuals from ministries, researchers in the field, and representatives of non-governmental organisations, trade and various sector unions interested in adaptation action. The workshops were organized in Helsinki. 17 representatives of the target group participated in the first workshop and 19 in the second workshop. The represented organisations are presented in Appendix 1.

The participants of the workshops were divided into thematic groups, and topics were discussed in small groups. There were four themes in the first workshop and three in the second (the last two theme groups were combined):

1. Monitoring and evaluation
2. Connections of the national adaptation action to the local and regional level
3. Resources and opportunities in the public sector
4. Resources and opportunities in the private sector

The first workshop focused on identifying the goals of adaptation action and the second sought to define measures for their realisation. Based on the group work of the second workshop, the most important things were summarised amongst all participants. Between the workshops, the participants were able to reflect on the key results of the first workshop as synthesised by the research group.

2.3.2 Regional workshops

Three regional workshops were organized remotely in March 2022. Two of the workshops were in Finnish and one in Swedish. Participants were invited to the workshops by e-mail from each Regional Council (the statutory joint municipal authority) and the Regional Government of Åland, all Centres for Economic Development, Transport and the Environment (ELY centres) and Regional State Administrative Agencies, as well as the Social Security and Rescue Services of the newly established Wellbeing Services Counties. A total of 37 people participated in the events (Table 2). In this context, the Regional Government of Åland is also included in the regional councils.

Table 2. Number of participants in the regional workshops from the respective organisations

Organisation type	Participants
Regional Council	19
Centre for Economic Development, Transport and the Environment	13
Regional State Administrative Agency	1
Wellbeing Services County	0
Ministry	4
Total	**37**

Participants were provided with a comprehensive information package in advance, which summarised the basic concepts and information about the governance of adaptation activities especially at the regional level, the role of the regional level in the current National Adaptation Plan, and the goals of the workshops in the KOKOSOPU project. In addition, an introductory presentation on adaptation was given at the beginning of the events.

Before the workshops, the participants had been asked to answer a short survey regarding the challenges of adaptation work on the regional level and the factors that would promote adaptation activities from the point of view of the respondents' organisation (Appendix 2). 15 organisations responded to the survey, roughly half of them representing regional councils and the other ELY centres. The survey can be considered indicative, even though the number of respondents was small. Altogether, the respondent number was half of the workshop participants representing regional organisations.

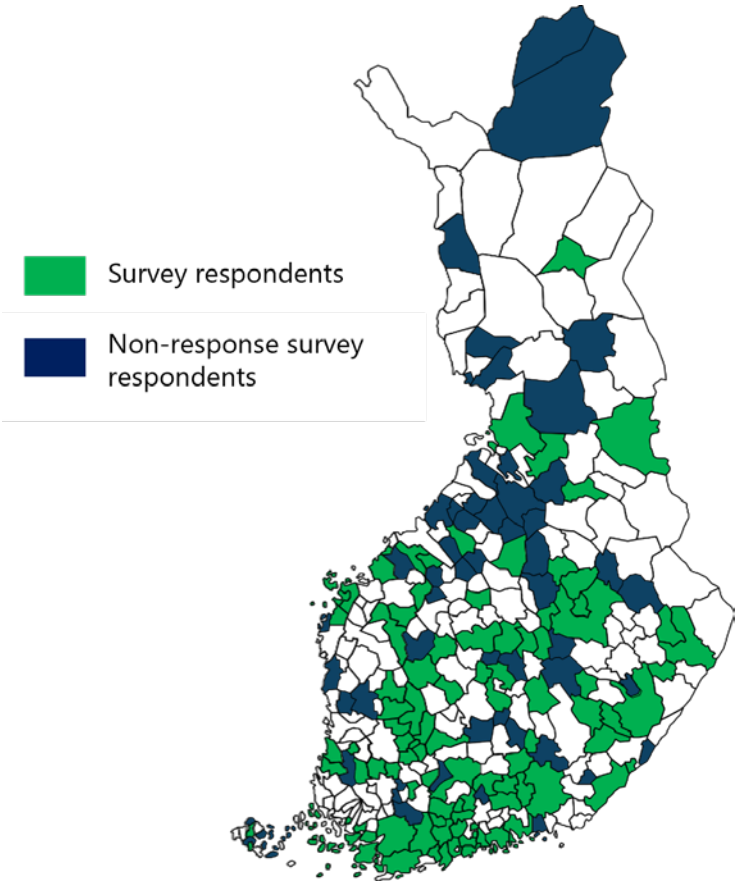
The actual workshop work was carried out in small groups utilising the virtual Miro Platform. Each group had a facilitator from the project team and a note-taker. The small groups had been formed in advance to include participants from several different types of organisations. Due to the small number of participants, the Swedish-language event was held as a group discussion without using the Miro Platform, however covering the same themes.

The work was divided into two main parts: 1) evaluation of the current state of adaptation activities and 2) future action. Future action was further divided into two themes. The first focused on the goals of adaptation activities and the paths to achieve them, as well as the necessary information and other support. The second was aimed at solving resource challenges, i.e., securing resources. The questions are presented in Appendix 2.

2.4 Survey on adaptation in municipalities

A municipal survey on climate change adaptation and mitigation was conducted in cooperation with the Association of Finnish Municipalities in winter 2021. The survey was sent electronically to each of the 309 municipalities. Answers were received from 96 municipalities, i.e., 30 percent of all municipalities in Finland. Initially many of the respondents were from the populous municipalities of southern Finland, and in order to balance the distribution, a supplementary survey was sent to non-respondents after the actual survey. The second survey was carried out in accordance with the 2005 NUTS-3 regional division to ensure that at least 50 percent of the municipalities from every region answered either the original or the supplementary survey. The supplementary survey was conducted over telephone in January 2022 and 60 municipalities responded. All in all, a total of 156 municipalities were reached (Figure 1).

Figure 1. Municipalities that answered the surveys



The purpose of the survey was to clarify the state of climate action in municipalities considering both mitigation and adaptation. The survey consisted of 43 questions divided into five different themes: basic information on climate action, organisation and resources of climate action, mitigation, adaptation, and future prospects of municipalities. In regard to adaptation, the survey had eight questions, which addressed the following themes: 1) general situation of adaptation action in the municipality, 2) factors that complicate the planning and implementation of adaptation, 3) the situation of planning and implementation of sector-specific adaptation measures, 4) the success of sector-specific adaptation measures, 5) origin of adaptation action ideas, 6) further investments in adaptation work, 7) factors supporting adaptation action, and 8) open question about adaptation in municipalities.

The distribution of the survey answers and the questionnaire are presented in the publication by the Association of Finnish Municipalities "State of climate action in municipalities and regions in 2021" (Puurula et al., 2022 in Finnish). The survey was a continuation of previous surveys carried out by the Association of Finnish Municipalities, which have been conducted since 2009 (Savikko 2009, Mattson 2012, Parviainen 2015). This report refers to the information presented in the report by the Association of Finnish Municipalities and presents supplementary information and analyses.

In contrast to the report of the Association of Finnish Municipalities, duplicate responses of some municipalities have been removed from the material to achieve a genuine sample with municipalities as the sample unit. The response of a higher official position has been selected for the analysis. If respondents were of the same position, the respondent was drawn. The final material consisted of responses from 96 municipalities (N= 96). In questions where identical wording was used in the actual survey and the supplementary survey, the materials could be combined directly (N=156). In other cases, the data of the supplementary survey was used to check qualitatively the generalisability of the findings.

2.5 Resources available for adaptation

2.5.1 Interviews

Interview invitations were sent to all regional councils, ELY Centres, State Regional Administrative Agencies, Ministries and the Prime Minister's Office. 32 interviews were arranged, of which one was cancelled. In addition, one ministry sent a written response. The interviews were conducted remotely and lasted approximately half an hour. In general, one representative from each organisation was interviewed, but in some interviews two representatives attended. The total number of respondents was 36 and they represented 32 organisations (Table 3).

The purpose of the interviews was to discover the amount of human and financial resources used in each organisation for adaptation activities and what the main activities were. Respondents also had the opportunity to specify the resources, for example, types of tasks. In addition, views on resource needs in the future 5–10 years were identified, as well as where the possible additional resources should come from, in the opinion of the interviewees. The interview questions can be found in Appendix 3.

Table 3. Number of organisations interviewed according to the organisation type

Organisation type	Number of organisations
Regional Council	13
Centre for Economic Development, Transport and the Environment	6
Regional State Administrative Agencies (AVI)	3
Ministries and Prime Minister's Office	10
Total	32

2.5.2 Funding granted from the European Regional Development Fund, the European Social Fund and the European Agricultural Fund for Rural Development

As part of the resource analysis the amount of funding granted by the European Regional Development Fund ERDF and the Social Fund ESF to adaptation projects was examined. Searches were conducted in Structural Fund Information Service with the search words "climate change", "adaptation" and "climate". A similar search was also carried out in the European Agricultural Fund for Rural Development EAFRD's project register.[1]

In addition, a literature review was conducted to find information on the funding of adaptation in the new EFRD programme period. The Rural Development Fund is undergoing a transition period in 2021–2022, and the new programme is not yet available.

1 Information Service for Structural Funds https://www.eura2014.fi/rrtiepa/ and information service for the Finnish Rural Development Fund https://tietopalvelu.ruokavirasto.fi/QvAJAXZfc/opendoc.htm?document=Published/raportointi.qvw&Sheet=SH_HR_FI&anonymous=true

3 Overall evaluation on the recent development of Finland's adaptation activities

The general objective of the first National Adaptation Plan (MAF 2014) was to improve the adaptive capacity of Finnish society by 2022. The objective was specified with three sub-goals: A) incorporating adaptation into planning and operations of sectors and societal actors, B) developing the necessary climate risk assessment and management methods, and C) new, innovative solutions developed with the help of research and development, communication and training, and citizens' better awareness of adaptation to climate change. This chapter examines the progress towards these objectives.

3.1 Adaptation objectives

The subchapter examines the objectives set for adaptation measures at different levels of governance.

3.1.1 National objectives

Since the mid-term evaluation several legislative reforms and plans have formulated the objectives of adaptation activities for different sectors. Most of the objectives are general in that they state the need to adapt or prepare for climate change, but do not set quantitative goals, such as limiting the amount of flood damage or the extent of forest fires or reducing the number of cases of illness caused by heatwaves.

The revised Climate Act (423/2022) creates a framework for adaptation, with the aim of highlighting adaptation alongside mitigation as a part of the climate policy planning system, and specifying substance contents in greater detail compared with the previous legislation.

Adaptation to climate change has been included as an objective in the government's proposal for the new Nature Conservation Act (HE 76/2022). In the ongoing legislation reform of the Rescue Act (379/2011), the aim is to make the law more reflective of its operating environment, where climate change has been identified as a central megatrend. The impacts of climate change on comprehensive security have also been taken into

account in the Government's decision on the Objectives of the Security of Supply 1048/2018, which supplements Act on the Measures Necessary to Secure Security of Supply (1390/1992).

The water management sector is undergoing a National Water Supply and Sewage reform (2020–2022), which focuses on securing a reliable operation of water supply services and better future risk management, for example, as regards to climate change (MAF 2021a). In addition, the Water protection programme (2019–2023) includes several cross-sectoral goals that serve climate change adaptation and preparedness. In contrast, in the Programme of Measures of Finland's Marine Strategy (2022–2027) there are no specific objectives related to climate change, even though climate change is considered a precondition for achieving other necessary developments.

Specific adaptation needs have not yet been recognised in all areas of legislation that could be affected by climate change. For example, in the ongoing reform of the Mining Act (621/2011) the goal is to improve the level of environmental protection, but thus far adaptation to climate change has not been addressed explicitly. Instead, a general reference has been made to the Environmental Protection Act, Section15, (1166/2018) that specifies an obligation to be prepared, requiring operators to draw up preparedness plans based on risk assessment (Vääriskoski-Kaukanen 2016, Vihervuori 2019).

In international action, the purpose of new Climate Foreign Policy Action Programme is to extend climate change as a cross-cutting theme to all activities of the Ministry for Foreign Affairs of Finland, in line with the Sustainable Development Goals (Agenda 2030) (MFA 2019). This means promoting climate change mitigation and adaptation as part of security and trade policy in addition to development policy.

One of the goals of the National Adaptation Plan was to increase and improve citizens' awareness of climate change and adaptation activities. To improve the availability of reliable climate information, the update of Climateguide.fi-portal was initiated. In addition, in accordance with the Climate Act, Government submits an Annual Climate Report to the Parliament, which also evaluates the implementation of the Adaptation Plan. Wider awareness and dialogue about the key issues of climate policy, including adaptation, have been maintained by the expert reports and statements prepared by the Climate Panel.

3.1.2 Regional goals

Regional adaptation needs and goals were recently examined in the "SUOMI" report by the Finnish Climate Change Panel (Gregow et al., 2021). The analysis of adaptation action and strategic plans of the regional councils shows that regions are at different stages in their adaptation activities.

In some regions, adaptation or preparedness were already addressed in climate strategies or programs or regional development plans completed in the beginning of the 2010s, although usually on a very general level. Adaptation needs were therefore unstructured and actual plans and systematic goals were missing. Only a few regions had considered how climate change affects the development of the region and how the region could adapt to the changes or benefit from the emerging opportunities. Moreover, the main focus in the regions' climate action has thus far been on mitigation.

However, the situation is rapidly improving, and several regions have formulated adaptation goals in the recent (regional) climate roadmaps, reflecting regional contexts. Adaptation themes are also reflected in the regional strategic programmes 2022–2025. According to the Regional Development Act (756/2021), climate change mitigation and promotion of adaptation are part of regional development and the duties of regional councils. Adaptation can also be promoted in regional land use planning, which under the Land Use and Building Act (132/1999) belongs to the statutory tasks of the regional councils besides regional development work.

There are regulations in the sectoral legislation that enable the setting of regional climate goals, for example the Land Use and Building Act (there will be separate laws for construction and planning in the future). However so far, few concrete goals have been set.

ELY centres are regional expert authorities of the state and regional implementers of numerous laws. Separate regional adaptation goals can be set based on some laws, and ELY centres participate in goal discussions with both regional councils and municipalities.

3.1.3 Goals of municipalities

About half of Finland's municipalities have set climate goals, and about 80 percent of Finns live in a municipality with some kind of climate goal (Puurula et al., 2022). Almost all municipalities with more than 50,000 inhabitants have climate goals, while only about a quarter of municipalities with less than 5,000 inhabitants have them (Table 4). Based on the survey, almost half of the municipalities have set goals for both mitigation and adaptation. Climate goals are currently being prepared in 19 municipalities. Most of

the goals concern both mitigation and adaptation. For large municipalities, the goals of climate action have been tightened and specified in recent years, and several large municipalities strive for carbon neutrality (Sitra 2021). Detailed information about the goals and concrete measures of municipalities' climate action is, however, still limited.

Table 4. Setting climate goals in municipalities

Size of municipality (Number of inhabitants)	Share with climate goals (%)
Under 5 000	24
5 000–10 000	49
10 000–20 000	71
20 000–50 000	86
Over 50 000	95

3.2 Legislation and other governance

Since the interim evaluation of the Adaptation Plan (Mäkinen et al., 2019), several legislative reforms, which can be considered to promote adaptation, have been initiated. In addition, the programmes, initiatives and strategies regarding climate change mitigation and adaptation carried out at the EU level influence the development of national regulation and policies.

3.2.1 Development of EU policies

The European Green Deal (COM (2019) 640 final) and the implementation of the European Climate Law ((EU) 2021/1119) increase policy guidance on climate change and also the need for coordination between member states. The European Climate Law, Article 5, states that the member states and the Union must improve their adaptive capacity, strengthen climate resilience and reduce vulnerability to climate change, and promote useful synergies with other policies and legislation. In addition, member states must adopt comprehensive national adaptation strategies and plans based on reliable climate change and vulnerability analyses, monitoring data and indicators, as well as the latest scientific information.

The EU Biodiversity Strategy (COM (2020)380) and the Forest Strategy (COM (2021)572 final) emphasize the interdependencies of climate change, sectors and measures and guide the formulation and development of national policies in line with the mitigation goals of the new EU Climate Law and the Adaptation Strategy (COM (2021) 82 final). Adaptation to climate change must also be considered in the environmental protection requirements in the national implementation plan of the Union's Common Agricultural Policy (CAP).

In the Joint Programming Initiative Healthy and Productive Seas and Oceans (JPI Oceans21) climate change is one of the key thematic areas. The objective of the initiative is to strengthen the knowledge base and develop innovative solutions and approaches from different societal development paths, which can be used to manage the multiple climate risks to the oceans. The EU Strategy for the Baltic Sea Region (SWD (2021) 24 final) aims at strengthening cooperation between member states in order to respond to key global challenges, such as climate change, pandemics, demographic changes and migration.

3.2.2 National policies and regulation

Legislation and other policies influencing adaptation activities have developed in different ways in different administrative sectors. So far, there have been few national legal obligations regarding adaptation. General awareness of climate change has improved in the administrative branches during the implementation of the National Adaptation Plan. Many legislative proposals, strategies and plans have referred to the need to adapt to climate change, as well as risk assessment and management (Tables 5–16). Recent strategies and legislative initiatives have been compiled in the tables, organised according to the administrative branches of the ministries. However, the tables are not comprehensive, as in many administrative sectors there is guidance that promotes or supports adaptation, even if it is not defined as adaptation regulation. The tables nevertheless give an overview of the possibilities of adaptation activities in different administrative sectors.

Common to all administrative sectors

Table 5. Legislation, and other policies common to all administrative sectors, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
The Climate Change Act (423/2022)	Mainstreaming of adaptation, fairness perspectives.
The Strategy for Arctic Policy (PMO 2021)	Finland's main objectives in the Arctic region. All activities must be based on the carrying capacity of nature, climate protection and the principles of sustainable development, as well as respect the rights of indigenous peoples.
Strategy of the National Commission on Sustainable Development 2022–2030 (PMO 2022)	According to the vision, the principles and practices supporting adaptation to climate change are integrated into all public decision-making. The importance of education is emphasized. Adaptation, mitigation and safeguarding biodiversity are treated as parallel and interrelated tasks.
The Emergency Powers Act (1552/2011)	The Act concerns authorities' preparedness for exceptional circumstances and authorities' powers during exceptional circumstances. The obligation to prepare covers both short-term, unexpected events and long-term changes in the operating environment (Meriläinen et al., 2021). In the general justifications for the reform of the Emergency Powers Act HE 63/2022 vp, climate change is referred to as one of the factors influencing the overall security conditions.
Government Report on Finnish Foreign and Security Policy (MFA 2020)	A state policy according to which Finland promotes mitigation of climate change and adaptation to it in all sectors of foreign and security policy, including trade and development policy.

Ministry for Foreign Affairs

Table 6. Legislation and other policies under the Ministry for Foreign Affairs, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
Climate Foreign Policy Programme (MFA 2019)	Activities promoting mitigation and adaptation to climate change must be included in the Ministry's all operations in line with the goals of Sustainable Development (Agenda 2030).
Report on Development Policy Extending Across Parliamentary Terms (MFA 2021a)	Emphasizes the use of grant-based funding as part of climate finance and when supporting climate change mitigation and adaptation. Also underlines the importance of policy coherence in development policy and development cooperation.
Era of new cooperation – The Contribution of the Ministry for Foreign Affairs of Finland to Strengthen Multilateral Cooperation (MFA 2021b)	Highlights the use of meteorological expertise in addition to the management of natural disaster risks in different sectors of society.

Ministry of Justice

Table 7. Legislation and other policies under the Ministry of Justice, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
The performance targets in the administrative branch of the Ministry of Justice for 2022–2025 (MoJ 2022)	Climate change is confirmed as a cross-cutting issue, and its prevention and consequential impacts are also factors changing the operating environment of the courts. The courts should consider the possibilities of influence and their actions in this regard.
Checklist for impact assessment of legislative proposals (MoJ 2017)	Climate impacts are mentioned as one aspect to be checked.

Ministry of the Interior

Table 8. Legislation and other policies under the Ministry of the Interior, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
Reform of the Rescue Act (MoI 2021)	Analysis of the operational environment of the Rescue services and civil preparedness: the importance and variability of extreme events (Puustinen and Kekki 2020).
Safe and crisis-proof Finland Strategy of the Rescue Services until 2025 (MoI 2016)	Climate change has been identified as a factor that needs to be taken into account.
National risk assessment 2018 (MoI 2019), Internal Security Strategy (MoI 2017) and Security Strategy for Society (Finnish Government 2017)	Climate change is considered a factor changing the security environment, in addition to which the direct and indirect impacts of climate change on the environment, society and the economy are identified. A new risk assessment and regional risk assessments are under preparation.[2]
Government Report on Internal Security (Finnish Government 2021b)	Emphasizing the importance of prevention and securing help in emergency situations throughout the country. Climate change has been identified as one of the most significant forces changing internal security. Prevention of security problems through extensive cooperation.

2 https://intermin.fi/pelastustoimi/varautuminen/kansallinen-riskiarvio [20.6. 2022]

Ministry of Defence

Table 9. Legislation and other policies under the Ministry of Defence, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
Goals and Measures of the Defence Forces' Energy and Climate Programme 2018–2021 (Finnish Defence Forces 2018)	Identified how adaptation to the impacts of climate change should be considered in the operational environment of the Defence Forces.
The Strategic Plan of the Ministry of Defence (MoD 2011)	Climate change has been identified as one of the key change trends.
Government's Defence Report (Finnish Government 2021c)	The Defence Administration monitors the impacts of climate change on the operational and security environment. Adaptation needs, including the impacts of weather phenomena caused by climate change, are taken into account when planning operations.

Ministry of Finance

Table 10. Legislation and other policies under the Ministry of Finance, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
National Strategy on Public Procurement 2020 (MoF and the Association of Finnish Municipalities 2020)	Preparedness for climate change has been identified as relevant and aligned, inter alia, for the development of the food system.
Sustainable Growth Programme for Finland -Recovery and Resilience Plan (Finnish Government 2021d)	Finland's Sustainable Growth Programme supports ecologically, socially and economically sustainable growth in accordance with the goals of the Government Programme. The main focus is on mitigation measures, but adaptation is mentioned alongside it.
Strategy for Public Governance Renewal (MoF 2020)	According to Action 3, the state and municipalities bear the responsibility for mitigating and adapting to climate change. The climate crisis and biodiversity loss are taken into account in the Public Governance Strategy and budget processes so that environmentally sustainable operating methods also support social and economic sustainability. It will be ensured that administrative branches and municipalities receive sufficient support for environmental impact assessment.

Ministry of Education and Culture

Table 11. Legislation and other policies under the Ministry of Education and Culture, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
The sustainability education development project and the government's special grant for climate and sustainability education in primary and secondary education[3]	Supports the change in the operating culture of primary schools, upper secondary education and vocational education organisers towards a more ecologically sustainable way of life and strengthens learners' knowledge, skills and attitudes related to climate change mitigation and adaptation.
ILO – Climate Knowhow (Finnish National Agency for Education)[4]	Thematic project for education on climate competence from the point of view of mitigation, adaptation. The aim is to identify of opportunities for upscaling new pedagogical approaches.
Towards Sustainable Architecture: Finland's national architectural policy programme (MEC, MoE ja MEAE 2022)	The role of architecture and land use in adapting to climate change, for example, criteria for the nature-based treatment of stormwater and the Green Factor.

3 https://www.oph.fi/fi/funding/valtion-erityisavustus-perusopetuksen-ja-toisen-asteen-ilmasto-ja-kestavyyskasvatukseen [16.6.2022]

4 https://www.oph.fi/fi/palvelut/ilo-ilmasto-osaaminen-0 [16.6. 2022]

Ministry of Agriculture and Forestry

Table 12. Legislation and other policies under the Ministry of Agriculture and Forestry, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
Climate Change Plan for the Land Use Sector (MAF 2022a)	Risks and adaptation needs identified in the land use sector: agricultural land, forestry and other land use.
The new Forest Damages Prevention Act (1168/2021) (MAF 2021c)	Risks of increasing disease and pest pressure: combating the bookworm, core borer and rootworm and agents' self-monitoring obligation.
The National Forest Strategy 2025 (MAF 2019), new Forest Strategy 2035 (under preparation)	Adaptation in the portfolio of strategic projects: Climate-resilient forestry, where funding is specifically allocated to research and putting research information into practice.
Climate Programme of Metsähallitus (2020) [state-owned enterprise that produces environmental services]	Consideration of climate risks on state lands, incl. evaluation of adaptation means in the management and use of protected areas.
Regional Forest Programmes 2021–2025 (Forest Centre)	Statutory forest programmes implement the goals of the EU and Finland, including increasing biodiversity, mitigating climate change and rural development.
Finland's CAP-plan (MAF 2022b)	Adaptation is a performance target and a special goal in the CAP plan. Key actions concern water management in changing weather conditions, new plant varieties and crops, new challenges in pest control.
Climate-friendly food programme (MAF 2021d)	The program refers to connections with the National Adaptation Plan and to the global food system
Organic 2.0 – Finland's National Programme for Organic Production 2030 (MAF 2021e)	Mention of organic production as a possibility, no guidance aimed at adaptation.
Plant Health Act (1110/2019) Animal Diseases Act (76/2021)	Risks caused by climate change stated in the justifications (HE 11/2019 vp), adaptation has not been taken into account in the justifications of the Animal Diseases Act.
The Finnish Fishing Act (379/2015)	No direct guidance or steering on adaption to climate change. Adaptation issues were also not identified in detailed guidance such as fisheries management plans.

Law or other policy	Connection to the management of adaptation
Working group for the future reindeer management[5]	A detailed operating model for management and utilisation plans for reindeer pastures. Adaptation to climate change has been identified as a topic. See also the SAAMI project (Näkkäläjärvi et al. 2020).
The Hunting Act (615/1993), the Wildlife and Game Administration Act(158/2011), the Game Animal Damages Act (105/2009)	Adaptation to climate change and subsequent measures have not been comprehensively examined, for example, in stock management plans.
National Water Supply and Sewage Reform (MAF 2021a)	Ensuring trouble-free operation of water supply services and managing risks better than at present.
Water Resources Management Strategy of Finland 2030 (MAF 2021f)	Changes in the operating environment: sustainable use of water resources, risk management and self-sufficiency (security of supply), mitigation and adaptation of climate change and biodiversity loss.
Flood risk management plans for 2022–2027 (MAF 2021b)	Update of the plans in light of the development of flood risks.

5 MAF; decision to establish a working group for the future of reindeer husbandry (in Finnish); Decision 1.11.2021 VN/1647/2021

Ministry of Transport and Communications

Table 13. Legislation and other policies under the Ministry of Transport and Communications, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
Revision of the Road Traffic Act (729/2018)	The impact of changing winters on driving conditions and meteorological research data have been used in the evaluations.
Traffic Safety Strategy 2022–2026 (Rekola et al. 2022)	Mitigation of climate change is considered, adaptation to climate change is not examined.
Budget proposal of the administrative branch for transport and communication	Mitigation and adaptation of climate change require more research and understanding of the sector's environmental and climate impacts.
The National Transport System Plan for 2021–2032 (MTC 2021a)	The current situation of adaptation to climate change in road maintenance: climate change is estimated to cause significant risks to the operational reliability of the transport system due to the increase in weather fluctuations and extreme events.
A 12-year strategy guiding transport system planning (Finnish Government 2021e)	Year-round adaptation to, for example, changes in the operating environment.
Strategic situational picture of the transport network (Traficom 2021)	The impacts of climate change on the need to upgrade winter maintenance levels.
Government Resolution on reducing greenhouse gas emissions from maritime and inland waterway transport (MTC 2021b)	The impact of climate change on icy winters and adaptation to changes. See also the Finnish Transport Infrastructure Agency (2019).
Climate and Environmental Strategy for the ICT Sector (MTC 2021c)	Expanding the knowledge base, developing measurement, increasing consumer awareness and competence, and utilising emerging technologies and responding to challenges.

Ministry of Economic Affairs and Employment

Table 14. Legislation and other policies under the Ministry of Economic Affairs and Employment, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
The Finnish Bioeconomy Strategy (MEAE et al., 2022)	Includes a task to identify the means of the bioeconomy to curb climate change and promote adaptation to its impacts, as well as to stop the deterioration of biodiversity.
Reform of the Mining Act[6]	Climate change has not been explicitly identified, general demand on taking environmental protection requirements and climate change into account in mining.
The Act on Regional Development and Implementation of the European Union's Regional and Structural Policy (756/2021) "Regional Development Act"	The objective, set to the development of the areas, is to "improve the quality of the living environment and curb climate change and promote adaptation to it" (Section 2)
Climate and Energy Strategy (MEAE 2022a)	Reference to the National Adaptation Plan, no own evaluation of adaptation issues.
Government's decision on the objectives of security of supply (1048/2018) and a Draft for new Report on Security of Supply[7]	Cross-borders impacts (threats) of climate change need to be taken into account in security of supply, incl. large population movements and infectious diseases (pandemics). In the draft, the energy crisis, the impacts of extreme weather events on the reliability of physical infrastructure and climate risks for food production are identified as key challenges.

6 https://tem.fi/kaivoslakiuudistus (in Finnish, Reform of the Mining Act 2020–2022, MEAE)

7 https://www.lausuntopalvelu.fi/FI/Proposal/DownloadProposalAttachment?attachmentId=18062

Ministry of Social Affairs and Health

Table 15. Legislation and other policies under the Ministry of Social Affairs and Health, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
Climate change in the healthcare and social welfare sector: Climate change adaptation plan of Ministry of Social Affairs and Health (2021–2031) (Meriläinen et al., 2021)	The goal is to examine the current state of adaptation and the structures that support it, to identify current and new adaptation measures in the area of health and well-being, to concretize and clarify measures in the area of responsibility of MSAH's administration.
Health Protection Act (763/1994), and related guidance and regulations.	The general "tools" for guidance are found in regulations that create the conditions for safeguarding health also in a changing climate. Adaptation to climate change has not been directly mentioned as an issue to be discussed.
The Occupational Health Care Act (1383/2001) and the Occupational Safety and Health Act (2002/738)	Adaptation to climate change has not been identified as a special issue, but the regulation creates a framework for reacting when risks materialize, for example in heat situations.

Ministry of the Environment

Table 16. Legislation and other policies under the Ministry of the Environment, which may support adaptation to climate change.

Law or other policy	Connection to the management of adaptation
The Land Use and Building Act (132/1999) and Decree (985 /1999)	Climate change is only mentioned once in the Land Use and Building Act, but in practice, attention has been paid to weather conditions. The Land Use and Building Decree requires that the impacts on the climate are examined. In reforming the Land Use and Building Act, the purpose is to pay more attention to climate change (see the proposal for the Building Act).
Proposal for the Building Act[8]	Utilisation of the construction permit also as a climate policy tool.
Reform of the Nature Conservation Act (HE 76/2022 vp)	Interdependencies between climate change and protecting biodiversity and ways to promote adaptation are considered.
Water Protection Programme (MoE 2021b)	Reduction of agricultural nutrient drainage, development of water management in agriculture and forestry, restoration of water bodies, urban water management and funding of research and development work.
Government resolution YM/2021/68 on management plans of water resources for 2022–2027	Identifying the challenges of climate change impacts and noting the information needs.
Programme of Measures of Finland's Marine Strategy 2022–2027 (Finnish Government 2021a)	An assessment of the impacts of climate change, which may exacerbate other problems and thus require increasingly effective actions.
Helmi-Habitats Programme (https://ym.fi/helmi) (Finnish Government 2021f)	Aims to strengthen Finland's biodiversity and safeguard vital ecosystem services. At the same time, the programme is working to curb climate change and promote adaptation to it.
Climate change adaptation in the environmental administration sector (MoE 2016).	A systematic review of adaptation measures in the Ministry of the Environment's administration. Progress in the implementation of the action programme in 2016–2019. (Mäkinen & Hildén 2020)

8 https://mrluudistus.fi/uutiset/ehdotus-uudeksi-rakentamislaiksi-julkaistu-kuulemistilaisuus-13-4-2022/

The tables 5–16 above show that all administrative branches have paid attention to the impacts of climate change at some level. Some have recorded concrete means and actions, which can directly address the impacts of climate change, such as water management challenges and floods. Some sectors have general regulations that are also suitable for managing climate change impacts, even if adaptation is not specifically addressed (for example, the Plant Health Act (1110/2019) and the Security of Supply Act (1390/1992)).

Certain gaps can be identified in the policies and regulation. For example, climate change is not considered in regulation or other guidance related to game and fisheries. Another example is the Climate and Energy Strategy which refers to the National Adaptation Plan, but without further elaboration of how risks will evolve when the amount of weather-dependent energy production is significantly increased. For example, extreme weather events directly affect energy production, not just distribution. Regulation is also partially inconsistent. For example, the National Public Procurement Strategy (MoF and Association of Finnish Municipalities 2020) identifies the risks of climate change especially for food security, but the Guide by the Public Procurement Advisory Group[9] has so far only focused on energy efficiency. In the Guide about preparedness in procurement (Korhonen 2022) climate change is not identified as a potential risk factor.

The revised Climate Change Act (423/2022) strengthens the general framework of adaptation management with the obligation to promote climate resilience and sustainable development. In addition, according to the Act, the assessment of climate risks should include both sector and administrative sector-specific and cross-cutting evaluations, because harmful impacts of climate change appear across sectoral boundaries. Moreover, a new content requirement of the National Adaptation Plan is that a regional risk assessment is to be carried out when necessary. The assessment should cover especially vulnerable sectors, ecosystems, groups and communities and identify adaptation measures that take place in different time spans. Efforts have been made to strengthen the strategic crosscutting nature of the Plan and the need to examine cross-border impacts has been emphasized (Section 10 justifications). The obligation to produce climate plans at the municipal, subregional and regional level will be considered in a separate government proposal amending the Act (HE 27/2022 vp). The extension of the Climate Act's planning system to include the land use sector also emphasises that the possible impacts on biodiversity must be taken into account when preparing climate policy plans (MoE 2021a). Strengthening biodiversity is a key action in terms of adaptation (Stein et al., 2013), and it creates opportunities for strengthening beneficial synergies.

9 https://www.hankinnat.fi/ymparistonakokohdat (environmental aspects in procurement, in Finnish) [2.6. 2022]

Adaptation to climate change is to be included in the objectives of the new Nature Conservation Act (HE 76/2022 vp). Climate change relates, for example, to the proposed regulations on nature conservation planning and the nature conservation information system. To account for climate change, a nature reserve referred to in Section 43 of the Act could be established in the future also if the area is of particular importance to the adaptation of habitat types and species to the impacts of climate change.

After the interim evaluation of the National Adaptation Plan, the social and health services sector has compiled the sector's first adaptation plan (Meriläinen et al., 2021), which creates a basis for developing policies and regulation. The plan discusses the risks related to the protection and maintenance of the population's health and cross-border impacts, which concern especially the security of supply. Actual sector-specific legislation has not been enacted in recent years. In the sector, activities promoting adaptation are presented especially in the separate legislation on environmental health and in the Emergency Powers Act (1080/1991). The Emergency Powers Act requires all administrative sectors to prepare for emergencies and recognises climate change as one relevant threat.

In the water management sector, a National Water Supply and Sewage reform (2020–2022) is underway, and attention has been paid to securing operation of water supply services and managing risks better than at present, for example, when the impacts of climate change intensify (MAF 2021a). In addition, the Water Protection Programme (2019–2023) has set several cross-sectoral goals: reduction of agricultural nutrient leaching, development of water resources management in agriculture and forestry, restoration of water bodies, stormwater management, and funding of research and development. Many of the goals serve climate change adaptation and related contingency planning. In addition, the Flood Risk Management Plans (MAF 2021b) for 2022–2027 were updated during 2021. During 2022, new regional water management action programs and plans will also be compiled.

The new Adaptation Action Programme for the natural resources sector will be completed during 2022. In the Climate Change Plan for the Land Use Sector (MISU), climate change is taken into account. The Plan's measures must promote mitigation, adaptation and safeguard biodiversity. With the research funding for the measures, an extensive "Catch the carbon" framework programme has been launched. Adaptation is also included in the goals of the national CAP plan for agriculture. In the forestry sector, the revision of the Forest Damages Prevention Act (1168/2021) is a key means to promote sector's adaptation goals, and on state-owned lands climate-smart solutions are promoted through the Metsähallitus Climate Programme, both in terms of mitigation and adaptation (2020).

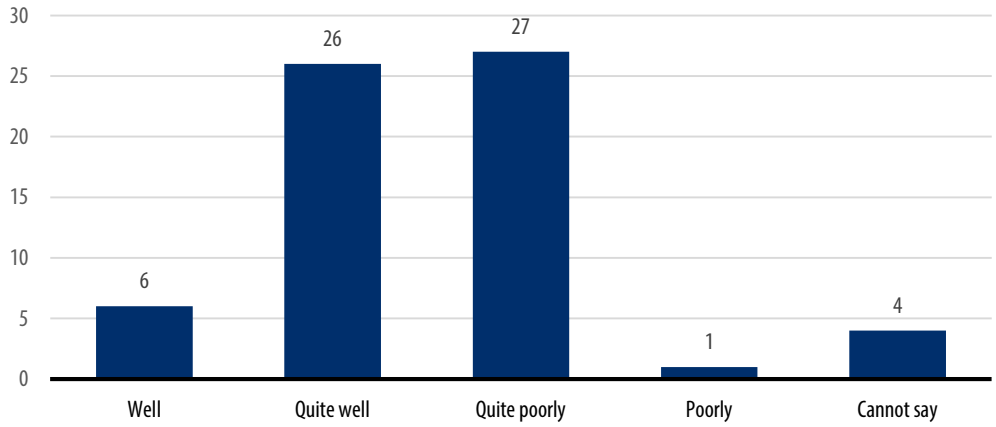
3.2.3 Mainstreaming adaptation

The purpose of mainstreaming adaptation is to ensure systematic consideration of adaptation needs in all sectors relevant to climate risk management. Mainstreaming can also promote the identification of connections between mitigation and adaptation and utilisation of synergies (Landauer et al., 2015, IPCC 2022b). Internationally, the importance of synergies has been emphasized, for example, in the strategic goals of the EU's Green Deal (COM (2019) 640 final) and in the related key policy documents such as the EU biodiversity strategy (COM/2020/380). One important objective of the European Climate Law is to strengthen synergies between sectors and the transparency of climate action in the EU member states. The Union's Adaptation Strategy emphasizes the systemic nature of adaptation, and mainstreaming in Green transition initiatives generally refers to better identification of important synergies between mitigation, adaptation and the safeguarding of biodiversity.

According to the interim evaluation of the National Adaptation Plan (Mäkinen et al., 2019), there have been no major conflicts between adaptation planning and other planning. Instead practical challenges are typically related to the coordination of mitigation and adaptation both in terms of practical work and resources. This can be seen, for example, in regional low-carbon roadmaps and in the emphasis of regions and municipalities climate action (Canemure project, see Saikku et al., 2022, Gregow et al., 2021). Identified tensions between adaptation, mitigation and safeguarding biodiversity are, for example, related to the development of urban form and the built environment. In addition to the challenges, useful synergies concern promoting biodiversity as part of both mitigation and adaptation activities. Both mitigation and adaptation require resources, which can be partially combined, although there may be differences in the emphasis of the activities (Landauer et al., 2019). Legislation and the authority of various institutions direct the implementation of adaptation and emission reduction strategies, projects and tasks (ibid).

The absence of legislative obligation to climate action was identified to be one of the obstacles to adaptation activities in the survey of the Association of Finnish Municipalities and KOKOSOPU project, and in the regional workshops. The survey responses show that 50 percent of the municipalities regard climate action (including both mitigation and adaptation) to be well or fairly well incorporated in the municipality's activities (Figure 2). The mainstreaming of municipal climate action has progressed compared to previous surveys (Puurula et al., 2022), although consistent consideration of climate action is yet to be reached and sector-specific differences remain large. According to the survey, zoning, flood management and water supply have progressed most (see chapter 3.4.3).

Figure 2. The estimated success in incorporating climate action into municipal activities. Distribution of responses (N=64).



The reform of the Finnish Climate Act supports mainstreaming. The revised Act emphasizes sustainable development, fairness and the rights of the indigenous peoples, i.e., the Sámi (thus strengthening the fundamental and human rights perspective) (Section 2). These additions both support and enable adaptation, although their effect ultimately depends on the practical implementation and the resources available (for example, the success of adaptation in aspects essential for securing the nature-based livelihoods of the Sámi). The inclusion of the goal to secure conditions that support Sámi people in maintaining and developing their own language and culture, indicates an effort to better account for vulnerable groups in the planning of climate policy. Concretely, this goal is promoted in the Climate Act by the provision on the Sámi Climate Council, which is an independent expert body participating in the preparation of climate policy plans, including adaptation.

Integration of adaptation and mitigation has progressed in the different administrative sectors, for example, in the Ministry of the Environment and the Ministry of Agriculture and Forestry. The Adaptation Programme of the Ministry of the Environment promotes integration between different areas of responsibility. The actions included in the Climate Action Package of the Land Use Sector (MAF 2020) are cross-sectoral and have many synergies with respect to adaptation. Adaptation is also one of the goals.

In addition, guidelines have been developed to assess climate impacts in the application of the Act on Environmental Impact Assessment Procedure (EIA) and the Act on the Assessment of the Effects of Certain Plans and Programmes on the Environment SEA)

(Hildén et al., 2021). The purpose is to promote the examination of adaptation to climate change across sector boundaries and better identify conflicts and synergies between adaptation and mitigation in the assessments.

The Regional Development Act (756/2021) mentions curbing climate change and promoting adaptation as one of the goals of regional development. The development of regions is based on the interaction between the state, regional councils, municipalities and other actors, as well as cooperation between administrative sectors.

The integration of adaptation has progressed on a practical level. However, there are challenges in identifying and implementing practical adaptation activities, especially in sectors that cross different administrative sectors, such as social and healthcare sector and overall security, which is part of the Ministry of the Interior's administrative sector. Cooperation between sectors is, nevertheless, a prerequisite for managing risks related to indirect impacts. Indirect risks and interdependencies have been identified, for example, in healthcare, natural resources, and transport and information sectors. Mitigation activities can also have impacts, for example, through the reliability of logistics and infrastructure.

When legislation is revised, it is possible to strengthen mainstreaming of adaptation with reference provisions and provisions requiring consideration, but so far this opportunity has hardly been utilised. For example, the Climate Act is not referred to in other legislation for the time being, even though the Climate Act includes a general obligation to promote climate action (Section 10 and its justifications).

3.3 Responsibilities and practices

3.3.1 National level

The European Climate Law (COM (2021) 82 final) promotes the development of activities in national plans and strategies in accordance with the EU Adaptation Strategy. This also strengthens policy coordination between member states. However, the EU regulation does not take a stand on the division of responsibilities at the national level between different administrative sectors or levels.

Nationally, adaptation work has progressed at different pace in different administrative sectors and ministries. So far, the Ministry of the Environment, the Ministry of Agriculture and Forestry and, most recently (2021), the Ministry of Social Affairs and Health have compiled a separate adaptation action programme or plan. In addition, the Ministry of Defence has prepared an Energy and Climate Program (goals and measures 2018–2021) of the Finnish Defence Forces, where adaptation is taken into account as a preparedness

for changes in the operating environment. The Climate and Environment Strategy for the ICT sector of the Ministry of Transport and Communications (MTC 2021c) also considers adaptation. In comparison to the situation described by the mid-term evaluation (Mäkinen et al., 2019), adaptation has progressed at the level of policy instruments and strategies, but the practices and responsibilities may still remain unclear. For example, in planning adaptation for the health sector it was noted that questions about the safety of domestic water belong to many administrative sectors. The development of regulation for adaptation in such issues requires seamless cooperation between ministries. If this fails, it may remain unclear who at the regional and local level is to take responsibility for operational action in, for example, special circumstances caused by extreme weather events.

The national adaptation activities have been led by the Ministry of Agriculture and Forestry since the drafting of the first Adaptation Strategy. However, as a governing principle each administrative branch (Ministry) has had responsibility over adaptation measures in its own field. A separate decision on the division of responsibilities in adaptation activities has not been made so far, but the ministries have drafted plans in their administrative fields as needed and guided the key issues of risk management under light inter-ministerial coordination. Fewer resources have been used for the coordination of national adaptation action than for the coordination of mitigation, where the administrative sectors have coordinated their actions in several plans and strategies (Medium-term Climate Policy Plan, Long-term Climate Policy Plan, Climate and Energy Strategy).

There are no quantitative goals for reducing climate risks or increasing adaptive capacity that would be directly comparable with the emission reduction targets in climate change mitigation. Without quantitative goals, it is difficult to agree on and share detailed responsibility between each administrative sector over what should be achieved. If it would be possible to set a quantitative reference and target level for adaptation one could examine and specify what actions are required to achieve the target level. Then it would be possible to agree on what each government sector is expected to do to ensure progress towards the common goal and how the implementation should be carried out in the multi-level governance structures. The identification of such goals and monitoring variables is, however, still under development also internationally, and thus far no ready-made solutions are available (Adaptation Committee 2020).

3.3.2 Regional level

In a recent report by Pirkanmaa ELY Centre (PIRELY 2022), authorities (adaptation actors) involved in adaptation activities were examined at the regional and municipal level. In the report, adaptation actors are divided into organisations under state and municipal administration. Regional public actors are the ELY centres (incl. Employment and Economic Development Offices), the Regional State Administrative Agencies (AVI) as well as the regional councils as statutory joint municipal authorities. In addition, the recent health and social services reform has created the wellbeing services counties, which will take on operational duties from the beginning of 2023.

The revised Climate Act (423/2022) includes a content requirement to conduct a regional risk review as necessary for the preparation the National Adaptation Plan. In addition, the Act is to be amended by an obligation to prepare climate plans at the municipal, sub-regional or regional level. In the draft proposal of the government, the examination of adaptation and the need for adaptation in the climate plan has been left as a completely voluntary content point.[10]

Next, the regional adaptation authorities and their statutory tasks and roles in adaptation action are presented. This is followed by an overview of the organisations' cooperation in regional adaptation activities.

Regional councils

The regional councils are statutory local governments of their regions, in which every municipality of the region must be a member. The statutory tasks of the councils are regional development and regional land use planning.

The regional development task is based on the Act on Regional Development and Implementation of the European Union's Regional and Structural Policy (756/2021). The responsibility for regional development rests with the state and the municipalities, but regional councils are the regional development authority responsible for managing the tasks of the municipalities in the region (Section 6). The aim of regional development is to promote sustainable development, growth and competitiveness in the regions, as well as the well-being of residents and the quality of the living environment. The regions prepare regional programs based on the region's long-term strategic policies (Section 8). Pursuant to the Regional Development Act, regional councils must, among other things, promote sustainable use of natural resources and climate change mitigation and adaptation, as

10 https://www.lausuntopalvelu.fi/FI/Proposal/Participation?proposalId=7d83d1c6-76dc-443c-8bf4-1eb3197798e5 [3.8. 2022]

well as cooperation in planning for high-quality living environment, and be responsible for integrating the planning with the rest of the regional plans. This helps in connecting mitigation and adaptation as part of the region's strategic development, in the planning and implementation of which the business community, associations and authorities also participate.

Climate change and the changes it brings to the physical environment, as well as the threats brought by mitigation measures and adaptation, and the opportunities that open up for the area's livelihoods should be taken into account in regional development visions.

As part of their regional development task, the regional councils have been preparing climate programmes and strategies for more than a decade in cooperation with other actors in the region. In recent years regional climate roadmaps have been prepared. Adaptation and mitigation have been addressed in these documents with varying emphasis (See 3.4.2). In addition to the actual climate change strategies or climate roadmaps, several regions have also included adaptation and other climate aspects in the regional strategic plans for 2022–2025. At best, this can mean that the impacts of climate change on regional development and planning measures are examined and that climate aspects are included in plans for implementation and funding.

Regional land use planning is governed by the Land Use and Building Act (MRL 132/1999), which is currently being revised. A regional plan is a general land use plan for utilisation of areas in a region or a part of it, and it guides land use planning in municipalities. When drawing up a regional plan, the national land use goals (Section 28) must also be taken into account, which can promote adaptation to the impacts of climate change and extreme weather events. With regional land use planning, adaptation can be promoted, for example, by reserving ecological corridors for different species.

ELY Centres

Centres for Economic Development, Transport and the Environment or ELY centres are state administration agencies. The task of the ELY centres is to promote regional development by managing the executive and development tasks of the state administration in the regions. ELY centres have important statutory tasks related to environmental protection, monitoring and control of environmental changes, which are not only linked to adaptation but also promote it in many ways. Adaptationwise, essential task areas concern at least the functionality of the transport system (including transport safety and road and traffic conditions), environmental and biodiversity protection, land use, construction control and the cultural environment, flood risk management, use and management of water resources, and tasks related to agriculture and fisheries. Central tasks related to adaptation also include monitoring the public interest in environmental

and water issues, contributing and distributing environmental information, and improving environmental awareness. Many tasks of the ELY centres require addressing adaptation needs in practice, although not all of these activities are necessarily identified as adaptation.

The Pirkanmaa ELY Centre has actively identified key climate action interfaces related to the official duties of ELY centres and that apply both to mitigation and adaptation for the development of activities.[11] The ELY Centres' Climate Roadmap project identified relevant interfaces, areas for developing climate action, and ELY centres' strengths in climate action. According to the project results, there is a demand for the expertise and practical knowledge of ELY centres.

During the ELY centres' climate roadmap project, a network of climate experts was established to strengthen regional climate action, information exchange and regional implementation. In the roadmap, several development targets with which the ELY Centre can promote climate activities, including adaptation, were identified.[12] In adaptation activities, the ELY centres are effective especially in flood risk management, but also in ensuring the operational reliability of society more generally (ELY centre 2021).

In addition to their expert role, ELY centres manage together with regional councils the structural and regional development funds, which can be used to fund projects that promote adaptation (Act on the Development of Regions and the Implementation of the Regional and Structural Policy of the European Union 756/2021). ELY centres also have a supervisory role, and adaptation perspective can also be highlighted in, for example, monitoring of environmental protection.

Regional State Administrative Agencies (AVI)

Regional state administrative agencies (AVI) handle the implementation, guidance and supervision tasks of several pieces of legislation. The domain of each regional state administrative agency includes one or more counties and regions. AVI's responsibilities include basic services, legal protection and permits, occupational health and safety, environmental permits, rescue services and preparedness, and educational and cultural

11 https://www.ely-keskus.fi/-/ilmastonmuutokseen-sopeutumisen-osaamista-vahvistetaan-ely-keskuksen-hankkeessa-pirkanmaa- (Climate change adaptation is strengthened in the project of the ELY centre (in Finnish) [31.8.2022]

12 https://www.sttinfo.fi/tiedote/kohti-julkisen-sektorin-murrosta---ely-keskusten-ilmastorooli-on-tarkea-osa-suomen-hiilineutraaliuden-tavoittelua?publisherId=69817869&releaseId=69920088 (The ELY centres have an important role in climate change activities (in Finnish) [31.8.2022]

activities. There are seven AVI agencies, of which the Government of Åland is one. Mainly, the supervision responsibility of each regional administrative agency applies only to its own designated area. Some tasks are, however, handled by one regional agency on a national basis. (Regional State Administration Agency 2022).

Tasks related to adaptation in Regional State Administrative Agencies include integration of preparedness, contingency planning and regional security of supply issues. Regarding the Water Act, AVI acts as a licensing authority, for example, in regulation of permits according to the Water Act. Under the responsibilities of rescue operations and preparedness, aerial surveillance flights of forest fires (drones and satellites) are being developed. In the future, a part of the tasks of the regional state administrative agencies will be transferred to the wellbeing services counties.

Wellbeing Services Counties

The responsibilities for organising social, health and rescue services will be transferred from municipalities to the wellbeing services counties as of January 1 2023, except for the capital city of Helsinki (Act on Organising Rescue Services 613/2021). The development of procedures and practices related to climate change will take time.

In the KOKOSOPU workshops, the role of the Rescue Services, in particular, was seen as central in future adaptation action, and the expertise of the Rescue services was considered necessary in the regional adaptation to climate change.

Roles and cooperation between regional actors in adaptation at the regional level

Regional public actors have different statutory tasks, but both in the findings of the SUOMI project (Gregow et al., 2021) and in the KOKOSOPU regional workshops, it became apparent that the roles and division of work of regional adaptation actors are partly unclear.

In some regions, cooperation between the ELY centres and regional councils, and also with other adaptation actors in the region, seems to be working quite well, but in some roles are still unclear. This is understandable, because adaptation action is only at a very early stage in some regions. The importance of adaptation action has not necessarily been recognised widely enough at the regional level, which means that goal-oriented discussion and planning have not been fully initiated. There is also some uncertainty about who is responsible for adaptation related tasks and who for coordination. However, some activities supporting adaptation have been carried out in different organisations for a long time, although they have not necessarily been identified as adaptation action.

An unclear division of responsibilities in adaptation tasks can lead to duplication of work. This can be problematic in terms of resource use and content-wise, and therefore, it is important to discover possible overlaps in adaptation activities. In addition, it is essential to identify the already extensive field of adaptation in regions, the ongoing activities and existing processes to avoid planning overlapping activities. There may also be a risk that adaptation needs of some specific sector falls between current organisational boundaries.

The role of ELY centres in adaptation action was regarded as crucial in the regional workshops. Flood protection was seen as a particularly functional joint work area in regional adaptation, and ELY centres have an important role in this. (See also 3.3.4.) Regional councils were considered to be suitable coordinating bodies for adaptation activities on the regional level. The regional development strategy and the regional land use plan are key means of guidance also in terms of adaptation. It would be natural to include adaptation in the foresight work of the councils. The regional councils also coordinate various working groups and advisory councils also in climate action, such as the distribution of funds for the Green transition and Green Deal, jointly with experts from the ELY centres. The regional councils can therefore be considered to play a key role in integrating climate issues (including adaptation) into regional development visions and strategic planning.

Based on the workshops, there is no single template for adaptation cooperation between regional level organisations. In some regions, cooperation forums or groups of regional actors or urban regions have been established, i.e., "climate task-forces", where representatives of different organisations can discuss regional adaptation and other climate issues informally. This was identified as one of the good practices of adaptation action in the SUOMI report (Gregow et al., 2021).

A survey sent to the participants in advance of the KOKOSOPU regional workshops, explored possible activities that could support adaptation at the regional level. Suggested actions were rated on a scale of 0–5, where 0 meant "would not support at all" and 5 "would support very much". Cooperation groups, i.e., the establishment of climate task-forces and the preparation of adaptation plans or strategies were estimated to support regional adaptation work a lot (average rating: 4). The integration of adaptation issues into all relevant regional planning (average rating 4.9), obtaining financial resources from Government budget and for the implementation of regional adaptation measures (4.7) and more detailed planning guidelines (4.7) were rated even higher.

The workshops demonstrated that there are different perceptions of how the communication between actors and the regional organisations should work. On one hand, regional councils were seen to function as contacts to municipalities, but on the other hand, the ELY centres were seen to be the primary contacts in practical matters for municipalities and citizens, such as landowners.

Regarding the division of roles between regional adaptation actors, the responsibility of the regional councils for regional development would seem to give them a regional coordination role. Consequently, both mitigation and adaptation could be integrated in the regional development plans of a region with its future visions and regional planning. The responsibility of ELY centres lies primarily within the implementation and supervision of sectoral legislation. Both organisations fund projects where adaptation can be promoted in accordance with different funding programs. The wellbeing services counties, which will become operational in 2023, will focus on special tasks in adaptation activities, but it is important that cooperation works between authorities. In particular, the importance of Rescue Services in adaptation and contingency planning is central.

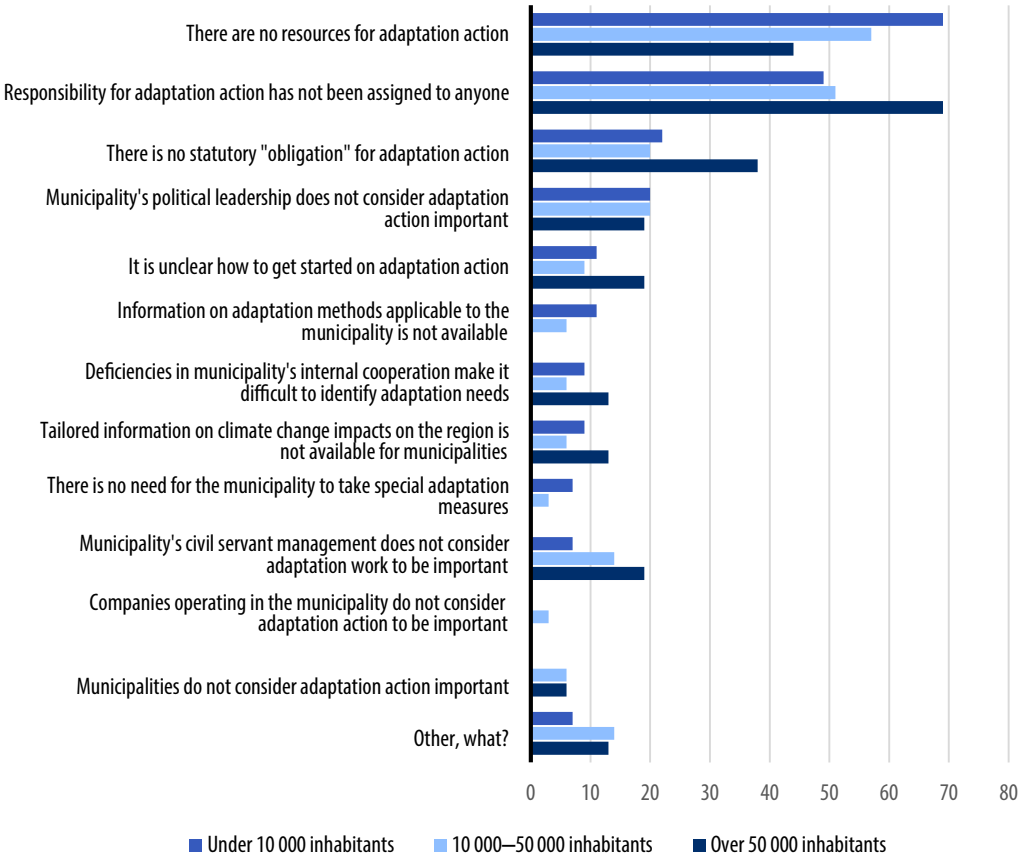
3.3.3 Local level

Municipalities are responsible for a wide range of tasks that influence how residents and companies operating in the municipality adapt to climate change. Statutory tasks of municipalities overlapping with adaptation are related to the following services:

- education and early childhood education and culture, youth, library and physical education services: relevant for awareness of climate change and adaptation measures;
- urban planning, land use: relevant for exposure to weather phenomena, vulnerability;
- water supply (and sewage) and waste management: relevant for managing the consequences of extreme events;
- environmental services: relevant for risks affecting different functions;
- social and health services (transfer to wellbeing services counties as a result of the social and healthcare reform): relevant for the vulnerability of different groups, preparedness for changing weather conditions;
- fire and rescue services (transfer to wellbeing services counties as a result of the reform of Rescue services): relevant for risk assessment, vulnerability, operational activities in tackling, for example, floods and forest fires.

According to the municipal survey, municipalities feel that the responsibilities related to adaptation are partly unclear. Half of the respondents saw that shortcoming in assigning responsibilities affects municipal adaptation action negatively. Only the lack of resources was seen as a more significant obstacle (Figure 3). When approving the Climate Act, the Parliament insisted that Government issues a Government proposal by the end of November 2022 to supplement the Climate Act with regulations regarding municipalities' climate obligations. In the draft Government proposal to amend the Climate Act,[13] it is proposed that a municipality could also set adaptation goals in its climate plan (Section 14a).

Figure 3. Obstacles to municipalities' adaptation activities, categorised according to municipal population. "What things make it difficult to plan adaptation and implement measures in your municipality? (You chose the three most important)", % of respondents who chose the option). (N=96).



13 https://www.lausuntopalvelu.fi/FI/Proposal/DownloadProposalAttachment?attachmentId=17917 [22.6. 2022]

Obligations related to adaptation action are still mostly missing from the strategic documents of cities (except for Helsinki), although the importance of the issue is expected to increase in the future. Practices have been developed on a voluntary basis in national climate networks. Thus regions and municipalities that have participated in the climate roadmap project CANEMURE and in international networks such as ICLEI, Eurocities and Covenant of Mayors, have played a significant role in speeding up adaptation action. However, their influence does not extend to the entire country yet, and especially smaller municipalities are lagging behind.

A group of municipalities can agree on regional coordination, which can be shaped according to the needs of the participating municipalities. According to the evaluation of the Adaptation Strategy of the Helsinki Metropolitan Area (2012–2020), cities no longer feel the need for a common strategy for this particular region, because cities are already working with adaptation from their own perspectives. Cooperation and networks are nevertheless useful for the implementation of international and EU projects (Häkämies et al., 2021).

The significance of the Climate Change Adaptation Monitoring Group of Helsinki Metropolitan Area (ILSE) as a forum for the exchange of information and ideas is considered key in supporting the adaptation of cities in the Helsinki Metropolitan area (Häkämies et al., 2021). One measure and goal of the new Sustainable Urban Living Programme is strengthening regional cooperation networks (HSY 2022). The Helsinki Region Environmental Services Authority (HSY) has maintained an adaptation monitoring group since 2013, and the aim is to intensify cooperation in the future with planners, experts and representatives of other stakeholders, research institutes and organisations from various sectors in the cities. In addition to this, an action plan for strengthening collaboration and information exchange inside the cooperation network will be drafted.

Adaptation activities of large cities have been supported by their otherwise active climate policy and membership in various cooperation networks. For example, voluntary Sustainable Energy and Climate Action Plans (SECAP) and related reporting obligations have promoted adaptation activities in cities. Adaptation measures are, however, typically based on a city's own specific premises, and coordination or information exchange, for example regionally or nationally, has been minimal (cf. international cooperation networks) or is only just developing. However, establishing national coordination and funding has been identified as essential for municipalities' practical adaptation activities.

The goals set in the strategies of large cities (for example, the Helsinki Adaptation Vision 2050 and policies and the HSY Sustainable Urban Living Programme) play an important role in organising the adaptation measures of the cities' administrative divisions and integrating adaptation themes into the activities of different sectors. However, adaptation

has so far been overshadowed by mitigation in most cities. One reason for this is arguably more efficient channelling of private funding into emission reduction and circular economy projects due to their perceived better cost-benefit ratio, effectiveness and monitoring. The lack of concrete adaptation targets is a challenge, and the voluntary nature of the guidance (there is no commitment at the level of plans or measurable targets) affects the progress of adaptation at a practical level (cf. emission targets of sectors, national and EU-level targets and reference levels).

The possibilities of small municipalities[14] to implement plans or measures related to adaptation are very different from those of large municipalities. Climate action in general is hindered by a lack of resources. Mitigation issues have also been a priority in climate action, if climate action has been done at all.

3.3.4 Interaction between different levels of governance

Finland's national adaptation policy is guided by the European Climate Law (COM/2021/82 final), which contains general goals and guidelines for the implementation of the member states' own adaptation plans. Due to the cross-cutting nature of adaptation, the goals must be systematically examined in different administrative sectors and in their strategies, action programmes and initiatives, as well as plans. To promote adaptation, the interaction between national, regional, and local levels should be improved, for example, by increasing the governance of adaptation measures by the responsible ministries, and coordination and communication between sectors. The adaptation plans of administrative branches or sectors within the branches (for example, Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Health and Social Services) with designated measures and identified information needs are steps in this direction.

The administrative sectors have different structures, regulation systems and practices to implement the interaction between different administrative levels. Administrative sectors where legislation requires planning at different levels (for example, water resources management and water supply and sewage, flood protection, land use planning, transport planning) have ready-made procedures for interaction that can be utilised for adaptation issues as well. This can also be seen, for example, in the implementation of local adaptation activities (see section 3.4.3)

14 The size of a municipality refers here to the number of inhabitants, not the geographical size

In many adaptation issues and practical activities, such as land use and flood protection, planning and decision-making take place in several linked administrative structures, which means that the responsible authority can be national, regional or municipal. For example, flood risk management and related water regulation is a key adaptation-related task and the implementation requires cooperation between several different actors. The Ministry of Agriculture and Forestry, regional state administrative agencies, ELY centres, municipalities, companies and the Finnish Environment Institute (SYKE) are involved. In the management of stormwater floods, local measures are emphasised, but regional and national land use and infrastructure planning also have an important role to play. Gregow et al., (2021) considered flood protection as an example of a particularly well functioning area of cooperation between different organisations.

The climate roadmap project of ELY centres (2021) identified interfaces of climate issues that are linked with the tasks of environmental protection. Adaptation management requires close cooperation and information exchange (policy coherence) between different levels. However, the key risks and adaptation tasks need to be identified first in, for example, regional climate strategies. Municipal climate plans furthermore offer opportunities to develop adaptation planning practices[15] supporting regional and national objectives.

Networks have an important role in the implementation of climate action. So far, national networks have focused on curbing climate change (Hinku,[16] Canemure[17]), but adaptation is also on the agenda in international networks (Heikkinen et al., 2020). Networks are important sources of peer support, exchange of good practices, knowledge and experiences. Networks also motivate climate action, as their activities often involve preparation of climate plans and reporting of actions.

National networks and regional cooperation are guided by the responsible ministries. In the state administration ELY centres have a key role in promoting and guiding 'grassroot' climate action. Based on the findings of the SUOMI project (Gregow et al., 2021), it is important to foster close connections between regional and state-municipal processes in the future. Municipalities, in particular, are hoping for concrete guidelines from the regional councils on how adaptation can be implemented, for example, in land use planning.

15 In the proposal to amend the Climate Act, municipalities are given an opportunity to include adaptation goals in their climate plans https://www.lausuntopalvelu.fi/FI/Proposal/DownloadProposalAttachment?attachmentId=17917 [24.6. 2022]

16 https://www.hiilineutraalisuomi.fi/en-US/Hinku [26.6. 2022]

17 https://www.hiilineutraalisuomi.fi/en-US/Canemure [26.6. 2022]

According to the municipal survey, networks are integral to planning adaptation measures (Figure 4). Municipalities' own networks are important for municipalities of all sizes, while in small municipalities with less than 10,000 inhabitants, regional cooperation emerged as a particularly important source of adaptation ideas. Larger municipalities rely on networks and their own information acquisition. Cooperation with authorities and research institutes was also emphasised. Large municipalities are also more capable of utilising international networks to support the planning of adaptation measures. The survey also showed that cooperation between municipalities in climate matters is the smoothest of all (Figure 5). The observation is significant when considering the kind of support that could best promote adaptation action in municipalities.

Figure 4. Municipalities' adaptation ideas categorised by the municipality's population. "Where do the ideas for the municipality's adaptation action come from? Choose the three most important", (N=96; percentage of respondents that chose the option).

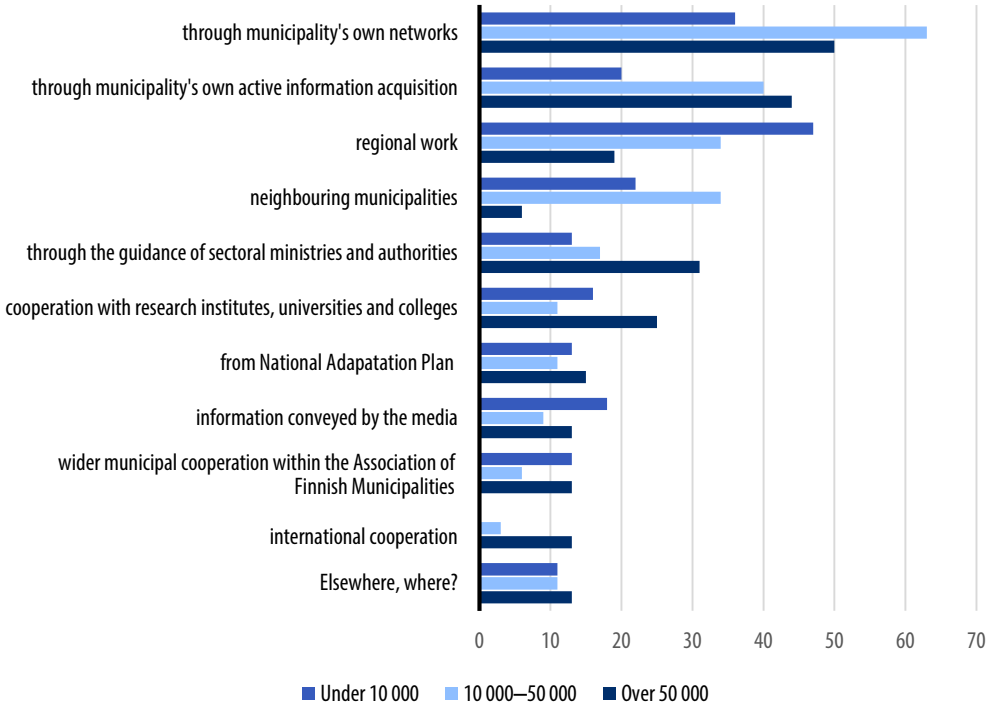
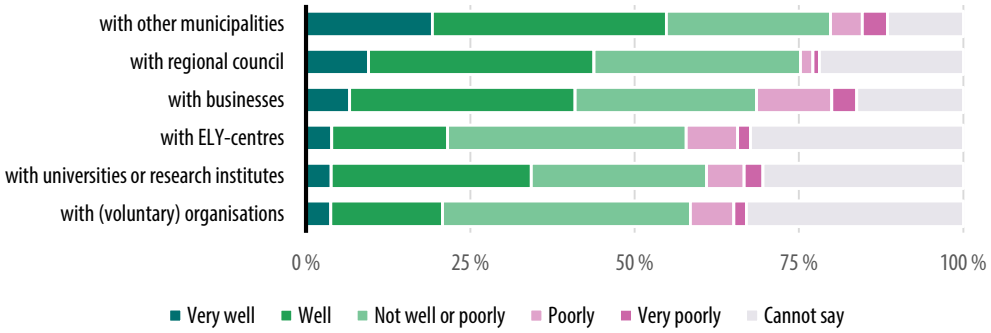


Figure 5. The smoothness of climate cooperation with different actors. "Evaluate how well climate cooperation succeeds between your municipality and the entities and actors below", (N=102–106).



Based on the answers to the original survey and the supplementary survey to non-responding municipalities, 80 percent of the municipalities are involved in regional climate activities. The size of the municipality affects the possibilities to participate in regional climate cooperation: 69 percent of municipalities with less than 10,000 inhabitants participate in cooperation, 89 percent of municipalities with 10,000–50,000 inhabitants and 94 percent of the large municipalities with more than 50,000 inhabitants participate (N=106).

3.4 Adaptation measures

3.4.1 National adaptation measures

National adaptation measures have concerned primarily the development of governance and regulation (see chapter 3.2). This entails directing resources to the development of adaptation and strengthening R&D activities, for example, through funding instruments of the Strategic Research Council, (STN), the Academy of Finland and the Government's analysis, assessment and research activities.

3.4.2 Regional adaptation measures

There is no all-encompassing information available on the concrete adaptation measures implemented and underway at the regional level. In the KOKOSOPU regional workshops, ongoing or already implemented adaptation measures related particularly to flood protection and stormwater treatment were discussed, as well as adaptation activities

carried out in different sectors such as agriculture and forestry. Long-term adaptation activities have been carried out in ELY centres, especially in water level regulation, overall management of water resources and flood risk management.

In many regions, adaptation planning is at such an early stage that adaptation needs have not necessarily been identified or concrete measures planned. Thus, actions according to specific plans have not yet been implemented either. The workshops also revealed that the implementation of adaptation measures lacks resources. However, not all ongoing activities that promote adaptation to climate change have necessarily been recognised as such, even if the measures, such as adjusting the permits for water regulation related to hydropower, have been carried out for a long while.

The preparation of strategic plans can also be considered an activity promoting adaptation. Regional councils began preparing climate programmes and strategies after 2008, and most of them were completed in the early 2010s (Sorvali 2012, Gregow et al., 2021). During this "first wave" of regional climate strategies, the focus was on mitigation. Adaptation was seldom considered, and therefore no concrete adaptation measures had been planned in most cases.

More than a decade later, the SUOMI project's report by the Finnish Climate Change Panel concluded that regions are at quite different stages in climate work in general and in planned adaptation action in particular (Gregow et al., 2021). With some exceptions, adaptation was still overshadowed by mitigation, but regions are currently activating adaptation action and its planning. The second wave of drafting climate strategies is underway. The adaptation sections or actions within regional climate roadmaps (Saikku et al., 2022) include both short-term adaptation plans and actions and efforts towards more strategic adaptation.

In several regions, adaptation issues are being included in the regional strategic plans for 2022–2025. In addition, climate roadmaps are being prepared in which adaptation issues are examined. So far, the Kymenlaakso region has been the first of the regional councils to prepare a separate climate change adaptation strategy (published on 16 June 2022), although the Climate Strategy of Lapland, completed in 2011, also focused on adaptation.

After the SUOMI project's report (Gregow et al., 2021) was published, several regions have started to implement some of the recommendations given in the report, such as hiring climate experts. However, it is not known to what extent the task description of the hired experts emphasises adaptation in comparison to mitigation.

3.4.3 Municipal adaptation measures

The municipal survey showed that adaptation measures have been taken, but also that adaptation work is only in the initial phase in a large part of the municipalities (Figure 6). About a third of municipalities with less than 10,000 inhabitants feel that so far there has been no need to invest in climate change adaptation. Those municipalities that have set a climate goal are clearly ahead of the municipalities that have no such goal. For example, almost 40 percent of municipalities with a climate goal have launched projects to promote adaptation. In municipalities without a goal, projects are implemented in less than 10 % of the municipalities (Figure 7).

Sectors that have already implemented most adaptation measures are those that have for a long time been paying attention to weather fluctuations and have a legal basis and advanced practices for planning and implementing measures. Flood protection, zoning, water supply and sewage, and especially stormwater can be seen as areas where action has already been taken. Instead, for example, in procurement, training and, somewhat surprisingly, also in rescue services, actions have been implemented in few municipalities only (Figure 8). This may be because Rescue Services mainly adhere to the concept of preparedness rather than adaptation, but also to the fact that potential long-term changes have not been examined.

Municipalities' perceptions on the success of adaptation measures correspond to the amount of experience relatively well. In those sectors where adaptation measures have been implemented the most, the measures have also been perceived as successful (Figure 9). However, communication and governance have been perceived as difficult. Over 40 percent of respondents felt that communication and governance had succeeded poorly or very poorly, and only 14 per cent that the measures had succeeded well or very well (Figure 9).

Figure 6. The state of adaptation action in Finnish municipalities, categorised according to the municipality's population. "What is the situation of adaptation action in your municipality? (Select all that apply)". (N=96; percentage of respondents that chose the option).

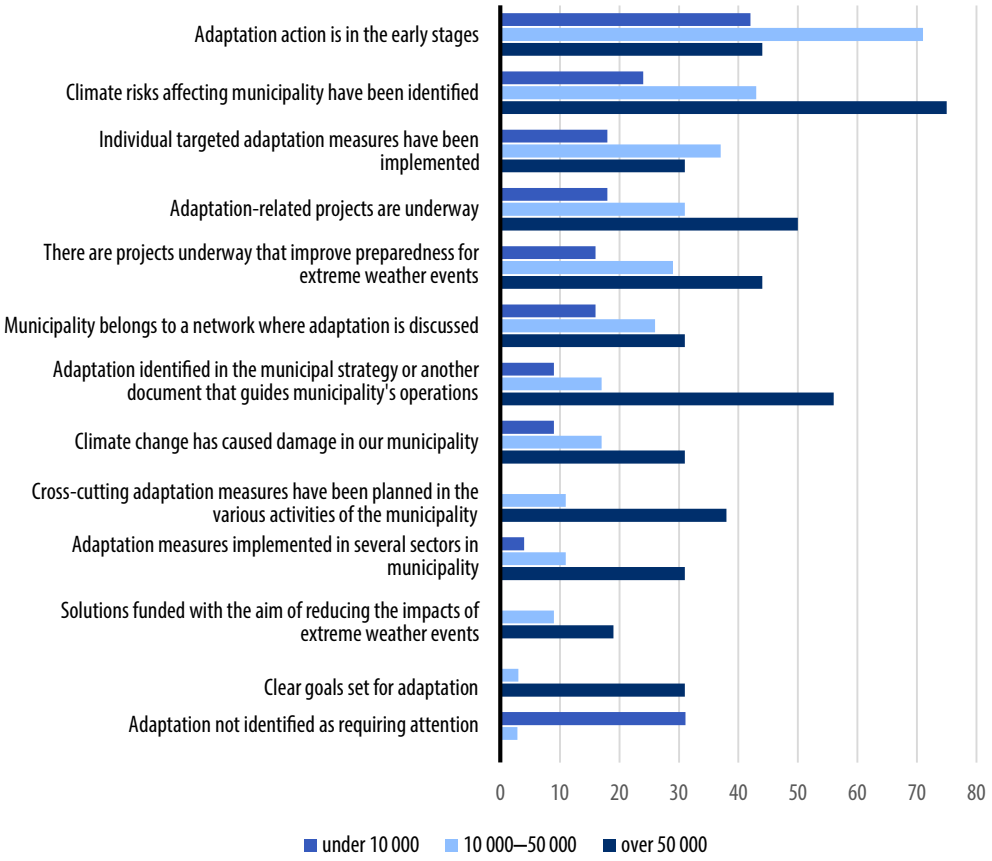


Figure 7. The state of adaptation action in Finnish municipalities, categorisation according to whether the municipality has set a climate goal or not. "What is the situation of adaptation action in your municipality? (Select all that apply)". (N=96; percentage of respondents that chose the option).

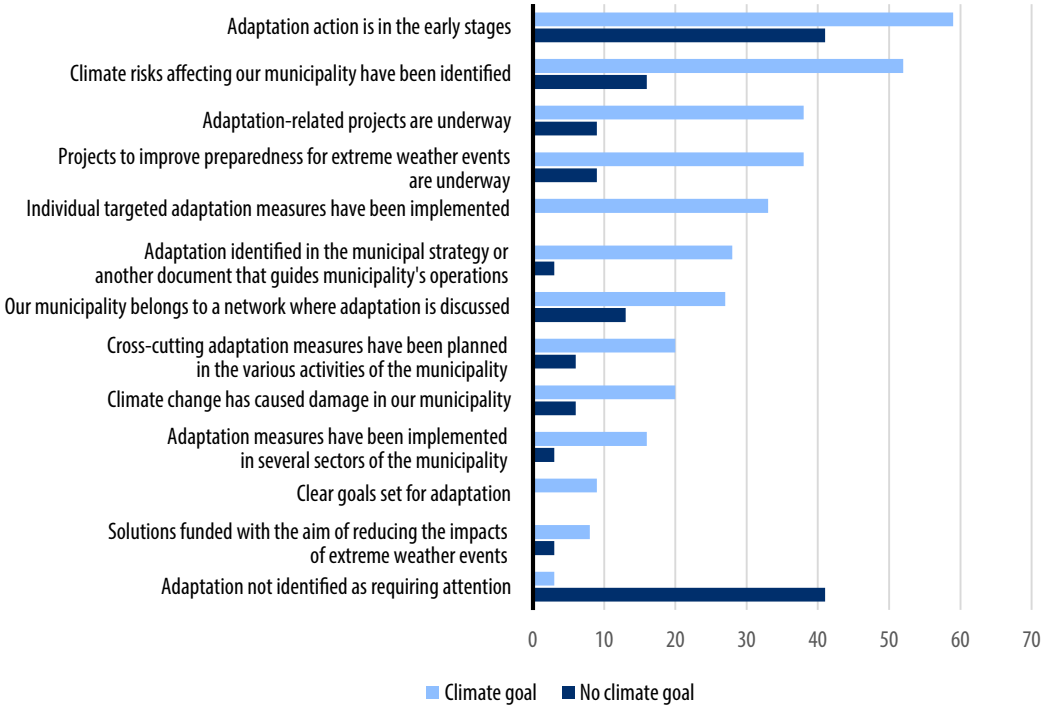


Figure 8. Implementation and planning of adaptation measures in municipalities by sector. "Has your municipality planned or implemented adaptation measures for the following sectors?", (N=148–155; percentage distribution of responses).

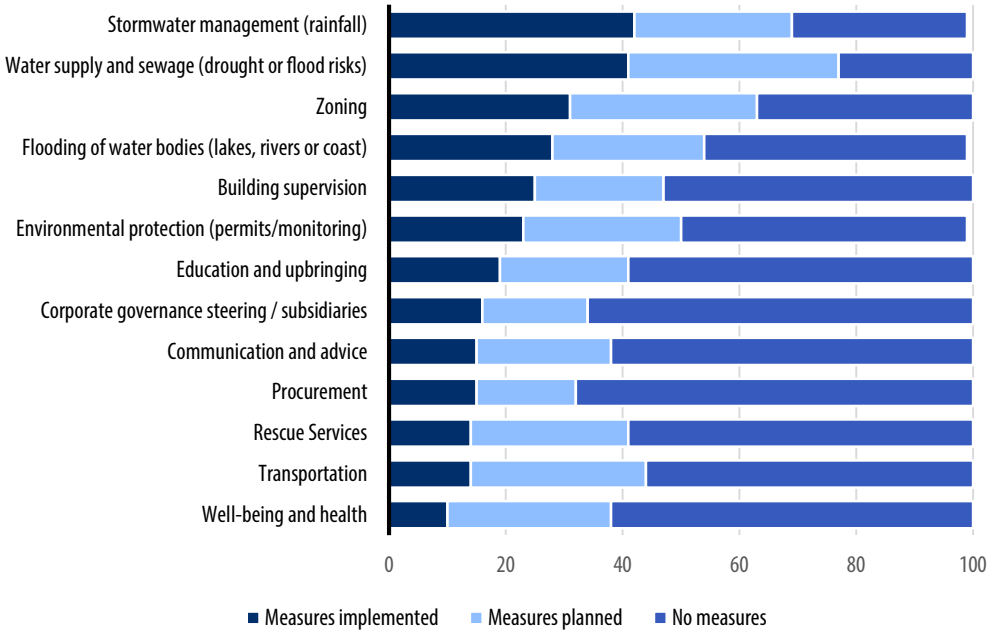
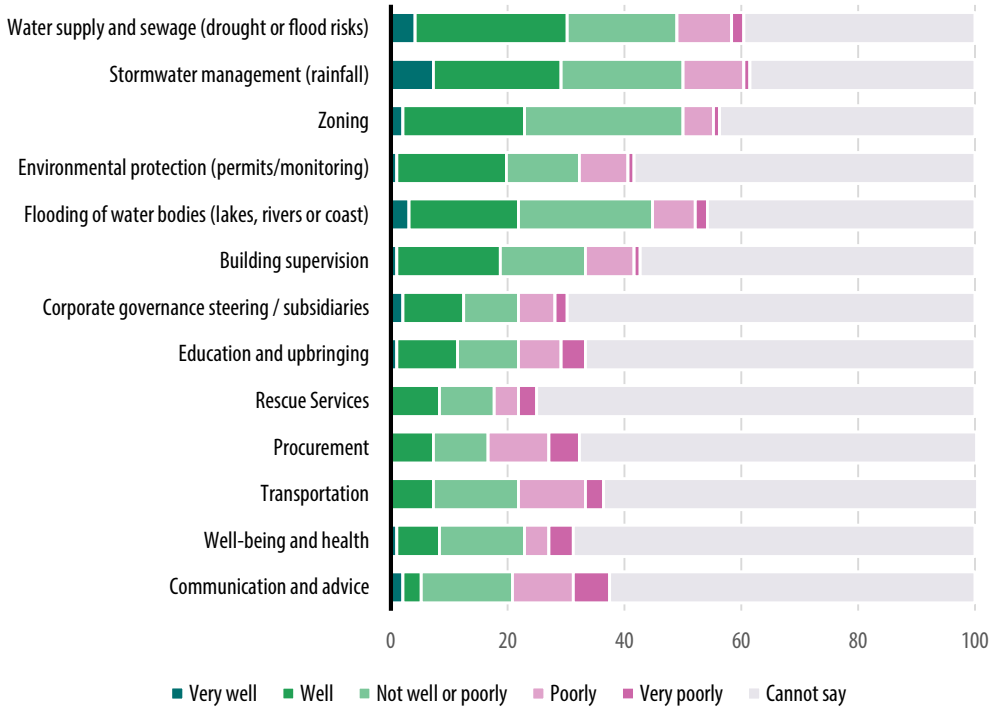


Figure 9. Success of adaptation measures in municipalities by sector. "Assess how well adaptation measures have succeeded in your municipality so far", percentage of respondents (N=96).



3.5 Resources of adaptation action

3.5.1 Resources and their evaluation

In this report, resources refer to human resources available for adaptation activities and funding directed to adaptation action. In terms of human resources, knowledge and know-how are central, but in the study, it was not possible to examine the educational background or other skills of the persons with tasks related to adaptation. In the workshops, however, the topic was discussed on a general level. Legislation and operating models can guide resources and enable access to them in adaptation activities, and this was examined in the municipal survey and workshops.

In the resource study, it became clear that evaluating the resources of adaptation activities is difficult, because adaptation action is often carried out alongside with other tasks and it is not easy to distinguish adaptation action from other activities. In addition, especially in planning for climate action it is also difficult to separate mitigation and adaptation activities as many plans cover both topics. Consequently, different people and different organisations evaluate adaptation resources in very different ways.

According to several interviewees of the resource study, organisations do not have specific monitoring working hours spent on adaptation tasks, and nor for climate action in general. This also makes it difficult to evaluate resources.

3.5.2 Central government

In the resource interviews, the representatives of the ministries estimate that tasks related to adaptation require from one to 56 person months (PM) in their organisation. There is a lot of variation in human resources between different ministries (Table 17). Three of the interviewees stated that they do not know how to estimate the resources and person months required for adaptation. The working time required for adaptation is not tracked in the worktime books, so it is difficult to give accurate estimates. In addition, the work related to adaptation goes along with the basic work in some ministries, and it is thus not specified.

In addition, in some ministries, tasks related to climate change are integrated into many different types of work, and climate issues cannot be separated from, for example, other themes of sustainable development. One interviewee stated that the annual variation in the number of tasks related to adaptation is very large, and a longer review period would be needed to get a better picture. According to another interviewee, tasks related to adaptation are performed without knowing that they are adaptation activities (for example, the Navy's training for adaptation to ice-free winters).

Table 17. Estimates of human resources in ministries

Human resources per annum (in PM)	Replies
< 1	1
1	1
1–2	1
12	1
13	1
42	1
56	1
Cannot say	3

Adaptation action carried out in ministries depends greatly on the sector of the ministry. Several ministries have tasks related to the preparation of a new National Adaptation Plan (KISS2030 project), which requires their work time. In addition, ministries make strategies, plans and reports related to their own sector, for example. Ministries also have specific tasks that may be related to adaptation to climate change. Such are, for example, safeguarding of energy supply and energy security in general, regional development, regulation related to buildings, safeguarding biodiversity and water services. The staff involved is mainly permanent, but there are also some temporary personnel, for example in time-limited projects.

When evaluating financial resources, the difficulty to evaluate the funds directly aimed at adaptation becomes again evident. They are not necessarily earmarked at the budget level. According to the interviewees, it is also a matter of interpretation: what is adaptation, what is mitigation and what is sustainable development? According to one interviewee, adaptation resources are currently evaluated in very different ways in different organisations, and it would be important for ministries, for example, to have a common framework for monitoring them. The ministries' estimates of the amounts varied widely, but only in one ministry were the amounts estimated to exceed 1 million euros (Table 18).

Table 18. Estimates of ministries' financial resources

Financial resources per annum	Replies
10 000–100 000 €	3
700 000–900 000 €	2
Over 1 million €	1
No funding instruments to be utilised for adaptation activities	1
Cannot say	1

Resources are both permanent (state budget framework) and temporary (projects, separate funding mechanisms). In some ministries, according to the interviewees, it is considered to be obvious that when temporary projects end, new projects will replace them. The amount of money allocated to adaptation depends, among other things, on the research projects ordered by the Government's analysis, assessment and research activities. During 2020–2022, an average of four projects were implemented each year with funding between 100 and 300 k€ per project. Funding is further allocated to adaptation related research, surveys and innovations through other funding mechanisms. In some ministries, budget funds are directed to advisory work. Funding is also directed to salary costs, training, and communication. For example, four ministries jointly contribute to the funding of the Climate Guide -portal that includes adaptation. The climate roadmap work of ELY centres is also supported, and money is allocated to, for example, the Finnish Environment Institute (SYKE) and ELY centres. Reporting of adaptation is a statutory task, but it provides only snapshots. According to one of the interviewees, it would also be interesting to use the monitoring data to explore trends.

The interviewees estimated that annual human resources should be increased slightly (2 answers), clearly (3 answers) or significantly (1 answer). Two of the interviewees did not feel confident to estimate future needs, and two considered that current resources are sufficient (Table 21). According to the interviewees, resource needs are focused on international and legislative tasks, monitoring and coordination, planning and management of adaptation. According to one of the interviewees, a change in thinking is also needed so that adaptation is on everyone's agenda all the time. According to one interviewee, organising adaptation activities is not necessarily a question of increasing personnel resources, but rather a question of allocation.

According to most of the interviewees, future annual funding should be increased slightly (2 answers), clearly (2 answers) or significantly (2 answers) in a 5–10 year time span. Three interviewees did not feel confident to estimate future annual funding needs (Table 22).

According to the interviewees, money is needed for personnel, research and preparedness related studies (proactive measures are more affordable), training (for example, trainings organised with the Finnish institute for health and welfare, THL, with the wellbeing services counties and the Association of Finnish Municipalities) and for implementing legislation. In addition, more resources are needed for service and maintenance, for example the maintenance costs of built infrastructure will rise. According to one of the interviewees, permanent resources should be increased in particular, because the risks are constantly increasing. To successfully prepare for the consequences of climate change, money is needed for implementation. Another interviewee considered the current resource situation related to climate issues to be good. The resources should at least remain the same, preferably increase, but it all depends on the political guidance and the government in power.

All interviewees thought that adaptation related funding should come from the state as targeted budget funding. In addition to this, EU funds were seen as a possible source of future funding, especially through LIFE projects. One of the interviewees stated that despite the potential, there is little practical experience in applying for EU funding and applying has been perceived as burdensome. The private sector is also seen as a possible source of funds.

The workshops revealed that financial and human resources are not the only challenge. Administrative sectors also have varying expertise of adaptation needs and measures. Information needs about risks, adaptation methods and, for example, organising monitoring are also very different in different sectors.

3.5.3 Regional resources

In the regional workshops and in the accompanying survey sent to participants the lack of financial and human resources was raised as a key challenge for the implementation of concrete adaptation measures. In the survey respondents were asked to rate statements on obstacles from 0 ”not significant at all” to 5 ”really significant”. The lack of funds needed to implement concrete adaptation measures (4.4), the general economic situation of the region and its municipalities (4.3) and the lack of human resources for adaptation related activities (4.1) were considered particularly significant challenges. There was also a lack of information and examples regarding concrete adaptation solutions (4). The economic structure of the region was also mentioned as a challenge for adaptation action (3.7). Based on the survey, the lack of interest by the organisation’s management in adaptation action (2.2), the lack of expertise on the impacts of climate change in the region (2.6) or the reluctance of companies (2.4) do not appear to be major challenges of adaptation action and planning.

Correspondingly, the second most important factor promoting adaptation was considered to be the availability of financial resources in the state budget for the implementation of regional adaptation measures (4.7 on a scale of 0–5, where 0 meant "would not support at all" and 5 "would support very much"). At present, adaptation action is carried out with few resources, often by a single individual. The key question for regional organisations is how to engage in project activities and adaptation activities more broadly given limited resources. The regional councils need climate experts and, in particularly, permanently employed experts specialised in adaptation issues, rather than temporarily hired staff in projects. Currently, adaptation is only one of the tasks of regional actors, and due to scarce resources, there is not enough time to do everything needed. Mitigation has attracted attention and other resources, but now both must be found for adaptation as well. Although projects can help initiate adaptation related activities and are therefore valuable, resourcing of adaptation action should be based on permanent funding instead of short-term projects.

Regional councils

According to resource interviews, regional councils use rather limited human resources for adaptation, at most six person months (PM) per year (Table 19). Most of the interviewees estimated that adaptation related tasks take less than one person month a year, and the rest of the estimates were between one and six person months. In the regional councils, the resources are partly permanent (work done with basic funding), partly temporary (for example projects, some employment contracts of climate coordinator etc.)

Table 19. Estimates on human resources of regional councils

Human resources per annum (PM)	Replies
<1	5
1	1
3	1
6	1
1–6	3

According to some of the interviewees, the separation of climate action into mitigation and adaptation is sometimes difficult, which makes it challenging to evaluate the resources used. In council organisations, adaptation is regarded partly a task on its own, partly belonging to other activities. Some councils have a separate (temporary) climate

expert or coordinator, and some councils have ongoing projects funded by the Ministry of Environment, which also covers adaptation. Based on the interviews, it became clear that adaptation issues are involved, for example, in regional planning, in tasks related to regional strategy, in the work of sustainable development experts, in transport planning and in matters related to social equality and integration.

Adaptation is a rising theme in many regional councils, and the work will increase in the future. In some regions, adaptation action is only at the beginning, and additional resources are needed to move the work forward. Adaptation involves learning, determining what adaptation is and what it requires from the councils. In many councils plans and roadmaps related to climate action and adaptation are underway, and in some councils, adaptation has been added to new regional programmes and strategies.

The regional councils have both permanent and temporary financial resources related to adaptation. The interviewees mentioned that the money related to adaptation is used for the salary of personnel, for various studies and projects, and for communication related purchased services. Part of the ERDF funding may go to adaptation related projects, but only the organisation's own financial resources have been taken into account in the estimates, except for the estimate of one expert, who also included ERDF-funds estimated to be about 35 percent of the funding of 1 M€) (Table 20).

Table 20. Estimates on financial resources of regional councils

Financial resources per annum	Replies
<10 000 €	3
10 000 €	2
30 000 €	1
30 000–50 000 €	
10 000–100 000 €	1
1 000 000 € (including 35 % based on ERDF funds)	1

Most of the interviewees estimated that in the future human resources (Table 21) should be increased either clearly (5 answers) or significantly (3 answers). In several regional councils, there would be a need for a permanent climate coordinator who would focus solely on climate issues, covering both mitigation and adaptation. In addition, permanent additional resources related to adaptation would be needed for regional development, municipal cooperation and coordination with municipalities and stakeholders. Human

resources would also be needed to get relevant sectors involved, and since some of the sectors inevitably do not perceive their own role in adaptation, the process would require a facilitator, either from a council or another entity. The interviewees identified that resources are also needed for communication, preparing reports, collecting and exchanging information, preparing climate strategies, monitoring the climate and circular economy roadmap or regional plans and measures, as well as ensuring food security and adaptation to climate change in agriculture.

Table 21. Estimates on annual human resource needs over a 5–10 year time span

Annual need of human resources	Regional councils	ELY centres	State Administrative Agencies	Ministries
Current resource is adequate	1	1		2
Should be increased (10–20 %)	2	1		2
Should be clearly increased (approx. 50 %)	5	2	1	3
Should be significantly increased (at least double)	3	1	2	1
Own estimate, approx. 30% increase		1		
Cannot say	1			2

The majority of those interviewed felt that funding should be increased in the future either clearly (4 answers) or significantly (3 answers) (Table 22). However, the quantity of additional resources needed also depends on the future responsibilities and obligations. If the regional councils are assigned adaptation obligations, then more money will be needed to implement them. In addition, the information needs of the future will affect the matter: If regional councils are given more responsibilities for fulfilling future information

needs, also more money will be needed. If the situation continues as before and the councils can utilise information provided by the Finnish Environment Institute and the Natural Resources Institute of Finland, less additional resources are needed.

Table 22. Estimates on annual financial resource needs over a 5–10 year time span

Annual financial resource need	Regional councils	ELY centres	State Administrative Agencies	Ministries
Current resource is adequate	1	1		
Should be increased (10–20 %)	1	1		2
Should be increased clearly (approx. 50 %)	4	3	2	2
Should be increased significantly (at least double)	3	1	1	2
Cannot say	4			3

One interviewee estimated that in the future, adaptation may be integrated into studies that are carried out anyway, in which case the need for additional resources is more limited. However, with additional resources adaptation could, for example, be better included in the update of the regional strategy and the climate roadmap. Another interviewee considered adaptation to be relatively straightforward, but at the same time vague, which is why adaptation perspectives are sometimes forgotten in climate related studies. Additional resources might make it possible to take adaptation into account more often. Money would also be needed for outlining different perspectives in relevant studies, concretising adaptation and creating examples, so that more in-depth analyses could be included in various studies.

According to the interviewees, money is also needed to hire employees. One interviewee mentioned the need for a human resource that would be able to "multiply" the money budgeted for the human resource so that they could initiate and work on projects. Another interviewee estimated that it would be good to have a cooperation group for

regional adaptation, where relevant actors in the region could exchange information and cooperate. Leading such a group could be the responsibility of a representative from a regional council, but this should possibly be made into a mandatory task to secure resources. In the interviews several topics were identified as needing additional resources. These include the preparation, monitoring, and promotion of climate plans, possibly through procurement, increasing one's own expertise, research, training for operators in the area, funding of experiments and pilots (a certain sector, such as forestry, agriculture, stormwater) and supporting climate action in municipalities.

The source of future funding was mainly seen to be the state, especially in the form of budget funding and funds provided for projects and studies. In addition, one interviewee also mentioned the need for so-called start-up money, which could be used to initiate adaptation activities. Another interviewee suggested that it would be good if obligations related to adaptation for regional councils were specified by the state, which therefore also would provide money for the tasks. Several interviewees also considered EU projects as a good means of funding, and adaptation was considered an important theme of the projects. In addition, the interviewees considered it good to increase the region's own funding, because it would enable more permanent activities. However, this was seen to be very unlikely because municipalities are generally not willing to raise membership fees.

In addition to money, the interviewees hoped for information, communications, background studies and future forecasts for different sectors, especially related to agriculture, food and energy issues. In addition, training and guidelines are needed. One interviewee pointed out that, in general, when talking about adaptation, only bad outcomes are seen and it would be good to try to take into account not only the risks but also the opportunities. Another interviewee pondered that funding is a problem in general for climate actions, so the question is how climate actions could be turned into a profitable business and that climate action would clearly be the more economically profitable option, in which case climate action could be pushed forward more easily.

One interviewee mentioned that the representation of the regional councils should preferably be strong in preparing the National Adaptation Plan and when considering the regional component. According to the interviewee, adaptation is perceived above all as a question of preparedness. It would be important to widely examine the regional impacts of climate change and adaptation, so that the regional councils could pass this information on to the municipalities.

Centres for Economic Development, Transport and the Environment

The representatives of the ELY centres provided views reflecting their organisation and specific sector within the centre. The Pirkanmaa ELY Centre has done a preliminary mapping of the adaptation activities of all ELY centres as part of the Climate Roadmap project and responded based on that work.

Evaluating adaptation resources in ELY centres was equally considered challenging due to its dependence on the definition of adaptation: if the tasks, that are related to adaptation in some way, are counted, the number is large, but if the focus is solely on work that is specifically designated as adaptation to climate change, then the work is just beginning. Some of the representatives had basic understanding of adaptation activities in units other than their own, but no quantitative estimates. In some units, adaptation activities are not carried out as such, but funding is granted for projects that aim, for example, at the adaptation of agriculture and forestry.

Table 23. Estimates on human resources of ELY centres

Human resources per annum (PM)	Replies
12	3
48	1
120	1

The interviewees estimate that human resources used for adaptation range from about 12 to 120 person months (Table 23). Human resources are both permanent (official work) and temporary (projects, some employment contracts). According to the interviewees, the human resources for adaptation measures in ELY centres are related, for example, to the process of preparing climate and circular economy roadmap of ELY centres, the planning processes of flood and drought risk management, the planning and advice of adaptation measures in different areas of responsibility (especially in terms of water resources and agriculture), as well as funding decisions, monitoring and evaluation. In addition, a small number of adaptation related tasks were mentioned in connection with land use planning, in connection with general and site plans and stormwater management. In addition, ELY centres have projects with a connection to adaptation to climate change (such as flood risks, nutrient load from agriculture and forestry and general water management). Some projects are primarily aimed at mitigation, such as the project 'Carbon-neutral

Pohjois-Savo, but a part of the activities goes to adaptation (for example, organising various events, workshops, regional studies focused on municipalities as a background for adaptation activities).

Based on the Climate Roadmap project of the ELY centres, the estimated annual human resources is approximately 800 person years. According to the interviewees, this number includes all statutory activities that can be regarded as adaptation, as well as the work done by climate experts at the ELY centres. The estimate of the personnel resources of all ELY centres is based on the fact that a total of about 2,700 people work in ELY centres, of which, based on this assessment, about 1,900 people contribute part-time to adaptation, which would correspond to 800 person years. The interviewees said that in the study carried out, water tasks of all ELY centres were estimated to be 100 percent adaptation and the other tasks in the environmental responsibility area 20–80 percent adaptation. In the area of business and industry, agriculture, fisheries and finance were estimated to include 20 percent adaptation, other tasks 0 percent. In the area of transport, road maintenance planning was estimated to be 40 percent adaptation, other tasks 0–20 percent. These proportions indicate a potential rather than an actual work effort devoted to adaptation.

According to the interviewees, ELY centres have both permanent (posts) and temporary (projects, distributed project funding) resources related to adaptation. The majority of those interviewed in ELY centres estimated that 100,001–1,000,000 euros of financial resources are used annually, and one interviewee estimated that 2–3 million go to projects that partly include adaptation (Table 24).

Table 24. Estimates on financial resources of ELY centres

Financial resources per annum	Replies
100 001–1 000 000 €	3
400 000 €	1
600 000 €	1
2–3 million €	1

Based on the report that evaluated the resources of all ELY centres, the combined financial resources for adaptation of all ELY centres would be around 190 million euros. The amount includes expenses for the use and management of water resources, support for water and fisheries projects, the Climate resilience of the Baltic Sea co-operation project, environmental damage prevention, some nature conservation expenses, promotion of

water and environmental management, and acquisition and compensation expenses for nature reserves. The financial resources of the transport sector are not included in this calculation. The estimate is indicative, and it includes all resources that include adaptation as one aspect.

The interviewees estimated that future annual resource needs will increase in the coming 5–10 year time frame (Table 21), because climate change and adaptation issues receive increasing attention in, for example, agriculture, and urban planning. According to the interviewees, additional resources would also be needed to develop adaptation and prevent adverse impacts in water resources management and water protection. In rural matters, the new funding period of the EU begins in 2023. In the future, climate and environmental issues should be stressed even more in all funding decisions, and more resources are needed to administer the processes. One interviewee pointed out that there is a need especially for coordinators who can advise applicants on climate change issues. There are various supervisors and inspectors in the ELY centre, but it is not certain that they can provide adequate advice in matters of climate change or that climate advice is taken seriously.

The interviewees, who had evaluated the resources of all the ELY centres in the Climate Roadmap project, noted that more resources are needed especially in the substance sectors, so that more adaptation related tasks can be carried out. In particular, the lack of stormwater experts is significant, and this applies to almost every ELY centre. Climate change issues require dedicated expertise. Therefore, they estimated that the number of climate experts and coordinators should be doubled. Currently, ELY centres have two permanent climate experts and the others are temporary. At the moment, the experts have started to organise adaptation training for the ELY centres so that all different substance expert can take climate change into account in their work.

Most of the interviewees thought that the future annual funding should be increased in a 5–10 year time frame (Table 22). One interviewee argued that the continuity of the current funding should be secured and that money will be needed in the future at least as much as has been received recently.

Regarding the most important funding targets in the future, the interviewees mentioned studies, training, familiarisation of new employees to the topics of adaptation, and the maintenance and development of competence. In addition, additional resource needs were identified in agriculture and forestry and land use planning. Also, for example, in the transport sector, the road network suffers increasingly from heavy rainfall and temperature fluctuations, creating demands for additional funding in road maintenance.

According to those who surveyed the resources of all ELY centres, the need for additional resources depends on the task. For example, road maintenance needs additional resources to adapt to the adverse consequences of a changing climate. In the case of nature conservation, the reallocation of existing funds is important, as there are currently actions, such as developing ecological corridors, that cannot be funded through any channel in use. On the other hand, if the objective of adaptation is added to the Nature Conservation Act, there will also be a need for resources to start new activities devoted to adaptation.

According to all interviewees, future resources should come from the state in the form of targeted budget funding and project funding. Project type funding is not suitable for long-term work, and therefore, to develop activities, the funding should be more long-term than project funding. According to the interviewees, projects are a good addition and can be used to inspire basic activities, but they should form side-lines rather than basic activities. Some of the interviewees also mentioned the structural funds of the EU, and one interviewee stated that the ELY centre in question could be involved in the LIFE project as an operator but would not apply for funding.

Regional State Administrative Agencies (AVIs)

According to the interviewees, regional state administrative agencies (AVIs) use approximately one person month or less on adaptation. The resources are mainly permanent, and temporary personnel is used occasionally to clear backlogs. Tasks related to adaptation are mainly integrated with other tasks, and these are related to dealing with problems caused by climate change in various sectors. For example, in the monitoring tasks of the Rescue Services, attention is paid to how well fire and rescue departments are prepared for forest fires. In addition, judicial control by the Rescue Services and matters related to promotion of societal preparedness are counted as adaptation tasks, although there are few activities beyond the identification of potential threats. In addition, the regional state administrative agencies use work time in their internal climate group and in a common climate group with the ELY centres.

According to one of the interviewees, the EU Recovery and Resilience Facility Funding Instrument (RRF money) will grant funding to regional state administrative agencies to pay for 4 person years (the AVIs of Southern Finland, Northern Finland, Western Finland and Eastern Finland) implementing the Green transition. The purpose of the money is to hire additional personnel for processing water management applications and for rescue and preparedness work.

The interviewees of the regional state administrative agencies estimated that in the future human resources should be increased significantly (2 answers) or clearly (1 answer) (table 21). Additional resources are needed to monitor the consequences extreme

weather events or other sudden changes, to plan measures and prepare for them, and to ensure the maintenance of societal functions. Resources devoted to the activities under the strategy "Creating a Sustainable Future" of the regional state administrative agencies and ELY centres (https://tem.fi/aluehallintovirastojen-ja-ely-keskusten-strategia-asiakirja-2020-2023), appear to have decreased, and at the moment additional resources would be needed even for getting the statutory tasks done. One interviewee argued that support is needed from the supervising ministries. For example, there was no mentioning of climate change, Green economy or Green transition in the performance agreement negotiations.

All the interviewees of the regional state administrative agencies estimated that less than 10,000 euros are used per year on adaptation. These resources based on budget funding. Resources are used for personnel costs, property and equipment maintenance, and development tasks. There have been separate development projects, for example a drought-related preparedness exercise was organized with the Finnish Environment Institute and the Southwest Finland's ELY centre as part of the Winland project funded by the Strategic Research Council.

According to the interviewees, there should be either clearly (2 answers) or significantly more money (1 answer) for adaptation in the future (Table 22). According to the interviewees, the greatest resource needs concern training and preparing personnel, for example in the form of situational picture systems and regional risk assessments, which should take climate change into account. There may also be investment needs. When allocating resources, "the question is about using working time for the assessment of the impacts and planning of measures, and how to prepare for future conditions". All interviewees of the regional state administration agencies thought that funding should come from the state budget or possibly from the EU.

ERDF, ESF and EAFRD funding for adaptation projects

ERDF, ESF and EAFRD have been able to fund adaptation measures, even though adaptation has not been a priority area in Finnish programmes. We searched for funds distributed from the ERDF and ESF funds using the following keywords: "climate" AND/OR "climate change" AND/OR "adaptation" in the Eura 2014 Service. (Table 25). Each search term was used once individually, with some overlapping results.

A total of 40 funded projects specifically related to climate change adaptation were found (Table 26). Adaptation related projects are those that are either directly related to or aim at adapting to climate change (for example, CLIMINI: Adaptation of reindeer husbandry to climate change) and those where adaptation is one aspect of the project, but not the main goal of the project (for example, BlackGreen – North Karelia's Biochar Programme, which

mentions adaptation as follows: "Promotes the management of plant production risks as the climate changes"). Six projects were related purely to adaptation, and the remaining 34 were indirectly related to adaptation.

Table 25. Climate projects funded from ERDF and ESF funds.

Search word	Total results	Adaptation related projects
climate	188	21
climate change	148	15
adaptation	43	7

Table 26. Targeted funding for climate projects (ERDF and ESF)

	Total of search results (search word "climate")	Climate change related projects (subset of search word "climate")	Adaptation related projects (subset of search word "climate")	All adaptation related projects found using all the search words
Number	188	121	21	40
Funding	30 942 044 €	24 559 291 €	7 693 581 €	15 178 103 €

The search word "climate" matched a total of 188 projects, of which 121 projects were related to climate change in some way. Of these 121 projects, there were 21 projects related to adaptation to climate change. Based on this search, a little over 24 million euros have been granted to projects related to climate change, of which a little over 7.6 million euros to adaptation related projects, which is about 31 percent of all the project funding related to climate change.

In the new programme period 2021–2027, ERDF action line 2 "Carbon-neutral Finland" has a special goal "Promoting adaptation to climate change, risk prevention and disaster preparedness and recovery". The funding planned for the special goal is approximately EUR 37.8 million, which is a good 8 percent of the planned funding of the entire line of action (Ministry of Employment and Economy 2022).

Table 27. Climate projects financed by the Fund or Rural Development

	Projects with search word "climate change"	Projects related to adaptation
Number	39	8
Funding	8 037 999 €	1 899 937 €

In the Fund for Rural Development 39 projects were found with the search word "climate change", of which 8 projects were related to adaptation in some way. The funding share of adaptation related projects is about 24 percent of all projects found with the search word "climate change" (Table 27).

3.5.4 Municipal resources

When talking about climate action in general, 80 percent of the municipalities that responded to the survey said that the municipality does not have enough financial resources of its own to achieve climate goals. The resources available for municipalities to adapt vary considerably between municipalities, and the size of the municipality significantly influences the amount resources available. Some of the large municipalities have been able to invest in adaptation activities, and they have implemented, for example, risk assessments and developed their planning. Small municipalities do not have resources to even apply for funding intended for development activities. In the survey, almost 70 percent of the municipalities with less than 10,000 inhabitants reported a lack of resources as an obstacle to adaptation activities, whereas the corresponding figure for municipalities with more than 50,000 inhabitants was about 50 percent (Figure 4). In poorer municipalities, adaptation work has not started at the same pace as in the wealthiest municipalities. In poorer municipalities there are significantly fewer projects promoting adaptation than in municipalities with a higher annual contribution margin (Figure 10). Municipalities with a low annual contribution margin have also not been able to participate in network cooperation to the same extent as municipalities with a higher contribution margin.

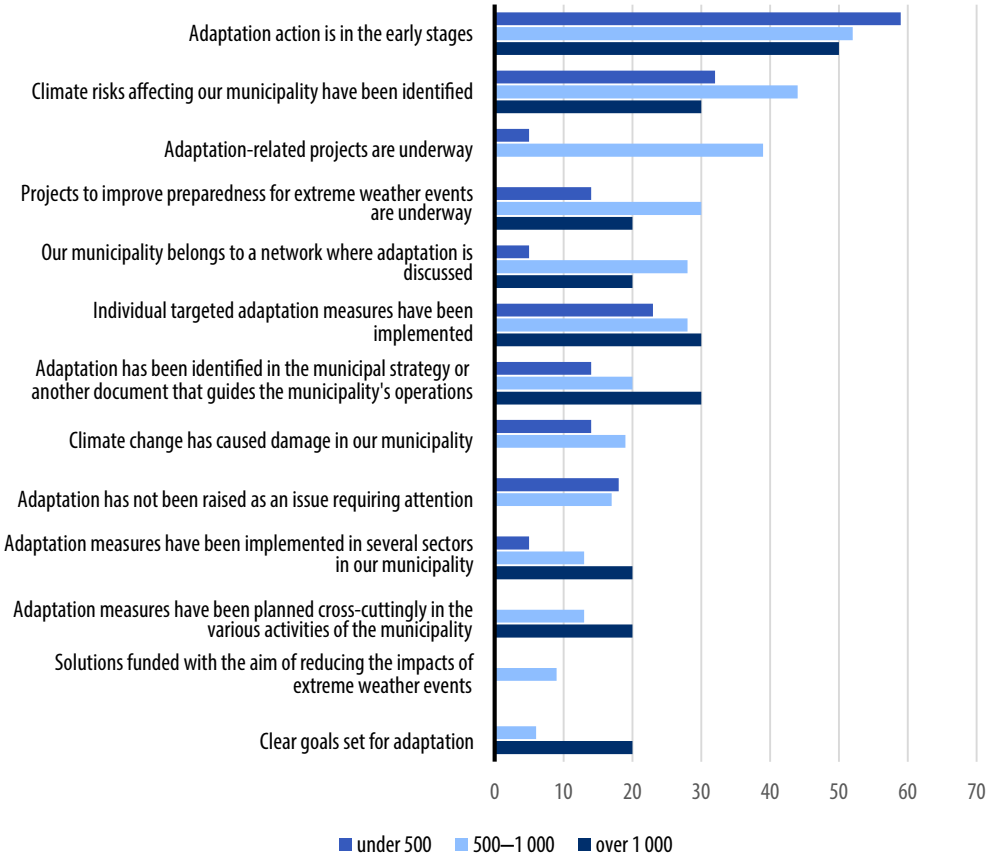
The variation in municipalities' resources affects, for example, the organisation of activities, which is essential for adaptation and preparedness. For example, in the water supply and sewage sector, the preparedness largely depends on the access to resources (municipalities are responsible for organising water supply and sewage), and

on external factors, such as the COVID-19 pandemic and financial challenges in the social and healthcare sector. Without dedicated resources it is difficult to make necessary investments in the sector (MAF 2021b).

In the analysis of the operational environment of the Rescue Services and civil preparedness (Puustinen and Kekki 2020), it was noted that challenges related to the adequacy and maintenance of regional operational readiness will increase in the future due to significant regional variation of risks (including climate change impacts) and circumstances. The regional risk assessments have not yet considered, for example, the effects of an aging population on rescue operations, migration towards urban centres or the decrease in tax revenues. Instead, attention has focused on real-time rescue operations or advance preparedness (Puustinen and Kekki 2020). A wide range of societal actors participate in the cooperation between regional fire and rescue departments and other regional authorities. These include regional preparedness committees (or similar institutions), regional preparedness cooperation committees of businesses (ELVAR), municipal preparedness networks, joint activities led by regional state administrative agencies, regional emergency management group work, joint activities etc. with the voluntary rescue services and the Leader networks of rural development, as well as wider cooperation between fire and rescue departments (HIKLU cooperation). (ibid) Regional and economic restructuring and development can therefore significantly affect the continuity of operations in the future.

In the regional workshops of the KOKOSOPU project, the challenges related to the maintenance of human resources in municipalities and regional councils were also pointed out. The role of experts and coordinators is essential for obtaining funding, for example, from the regions. A long-term perspective is therefore important in considering human resources.

Figure 10. The situation of adaptation action in Finnish municipalities, categorised according to the municipalities' annual contribution margin (euro/inhabitant/year). "What is the situation of adaptation action in your municipality? (Select all that apply)". (N=96; percentage of respondents that chose the option).



Human resources available for climate action vary considerably in the municipalities (Figure 11). In small municipalities, task related to climate change are additional tasks for officials with other main tasks, whereas larger municipalities have dedicated human resources for this. Municipalities utilise a lot of expertise from other municipalities or joint municipal authorities (Figure 12). This is practised more in larger municipalities, which is logical, because they generally do more climate action as well. The regional councils were also a key source of climate expertise. Climate related education has not reached small municipalities, and the opportunities to participate in various advisory events are also more limited than in large municipalities. Universities, colleges and research institutes are important climate cooperation partners for municipalities of all sizes, although the use of this knowledge resource is stronger in the large municipalities.

Figure 11. Organization of climate action in municipalities, categorised according to the municipality's population. "How is climate action organized in your municipality (select one or more options)". (N=64; percentage of respondents that chose the option).

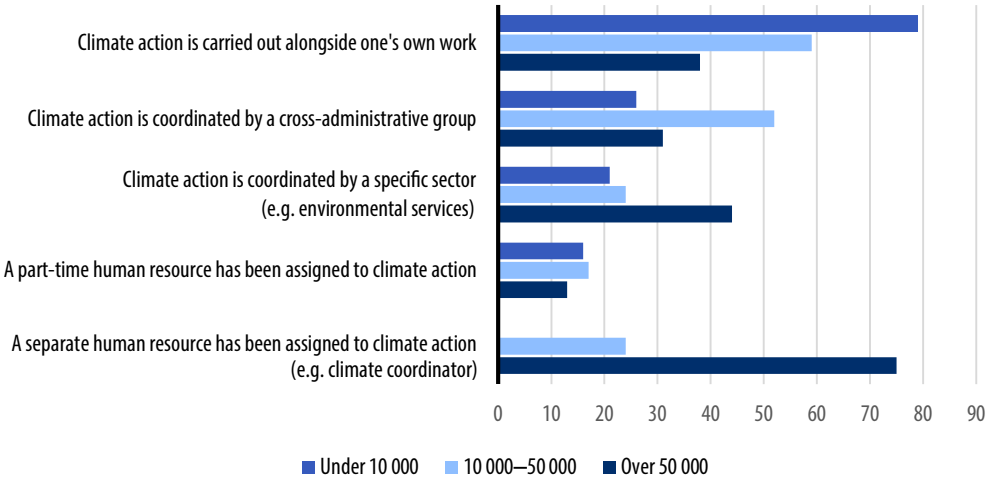
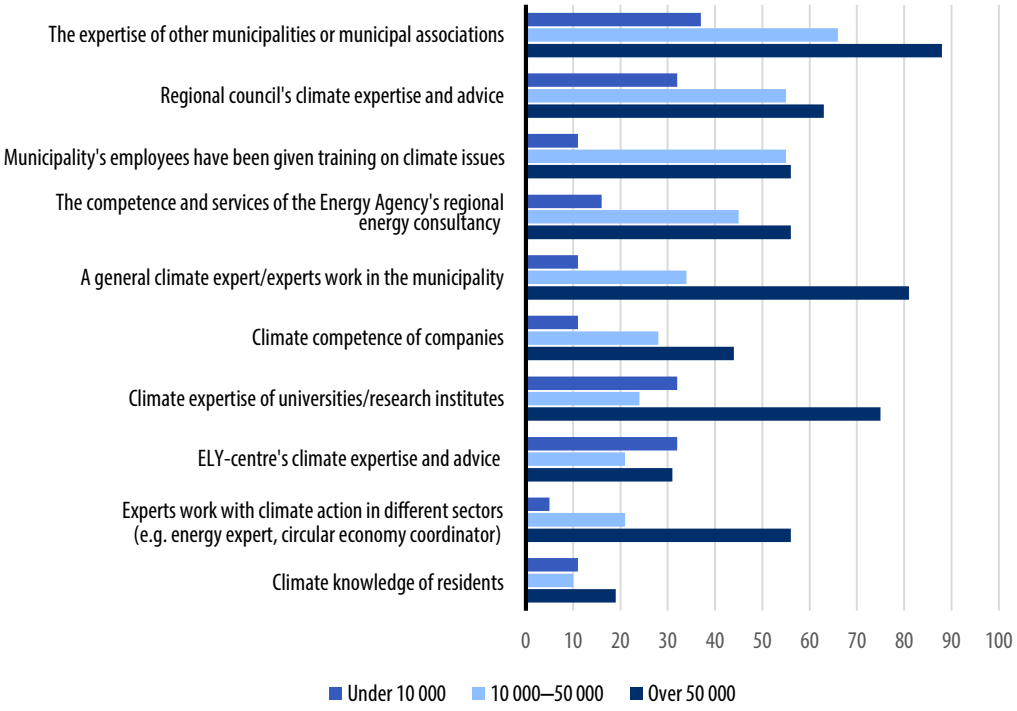


Figure 12. Climate expertise utilized by the municipality, categorised according to the municipalities' population. "What kind of climate expertise is used in your municipality? (Select one or more)". (N=64; percentage of respondents that chose the option).



3.6 Monitoring, evaluation and research

3.6.1 Monitoring data

It is essential to specify whether monitoring aims to track the implementation of adaptation measures and policies, their impacts or the actual adaptive capacity. Thus far, the evaluation of adaptation action has focused on policy monitoring. In order to evaluate the development of the adaptive capacity and possible shortcomings in it, scenarios examining the progress of climate change are needed. Thus far, this work has not been carried out in the administration, but scenarios have been prepared and analysed in research projects (Lehtonen et al., 2021b, the EU project OPERANDUM and the VNTEAS KUITTI project, where costs were estimated in relation to a situation where adaptation or preparedness for climate change does not take place, Perrels et al., 2022). Monitoring data that supports adaptation is available, for example, from the databases of Statistics Finland and research institutes.

ELY centres monitor the state of the environment and generate information that can be used in a variety of ways to support adaptation activities. ELY centres monitor impacts of climate change, and especially in hydrological monitoring, long time series are available. They can be used as a base for projecting future risks and preparing for changing conditions during different seasons.

Data supporting adaptation monitoring sector by sector is currently available for the conservation of water bodies and the sea, and for biodiversity and flood protection (for example, flood risk maps). In the Climate Programme of Metsähallitus (2020) impacts of climate change on forests and options for adaptation are to be monitored to support planning and the management and use of nature conservation areas. So far, however, no clear goals or metrics have been set for monitoring.

Under the Ministry of Transport and Communications (MTC), concrete measures are monitored with precise performance and effectiveness reports. The goal of the Transport Safety Strategy (MTC 2022) is to develop transport safety based on up-to-date statistical information. In addition, the ICT sector intends to prepare tools that facilitate monitoring of climate and the environment.

The indicators created to support Government in monitoring progress towards the Sustainable Development Goals (SDGs) do not include specific indicators on adaptation.[18]

18 https://kestavakehitys.fi/en/indicator-baskets

According to the mid-term evaluation of the National Adaptation Plan, the implementation of indicator work and the organisation of monitoring have not yet started on a wider scale. However, not all adaptation can, nor should, be considered as driven by the policy measures or instruments in the Adaptation Plan, because a lot of adaptation activities progress 'spontaneously' or without being classified as adaptation action (Mäkinen et al., 2019).

Regionally adaptation monitoring has been actively developed in Pirkanmaa as part of regional adaptation planning. The Kymenlaakso Regional Council has recently led the preparatory work for the regional adaptation strategy 'Climate Resilient Kymenlaakso', as part of which monitoring and evaluation of the strategy was also prepared, for example, with the help of adaptation indicators.

Monitoring data on adaptation at the local level is mainly available from bigger cities (especially members of the Covenant of Mayors network) that have necessary resources and that have also identified the need for managing key climate and weather risks. In the Helsinki Metropolitan Area, efforts have been made to promote monitoring of the effectiveness of adaptation measures based on the indicators developed by Helsinki Region Environmental Services (Kankaanpää 2017).

3.6.2 Evaluations to develop adaptation activities

The mid-term evaluation of the National Adaptation Plan (2014–2022) identified the following goals for developing adaptation: 1) improving awareness of weather and climate risks and the need for adaptation, 2) clarifying the roles and responsibilities related to adaptation and ensuring sufficient coordination, and 3) the development of policy instruments to support adaptation and the development of instruments that promote the implementation of policies (Mäkinen et al., 2019).

The SUOMI project of the Finnish Climate Panel also examined and internationally benchmarked the evolution and active development of policies promoting adaptation, especially from the perspective of existing and possible policy instruments such as adaptation reporting mandate, the Green Factor, climate roadmaps, cross-sectoral participative decision-making support forum. In addition, the project compiled information on the economic consequences of climate change impacts, the state of regional adaptation activities and projections of climate risks that are central to regions and marine areas. (Gregow et al., 2021)

The VNTEAS KUITTI project examined direct and indirect costs of inaction related to climate change from the perspective of Finnish economy in different scenarios and assessed the availability of information needed to estimate the economic impacts of climate change and adaptation in Finland. In addition, the project provided an overview of innovation needs and alternatives that serve adaptation. (Perrels et al., 2022)

Monitoring of adaptation has varied across administrative sectors. So far, only the environmental administration has consistently evaluated the implementation of the adaptation action programme. Based on the evaluation, progress has been made in taking adaptation needs into account in the administrative branch led by the Ministry of the Environment, but the consistency of governance, the planning of adaptation actions and the knowledge base need to be developed further. In addition, regional and cross-sectoral cooperation between authorities should be strengthened and efforts should be made to bring local and regional perspectives and experiences into adaptation planning (Mäkinen and Hildén 2020).

Monitoring or the development of monitoring have been mentioned in the strategies or adaptation plans of various sectors, either as a goal or in the policy measures. Cross-cutting monitoring has been implemented, for example, in monitoring and evaluating the implementation of the Arctic Policy Strategy (PMO 2021) and the Sustainable Development Goals (Agenda 2030) (Berg et al., 2019).

According to the revised Climate Act (423/2022), the measures included in the Adaptation Plan must in the future reflect the goals of Section 2 of the Act. Adaptation measures can thus be refined, for example, in relation to achieving the goal of carbon neutrality or according to the progress of climate change. In addition, an evaluation of the Adaptation Plan should be made during the Parliamentary election periods when there is no obligation to draft a new plan (Section 1). This official interim evaluation should examine the need to update the plan and the need for new measures.

3.6.3 Research and development supporting adaptation

Research on climate change impacts and adaptation has become well-established in the field of climate research. Adaptation research is carried out in national projects, where significant funders include, for example, the Academy of Finland, the Strategic Research Council (SRC), ministries and the Government's analysis, assessment and research activities (VNTEAS). National research institutes, universities and universities of applied sciences also actively participate in international research and development work, especially through funding received from the European Union.

Key research themes include:

- climate change impacts in different sectors and parts of Finland, for example agriculture and forestry, health, construction and other infrastructure, ecosystems and the Arctic region;
- specification of global and European scenarios for Finland, for example, Representative Concentration Pathways (RCP) and Shared Socioeconomic Pathways (SSP);
- assessment of climate risks, looking not only at the risk factors, but also at exposure and vulnerability at the national, regional or local level, as well as the assessment of the costs of inaction related to climate change;
- adaptation and improving resilience using, for example, nature-based solutions for managing floods and waterways in urban areas;
- cross-border impacts and policy actions for their management.

Project funding strongly directs R&D activities dealing with adaptation issues in Finland. The VNTEAS projects and the R&D funding of the ministries have produced targeted information for the needs of policy development. The projects are usually relatively short-term (about one year or shorter). In the projects, information can be compiled to support, for example, drafting of legislation or strategies. The research funding of the Academy of Finland, SRC and the EU is more long-term and enables focusing on new topics such as cross-border impacts and the utilisation of scenarios. There is a special need for R&D activities that apply the results of long-term theory-oriented research to practical applications and tools and to the development of follow-ups. For example, LIFE -project funding, part of Business Finland's funding and EU mission funding[19] are suitable for this. Demand for this type of R&D activity is growing, but its implementation requires joint development between private sector, research communities and administration. Finland has not yet been a pioneer in this.

19 https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change-including-societal-transformation_en

3.7 Overall evaluation of the current state of adaptation in Finland

3.7.1 Strengths

General awareness of the impacts and risks of climate change and adaptation to climate change has strengthened. This can be seen, for example, in numerous documents and public discourse referring to adaptation.

The revised Climate Act obliges authorities to take adaptation actions into account more decisively and to carry out analyses and actions that promote climate resilience in various sectors. The National Adaptation Plan and the Act's general obligation to promote the objectives of the Climate Act encourage authorities to develop adaptation measures.

Many other legislative reforms (for example the Nature Conservation Act, the Rescue Act, the Buildings Act) have taken climate change into account as a key factor influencing the operating environment, and new regulations enable more flexible ways of dealing with climate change impacts. The guidance on adapting to climate change and assessing climate impacts has also been strengthened nationally, and EU-level guidance has been considered.

Regional cross-sectoral studies have become more common due to the active role of regional councils and ELY centres. They are expected to improve the base for the implementation of concrete adaptation measures also in those municipalities that do not have sufficient resources for active planning of adaptation measures.

ELY centres have abundant information and professional expertise supporting adaptation and preparedness, which can support adaptation planning in the municipalities and regions. For example, flood protection, guiding land use planning and supervision of several substance laws are key tasks of ELY centres. The regional councils have from their side also paid increasing attention to the strategic planning of adaptation.

The need to plan measures is becoming clearer in the municipalities, and the willingness to plan and implement adaptation measures is good. Many of the cities with more than 50,000 inhabitants that are actively involved in climate action have also included adaptation measures in their strategic planning. Cities also actively use their own networks to share good practices and develop ideas.

Adaptive capacity is strengthened in many administrative branches with measures that generally improve preparedness for risks and various extreme conditions. These are not always identified as adaptation measures, but they support general societal resilience.

R&D activities on climate change have been carried out in Finland for a long time. Consequently, research information supporting new practices is available to be used in regions and municipalities. This also enables the development of climate services, for example the ClimateGuide.fi and the operation of the Flood Centre. Other guidelines have also been prepared, such as guidelines on the assessment of climate impacts of projects and legislation.

3.7.2 Challenges

General nature of the goals

The research material of KOKOSOPU shows that climate change is widely referred to, but no obligations or concrete goals have been set for adaptation. In this respect, adaptation activities differ from climate change mitigation, where national, quantitative emission obligations set clear frameworks for all actions.

National, regional and local adaptation goals are general, and it is difficult to monitor their realisation. In the absence of statutory obligations, authorities can, within their limited resources, only encourage stakeholders outside the public sector to adapt. Due to the lack of resources, the incentives are mainly information based.

Adaptation to climate change has not yet been prioritised, for example, in regional development work, although its significance has been recognised at a general level. In addition, the broad scope of adaptation, the absence of quantitative goals and obligations, and the challenges in assessing impacts, costs and benefits have formed stumbling blocks for the implementation and resource allocation of adaptation. Synergies between adaptation and mitigation have not been developed yet, nor have other connections been examined. For example, in energy policy and land use planning, it would be important to examine how mitigation measures affect vulnerability to extreme weather events.

Unclear responsibilities and roles

Responsibilities and action chains concerning adaptation are partly multi-dimensional, which has been perceived as a challenge especially in many municipalities. The challenge of implementing adaptation measures is caused by the large number of stakeholders and manifold distribution of authority. Authority often forms chains, where responsibility is borne by a national, regional, or municipal authority depending on the situation. For example, preparing for the health impacts of climate change requires coordination

between many different actors. Thus, harmful health impacts of heat can be limited by developing regulation of buildings, creating warning systems, guiding building maintenance and ensuring that the most vulnerable have rapid access to health services.

Part of the ambiguity in responsibilities and roles is reflected in the fact that the adaptation perspective has not been mainstreamed in various activities, plans and impact assessments.

The evaluation found that many regional actors feel that roles and responsibilities are unclear, and that cooperation is partially underdeveloped. As the wellbeing services counties begin their operations, this challenge will probably become more prominent.

Dominance of short-term projects

Until recently, the development of adaptation action has focused on project work, which is why the implementation, continuity, and monitoring of activities, as well as learning and knowledge sharing, have often been left unsecured. Project-led activities require the executor to have their own funding and resources for project management, which in practice has excluded many small municipalities from active development activities.

Lack of detailed information and guidelines

Despite the general abundance of climate information, local, specific and solution-oriented information or expertise is hard to find. The lack of high-resolution regional and local climate data complicates adaptation planning and increases uncertainty. To support the planning, more detailed information is needed on how climate change can affect the daily lives and livelihoods, and where it is worth investing in adaptation.

Thus far the costs of climate change impacts and their distribution are not well-known, which also makes it difficult to assess the costs, benefits and profitability of adaptation measures. In fields such as flood protection or infrastructure construction, the cost-effectiveness of actions is examined in current planning practices, and, in principle, it is easy to include assessments of, for example, the impacts of adaptation measures on dimensioning and costs.

In all sectors, knowledge about the costs and benefits of innovative nature-based solutions is lacking. In assessing nature-based solutions impacts and benefits that are not limited to adaptation need to be considered. They may include safeguarding biodiversity, increasing recreational opportunities or positive health impacts.

Cross-border impacts

The significance of cross-border impacts has been recognised in Finland, but a more detailed examination of the issues has only just begun on a sector-by-sector basis. Cross-border impacts are difficult to control because impact chains can be multi-dimensional. Russia's attack on Ukraine has also shown that other, non-climatic factors can amplify the consequences of climate-induced events. For example, the failure of crops in important grain-producing areas because of climatic conditions leads to more serious repercussions when the war has significantly weakened the conditions for agricultural production in Ukraine and partly in Russia. There is as yet a lack of systematic examination of ways to prepare for cross-border impacts in different sectors.

Different time spans

Adaptation time spans and different time horizons in different sectors and livelihoods mean that some sectors are able to adapt to the constantly changing operating environment, while in some impacts of the actions taken can only be seen decades later (for example, in forestry and infrastructure). Analysing these requires different scenarios, which have not yet been systematically prepared and structured. Moreover, the connection to national and regional risk assessments and management is only developing.

Lack of resources

Adaptation activities at the regional and local level suffer from a lack of resources: financial resources for planning and implementation, a lack of permanent staff with expertise in climate matters and especially in adaptation issues. There is a lack of permanent funding, which would guarantee long-term and planned development; project funding is always temporary and can lead to the loss of adaptation expertise after the projects end. In the regional workshops and in the municipal survey, the absence of a legislative obligation to plan and execute adaptation action was seen as an important cause behind the resource scarcity.

The resource shortage is also reflected in the lack of knowledge and skills. When permanent resources are lacking, the know-how needed for adaptation planning and integration of adaptation as a genuine part of, for example, regional development and land use plans is not developed in a way that enables the implementation of concrete adaptation measures to strengthen adaptive capacity and resilience.

Fragmentation of monitoring and evaluation

Systematic monitoring of adaptation is only beginning to develop. There is a lack of monitoring data to evaluate the effectiveness of measures, and in many cases it is difficult to analyse the specific impacts of climate change. The impacts and effectiveness of adaptation measures can only be examined to a limited extent using historical data and statistics. The significance of adaptation will increase in the future and its effectiveness depends also on the actual progress of climate change. In addition, other societal developments, including cross-border impacts, determine the significance and effectiveness of actions. Therefore, besides monitoring, there is a need for research-based evaluations, which examine the impacts of adaptation measures on the one hand, and the actual change in risks and vulnerability (including changes in adaptive capacity) on the other hand. Thus far, very few such evaluations have been carried out in Finland.

Summary Chapter 3

In Finland, climate change impacts are receiving increasing attention in all administrative sectors. This can be seen in references to climate change in the development of regulation and other policies. In terms of goals and general awareness, the situation is therefore good, and the National Adaptation Plan has contributed to this development.

Consistent actions and guidelines, which would have concretely strengthened the adaptive capacity, have progressed at different pace in the administrative sectors. For example, in construction, infrastructure maintenance, water management, and the use and protection of water bodies, progress has been made to detailed analyses and guidelines that improve the conditions for adaptation. In other fields, such as game management, fisheries and healthcare, climate change has only recently gained attention as a concrete phenomenon that requires action.

At the regional level, the prevention and climate change impacts as well as adaptation to them have been included in the goals and tasks in accordance with the Regional Development Act. The division of work and tasks as well as responsibilities and procedures are relatively clear in sectors where managing weather variability and extreme phenomena has been 'everyday', such as in flood protection. In other sectors, there is still a need to clarify procedures and responsibilities. ELY centres have a wide statutory field with links to adaptation tasks, and as a result of the legal reforms, ELY centres are expected to gain more responsibility as expert authorities in adaptation activities.

The absence of a statutory planning obligation at the municipal and regional level can lead to unclear division of responsibilities for adaptation activities and difficulties in obtaining resources for them. Some municipalities have felt that the ambiguity of responsibilities has hindered implementation of adaptation measures in municipalities. The sectors where concrete actions have been taken are largely the ones for which weather and climate fluctuations have long been relevant. The preparation of regional climate roadmaps and other strategic documents can increase planning of adaptation action.

Finland has maintained R&D activities that support the development of adaptation measures and the preparation of policies promoting adaptation. Until recently, R&D activities have focused either on short-term studies on the one hand or long-term academic research. However, there is also a need for applied R&D projects, in which joint development methods would be created using tools such as checklists and guides for different sectors to implement concrete adaptation measures. Training should be aimed at supporting the preparation of regional and local adaptation plans.

In Finland, monitoring the state of the environment has developed over a long period of time, and the data has also been used to verify and assess climate change impacts. Adaptation measures are reported nationally in connection with the Annual Climate Report. Policy measures promoting adaptation are also regularly reported to the EU and the UN Paris Climate Agreement. Monitoring of individual adaptation measures at the regional and local level is developing, but the monitoring is still fragmented. Moreover, there is no unified data base which could be utilised to develop adaptation planning measures and activities and to share good practices of actions taken.

4 Challenges and prospects in adaptation to climate change

4.1 Development of climate risks globally and in Finland's neighbouring areas

Globally, climate change has already adversely and seriously affected both nature and people (IPCC 2022a). The average temperature of the earth has already risen by more than one degree from the period 1850–1900 to the period 2011–2020. The rise in temperature has been more pronounced in land areas than in sea areas. The temperature also rises at northern latitudes, including Finland, faster than the global average. In the Arctic region, warming is even more than twice as fast (IPCC 2021). The risks and effects of warming increase with the warming. (IPCC 2022a)

Greenhouse gas emissions and their warming effects contribute to, for example, heat waves, heavy rains, drought, tropical storms and change their occurrence and intensity. Climatic zones have shifted towards the poles, the growing season has lengthened in the northern hemisphere, and drought has become more common in already dry areas. Globally, seawater has become acidified, and the sea level has risen an average of 20 cm since 1901. Permafrost, snow and ice have decreased. The extent of ice in glaciers and the Arctic Ocean has decreased. The spring snow cover in the northern hemisphere has also decreased. Some of the changes that have taken place are irreversible or recover only very slowly. The changes that have taken place are also unprecedentedly extensive and fast. (IPCC 2022a)

The frequency of weather events that cause damage has increased. The events include, for example, heat waves, periods of drought, torrential rains, and combinations of weather phenomena that cause damage, such as drought and wildfires (IPCC 2021, IPCC 2022a). The same area can be affected by several damaging weather events, which increases the resulting risks. For example, both floods and droughts can occur in the same areas, and both pose risks to agriculture and food security. The resulting societal tensions can be reflected in a much wider area than where the drought or flood originally occurred. (IPCC 2022a)

Due to changing conditions, plant diseases and pests, as well as human diseases, spread to new areas. Health risks are also caused by, for example, the scarcity of clean drinking water and the intensifying heat waves, which are often worse in urban areas due to the heat island effect (IPCC 2022a).

There is considerable regional variation in the vulnerability of ecosystems and people across the globe. The sixth assessment report of IPCC documents extensive negative impacts in, for example, food production, human health and infrastructure (IPCC 2022a). Thus far, Northern Europe and the Arctic region have not been among the regions where the impacts of climate change have been the most serious in a global comparison.

If climate change progresses without greater success in mitigation measures, the loss of biodiversity and changes in the structure of ecosystems will also increase in northern regions. The probability of forest fires and harmful health effects will increase. Effective and proactive adaptation can help to avoid some of the harmful impacts (IPCC 2022a).

4.2 Development of climate risks in Finland– regional differences

The SUOMI project (Gregow et al., 2021) compiled tables describing weather and climate risks for the past climate (1981–2010 vs. 1991–2020) and the key changes related to the medium-term (year 2050) and long-term (end of the century) by region. As regards hydrological impacts, an examination was carried out to see how different water risks change by region and what should be considered.

The land area of Finland can be divided into southern and western parts and eastern and northern parts according to the similarities of the change. Despite similarities, each region has its own special features in terms of future weather variations, average climate, microclimate and environmental risk management and various impacts on, for example, hydrology.

In brief:

- **In the future, heat waves will significantly and adversely affect every land, water and sea area in Finland**. Depending on regional livelihoods, this can be a bigger or smaller risk, and management measures must be sector and region specific. Adapting to heat waves requires cooling in buildings and vehicles so that people remain healthy and able to work.

- **Drought risks and the danger of forest fires are increasing**, especially in the southern and western parts of the country. In spruce-dominant forests in the southern part of the country, the increasing risk of bookworms and other threats caused by the warming climate should already be taken into account. In addition, urban green space and the availability of water in cities should be ensured so that parks and nearby nature are preserved and that fire risk does not increase.
- **Precipitation will come more often as water in the south and west as autumns and winters continue to warm.** In the east and north, snow loads may increase well into this century (by 2050). The variation between years is increasing.
- In some years, **autumn and winter** can be very cloudy, wet, gloomy and dark in the southern and western parts of the country. This can have an impact on people's mental health and recreational opportunities.
- **Coastal snowfalls in winter may be heavy in the coming years when the ice-cover of the sea decreases**. When the sea stays open longer, strong coastal snowfalls can occur under certain wind directions and speeds. Thus, snow conditions in cities can be surprising despite general warming. This will be the case for the next 15–30 years.
- Although the period and depth of frost are decreasing in the southern and western parts of the country, **frost damage may cause new challenges as it starts to appear earlier, already in the middle of winter**. This can create new costs for road maintenance.
- Marine areas can also be divided into zones of different impacts according to open sea and inland waters. **Many coastal areas are severely affected by changes in the catchment area**. National agricultural measures have a long-term effect, especially in the inner archipelago. A reliable assessment of the impacts of climate change on the open sea is not yet possible. Yet, the state of the open sea largely determines the intensity of eutrophication, with the exception of the inner archipelago of the Finnish coast.
- **Windiness changes little**. Since the energy content of the wind varies with the cube of the wind speed, even a small increase is essential. The growth of wind energy has already taken place and the growth will continue, at least in the marine areas and in the southern and western parts of the country. Finland is in the storm track area, and according to the latest IPCC AR6 report (IPCC 2021), stronger storms can occur in the region, even though they are rare. For Finland, the effects come from the intensification of gusts and the reduction of frost. In the marine areas, ice loads must be taken into account, for example, in developing wind turbines and transport.

- **There is already evidence that as species move north, vector-borne diseases can also move north**. Circumstances occur in which viruses and insects or other animal species that transmit them must be monitored and the monitoring systems needs to be developed. For example, changes are visible regarding tick-borne diseases (Academy of Finland's CLIHE program projects). Similarly, melting permafrost can release frozen microbes. Health education should be increased among both citizens and healthcare professionals.

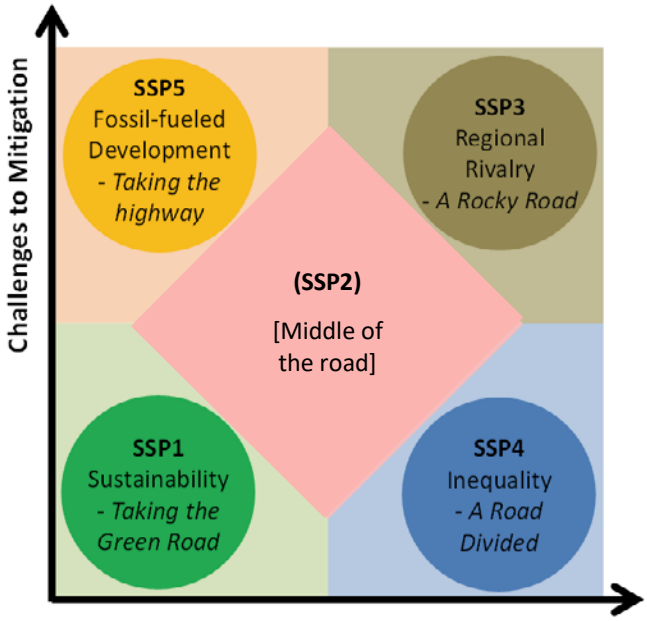
The Climateguide.fi portal has been a key national distribution channel for climate information and knowledge since 2012. In the future, the site will be expanded to include regional information on the development of risks. The first phase of the technical renewal of the site, which enables this, was completed in May 2022.

4.3 Other factors influencing the consequences of climate change

Societal development paths and events independent of climate change can significantly strengthen or weaken the consequences of climate change for society. The general economic situation, industrial structures, culture, education and other institutional features affect a society's ability to adapt, its ability to withstand the pressure of change and to recover from disturbances (resilience) (Engle 2011).

The importance of the societal development for adaptation has been examined using Shared Socio-Economic Pathways (SSP, O'Neill et al., (2014) and Frame et al., (2018), Figure 13), where different assumptions are made about the future development of society. In Finland, they have been applied to different sectors (Lehtonen et al., 2021) and are currently being applied regionally in the FINSCAPES project. The FINSCAPES project examines, for example, differences between the scenarios of the west coast and North Karelia.

Figure 13. Original Shared Socio-Economic Pathways (SSP) with regional application. SSP2 was not considered in the regional workshops of the FINSCAPES project. Source: O'Neill et al., (2014) and Frame et al., (2018).



The objective of the FINSCAPES project is to build a basis for two regional comparisons and find out which factors emerge as significant when considering regional development scenarios and adaptation to climate change. In cooperation with the regional councils, North Karelia and three Ostrobothnian counties were selected for the study. In North Karelia, the food system, nature services and tourism and the bio-circular economy were identified as climate-sensitive activities. In the counties of Ostrobothnia, the energy system, land and air transport and infrastructure and the food system, including agriculture, horticulture and fishing, were identified as significant. In both areas, health and well-being were treated as crosscutting issues.

With the help of the workshops, researchers and regional actors jointly develop regional SSP descriptions, which are linked to assessments of climate development and analysis on the ways climate change can affect the development of systems important for the future of the regions. The approach helps to identify how different societal goals and development paths interact with a changing climate. The analysis highlights the vulnerabilities and sensitivities of different systems and groups to changes. In this way, questions of justice and equity also come to the fore.

The European Green Deal emphasises fairness in all climate actions across the Union. The EU's Adaptation Strategy emphasises justice in promoting adaptability. The objective of the EU's Mission[20] on adaptation is to ensure that climate resilience (adaptability) improves significantly by 2030 in at least 150 European regions and communities. Vulnerability of a region and the possibilities to adapt is one criterion in the selection of the regions. The regional development funds of the EU can also promote fair adaptation.[21] In the Climate Justice project by the Finnish Climate Change Panel, an adaptation policy fairness index was created and it was used to analyse Finland's current National Adaptation Plan. Gap areas were identified in relation to all examined aspects of fairness. Taking into account the distribution of costs and benefits (both in terms of climate risks and adaptation measures) and their compensation are the most central shortcomings of the Plan (Juhola et al., 2022).

In Finland, attention has been paid, for example, to the circumstances and needs of the Sámi people in relation to adaptation. Research has shown that climate change has had a profound impact on the environment, livelihoods and culture of the Finnish Sámi and other arctic indigenous peoples (Näkkäläjärvi et al., 2020). When examining the health effects of climate change, attention has been paid to vulnerable groups in several ongoing projects of the CLIHE programme[22] funded by the Finnish Academy of Sciences. Health effects can cause polarisation, aggravating social inequalities (Carter et al., 2019).

The municipal survey (see chapter 3.5.4, Puurula et al., 2022) showed that the circumstances for adapting to climate change vary greatly between municipalities. Supporting fair adaptation measures requires a more detailed analysis of the areas, groups and individuals that may suffer the most from climate change impacts. For example, in the flood risk management plans (created for significant flood risk areas), the evacuation of the elderly, people with reduced mobility and children in a flood situation is mentioned as requiring special attention. However, a more comprehensive examination of fairness in flood risk management is missing.

20 https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change-including-societal-transformation_en [31.8. 2022]

21 https://rakennerahastot.fi/uudistuva-ja-osaava-suomi-2021-2027 (Innovation and skills in Finland 2021-2027, in Finnish [31.8.2022])

22 https://www.aka.fi/en/research-funding/programmes-and-other-funding-schemes/academy-programmes/climate-change-and-health-clihe-2020-2023/ [31.8. 2022]

4.4 Cross-border impacts

Cross-border (transboundary) impacts of climate change refer to changes that occur elsewhere than where climate change causes a measurable change in physical variables such as temperature, precipitation or wind. The spill over effects typically cross borders of countries and can be manifested in many ways and sectors (Carter et al., 2021). This chapter first describes the nature of cross-border impacts in general and then examines food security as a special case.

4.4.1 Cross-border impacts create new challenges for adaptation

Cross-border impacts are transmitted through many different impact chains. They can strengthen or weaken in the chain and the nature of the effects can change (Carter et al., 2021). At its extreme, climate change affects the stability and safety of societies. Adapting to and preparing for this kind of cross-border impacts requires evaluating the overall security model from a new perspective (Hakala et al., 2021).

According to Berninger et al. (2022), the Nordic countries have recognised and considered cross-border climate risks quite well in international comparison, and Finland is ahead of its neighbours in some measures. However, small countries with an open economy are also dependent on long value chains, which can increase vulnerability to cross border impacts. Disruptions in production elsewhere and transportation can result in, for example, problems with availability or higher prices.

Changes in climate conditions can be seen, for example, in commodities such as rice and coffee, for which the Nordic countries depend on the import from countries vulnerable to climate change. In addition, in the pharmaceutical industry, many critical supply chains extend around the world. Medicine production is focused on China and India (Hivdasani et al., 2021). Especially the latter is located in an area sensitive to climate change. The functionality of global production, transport and logistics chains is an essential factor in securing the availability of medicines for patients in many countries, including in Finland. Furthermore, the Finnish healthcare is completely dependent on imports in terms of medical consumables (National Emergency Supply Agency 2020).

The traditional way to adapt to cross-border impacts in the availability of goods has been to change products and producing countries, but the opportunities to use that way may diminish as adverse climate impacts become more common and intensify. In this case, it may be necessary to consider complementary solutions, such as increasing domestic production or supporting producer countries in adapting to climate change.

Cross-border impacts have been identified as potentially significant also in financial supervision, where the impact chains are not necessarily only related to commodities. According to the Financial Supervisory Authority's assessment, the physical risks to insured property in Finland are minor on a global scale, but changes in regulation, technologies and consumption habits affect the business models of insurance companies. For banks, the various cross-border impacts, which may materialize as credit risks, are also significant. (FIN-FSA 2022).

Cross-border impacts can also emerge as intensified population movements (Prokkola et al., 2021). Even though only a small portion of migrants would reach Finland, uncontrolled population movements may cause societal changes that can lead to extensive economic and political problems. Solving the issues may require an active contribution from Finland and a better integration of climate and security policies.

Due to their similarities, the Nordic countries could cooperate more to prepare for cross-border climate risks. Berninger et al. (2022) propose a joint Nordic research programme, sharing of best practices and tools, and dialogue with sectors. Moreover, strengthening cooperation in securing supply, preparing joint international initiatives and forming partnerships with developing countries is suggested. Since Finland as a whole is ahead of the other Nordic countries in preparing for cross-border climate risks, it may be appropriate for Finland to also lead in deepening the Nordic cooperation.

4.4.2 Cross-border impacts and food security

The IPCC report (2022a) shows that risks to food security caused by climate change are likely to increase. The availability of some agricultural commodities and raw materials for the food industry is exposed to such an extent that easy access and affordability for protein feeds and oilseeds, in particular, cannot be relied on even in Finland. Russia's attack to Ukraine and the COVID-19 pandemic have proven that events independent of climate change can strengthen disturbances caused by climate change and increase risks and uncertainty. Dependence on fossil energy as a production input increases costs and also the intensity of cross-border impacts due to geopolitical events. The impact chains are complex and identifying risks requires, for example, mapping of future challenges of global production areas and production factors of different foodstuffs (Lehtonen et al., manuscript 2022).

Climate change impacts typically increase variability in food production. Fluctuations can cause large and sudden changes in the market, which are also transmitted to Finland through world market prices. Fluctuations also seem to be increasing in Finnish agriculture, for example, two bad drought years have been experienced between 2017 and 2021 (see Salo et al., 2021, Luke 2022).

A precondition for strengthening general resilience would be to produce a greater proportion of protein and oil crops in Europe than is currently the case. High prices in the world market create incentives to cultivate protein and oil crops. Production of these plants could also diversify crop rotation, which has often been one-sided in Finland and elsewhere in Europe due to the cheap import of protein and oil plants. Limited own production results in relying on vulnerable import chains, which is also risky for the industry. The connection between the diversification of farming and sustainability has not been understood (Paloviita 2021). Due to the by-now obvious challenge of maintaining the security of supply it is imperative to take a new perspective, and this should be applied in practical action as well.

The production of legumes for human consumption can be increased in Finland and thus partly compensate for the decrease in feed use, if livestock farming decreases in the future. Since the quality of legumes is not always sufficient for human consumption, the possibility of feed use is important to maintain profitable production. This, as well as the development and increase of oil crop production, would diversify crop rotations and give opportunities for focusing and reducing nitrogen fertilization.

Even in Finland, increased prices can encourage producers to expand the production of protein and oil plant crops, but uncertainty can become an obstacle. Globally, climate change may lead to intermittent good harvest years in important production areas. If cross-border impact reaches Finland through low world market prices, then not even a good harvest guarantees profitable operations in Finland. Climate change can also cause crop failure years in Finland (diseases, pests, extreme weather conditions) (Palosuo 2022). Consequently, to tolerate fluctuations (to strengthen resilience), financial flexibility mechanisms should also be developed, which give individual producers opportunities to reduce risks. These could be, for example, price derivatives and crop insurance. In general, it is also possible to strengthen resilience by switching partially to plant products in human consumption, because most of the imported protein and oilseeds go to feed use.

Internationally research has only recently paid attention to the significance of climate change in terms of the global cross-border impacts and feedbacks in the food and commodity markets. The number of plants is big and research results on the impacts of climate change on crops are uncertain. For example, diseases and pests or matters related to restrictions on input use are seldom considered. The difficulty is compounded by the

fact that, in addition to the crop and production problems caused by climate change, many other things influence the market. The solutions need to be systemic. For example, by reducing highly specialised livestock production that relies on imported protein, availability and price risks could also be reduced also in Europe. Consumers' protein intake in Finland and the EU can also be reduced, that is, changes in consumption and demand are possible, but change requires gradual progress (Saarinen et al. 2019, ScenoProt 2021).

4.5 EU guidance on developing adaptation policy

The EU Adaptation Strategy (COM (2021) 82 final) provides a framework for the development of adaptation policies. Its implementation also influences the development of the member states' climate policies. This can be reflected in new goals and strengthening of adaptation as a general cross-cutting issue in all policy areas.

The European Council views the EU Adaptation Strategy as a response to climate change that is seen as an existential threat that affects both the economy and people's well-being. The aim of the strategy is to implement the EU's vision of a climate-resilient union by 2050 "by making adaptation smarter, more systematic and faster, and by enhancing international actions" (see Policy Objectives of the Strategy, Table 28). The Strategy proposes measures whose "full-scale implementation would significantly improve Europe's possibilities to respond to climate impacts already by 2030." The strategy emphasises "no regret" options, i.e., adaptation measures that are definitely worth implementing, because they prevent harm to people, nature and infrastructure and at the same time produce various economic and social benefits. Adaptation measures can also promote sustainable development in other parts of the world, and at the same time avoid and reduce cross-border impacts. It is still premature to assess how the EU's adaptation policies will be reflected in the adaptation policies of different countries in the future. However, it is likely that especially the integration of adaptation into other policy areas will be emphasised. Obligations to prepare adaptation plans at the regional and municipal level may also become stronger, as for example in Ireland's updated Climate Act[23].

23 Climate Action and Low Carbon Development (Amendment) Act 2021 (32/2021). https://www.irishstatutebook.ie/eli/2021/act/32/enacted/en/print.html.

Table 28. Policy objectives of the EU's Adaptation Strategy (COM (2021) 82 final).

Programme level (Strategic policy goals)	Implementation (Specific policy goals)
Smarter adaptation – increasing knowledge and managing uncertainty	Improving knowledge about adaptation
	Increasing and improving data on climate-related risks and losses
	Making Climate-ADAPT an authoritative European platform for adaptation
More systemic adaptation – supporting policy development at all levels and sectors	Improving adaptation strategies and plans
	Fostering local, individual and just resilience
	Incorporating climate resilience into macro-economic policies and national fiscal frameworks
	Promoting nature-based solutions in adaptation
Speeding up adaptation across the board	Accelerating the introduction of adaptation solutions
	Closing the climate protection gap (non-insured economic losses caused by climate-related disasters)
	Ensuring the availability and sustainability of freshwater
Stepping up international action for climate resilience	Support for international climate resilience and capacity development will be increased
	Scaling up international finance to improve climate resilience
	Strengthening global commitment to tackling climate change and information exchange on adaptation measures

The EU Adaptation Strategy introduces new areas and challenges to Finland's national adaptation policy. In the KOKOSOPU workshop discussions, the risks of climate change were considered through the adverse impacts on various businesses (especially financial harms), the vitality of municipalities, people's well-being and health, and the functionality of infrastructure systems. The EU-level framing of existential risks did not dominate. In the past, the discussion about the risks has mainly concerned individual sectors. Adaptation was now discussed in relation to these risks, but also as a possibility to develop the existing structures while adapting. Previously, the discussion on positive climate change related developments in Finland has primarily focused on the expected benefits for agriculture.

In the KOKOSOPU-workshops the strategic level and knowledge-based decision-making became important themes. This reflects points identified in the current (Sanna Marin's) Government Programme, Finland's current National Adaptation Plan and the EU's strategic

goals for smarter adaptation. More specific goals highlight, for example, the prioritisation of adaptation measures. Systematic and continuous development of adaptation action were identified in the KOKOSOPU workshops as a necessity to reach effective results. Specific policy goals include the development of the educational base and ensuring sufficient resources for different actors. The workshops also concluded that it is essential to consider justice and fairness in relation to adaptation in general, including the definition of obligations and rights from both a legal, ethical and practical management point of view. This goal is consistent with the EU Strategy to develop a more systematic adaptation. Accelerating adaptation measures is one of the EU's strategic goals. In the KOKOSOPU workshops, it was noted that adaptation goals should be checked regularly as knowledge increases, so that measures can be adjusted quickly in the light of better scientific knowledge, although Finnish stakeholders still do not yet appear to feel the urgency that is reflected in the existential threat referred to at the EU level.

The KOKOSOPU workshops paid attention to the desired approach and policy instruments in examining policy measures. The EU Strategy's approach to adaptation policy strongly emphasises the creation of partnerships and networks between public and private sectors, as well as between researchers and decision-makers to ensure a widespread sharing of climate data and knowledge related to adaptation measures in society. Policy measures and instruments to be highlighted include, for example, the EU's effort to improve monitoring, reporting and assessment of adaptation using harmonised standards and indicators. Also, the preparation of an EU-wide climate risk assessment and considering climate aspects more carefully in EU disaster risk prevention and management is seen to be important. In addition, the EU continues to encourage and assist member states in the introduction of nature-based solutions (such as carbon farming) through assessments, guidelines, capacity-building and EU funding. There is also support for the inclusion of climate sustainability aspects in the criteria applied to the construction and renovation sector and critical infrastructure.

The policy goals of the EU's Adaptation Strategy are more precise than those of Finland's National Adaptation Policy to date. In the KOKOSOPU workshops, the discussion of policy measures, especially in terms of governance of societal actors, reflected the responsibility of the state or an unspecified "public" actor and cooperation between other private and public actors. The activities of municipalities and regional actors were discussed in more detail because the discussion was focused to deal with them. The uneven regional distribution of the resources (required to take adaptation measures) was identified as a limiting factor. Underlying causes include the size differences of the municipalities, differences in wealth and in the regional distribution of climate risks. Regional actors and their opportunities for promoting adaptation were also discussed and it was concluded that they are still in a formative stage.

Summary Chapter 4

Climate change impacts are expected to intensify. The intensity of the impacts will reflect the gap between the actual development and the goals of the Paris Agreement to curb climate change.

In Finland, the societal consequences of climate change so far have been mild compared to countries where extreme weather events and their consequences (drought, heat, storms, floods, forest fires) have reached the proportions of natural disasters. However, Finland also needs to be prepared for more serious consequences than at present.

More detailed information on regional risk factors is needed in preparing for change. In addition, more attention than before must be paid to the fact that the general development of society affects both exposure and vulnerability. The understanding of the importance of other factors on the social consequences of the impacts of climate change has deepened.

Climate change impacts cross the borders of countries, so adaptation must also be an international activity. In addition, the COVID-19 pandemic and Russia's attack on Ukraine with its global consequences have shown that adaptation to climate change must be seen as part of a wider process. The aim should be to strengthen the overall resilience of societies. In order to strengthen resilience, different policy areas must be developed to support each other (policy coherence). The recent development of the EU's adaptation policy also emphasises the need to strengthen the mutual consistency (coherence) of different policy areas and system-level changes to strengthen adaptive capacity.

5 Development needs of adaptation action

The chapter examines adaptation policy development needs that can be identified by comparing the current state (chapter 3) with the development prospects (chapter 4).

5.1 Developing Finland's adaptation policy

In Finland, the economic and other social consequences of climate change have so far been relatively mild, although clear changes based on climate change can be identified in, for example, temperatures and ecosystems. When the impacts intensify, they also cause more significant economic and other social consequences, which emphasises the importance of anticipation, adaptation, and contingency planning (Perrels et al., 2022).

When aiming to strengthen adaptive capacity (climate resilience), it is essential that resources are directed to the most important actions and targets. This prioritisation is influenced by the risks on the horizon, but also by a reflection on impacts and questions about fair adaptation. Adaptation activities must be examined in a broad social framework, considering mitigation as well. Until recently, mitigation and adaptation have been seen as separate issues. Integration could bring more efficiency, prevent possible conflicts, and facilitate resourcing. Internationally, in its latest assessment, the IPCC emphasises the synergies of adaptation and mitigation with sustainable development (IPCC 2022a; 2022b). In Finland, municipal climate programmes and strategies often deal with mitigation and adaptation in parallel (see chapter 3.1.3).

5.1.1 General development targets

Mainstreaming

Numerous references to climate change in the legislation and strategic documents of various administrative sectors (chapter 3.2) show that the awareness of adaptation needs has strengthened under the National Adaptation Plan. However, mere recognition of possible impacts does not guarantee mainstreaming in practical actions. For example, mainstreaming adaptation in regional development requires specification and application of concrete project criteria.

The monitoring group of the National Adaptation Plan has been a forum for dialogue in the central administration, and an internal adaptation network has been operating, for example, in the Ministry of the Environment. ELY centres and regional councils also

have their climate networks and some municipalities have had cooperation groups. To mainstream adaptation both regionally and by sector, regular dialogues and a support network are needed. Related networks exist, for example Luontokunnat ('nature municipalities') [24] is a network dedicated to supporting municipalities in safeguarding biodiversity and sustainable use of nature. Dialogues and networks encourage practical actions and promote the implementation of good practices and knowledge between actors and regions.

Regular dialogues are required to identify and resolve potential tensions between adaptation and other goals. By strengthening and expanding the activities of various adaptation groups and networks, the prerequisites for mainstreaming can be improved and concrete issues solved more flexibly than at present. This can also promote the development of legislation. For example, the extension of the planning obligations of the Climate Act to municipalities, which is agreed by the government and subsequently required by the parliament, would be easier to execute if there were more information and documented experience on the implementation and synergies of adaptation and mitigation in municipalities.

Cross-border impacts

As the impacts of climate change intensify (IPCC 2021, 2022a,b), the scale of the risks and adverse consequences may also increase. Thus, to ensure good management of climate risks, it is increasingly important to strive for longer perspectives in planning and preparedness instead of focusing only on reactive action. This strategic adaptation need is particularly relevant in preparing for risks that materialise slowly or through uncertain impact chains, such as indirect and cascading cross-border impacts (Carter et al., 2021). Cross-border impacts can be significant for comprehensive security (Hakala et al., 2021). In addition, the low-carbon transition can partially increase the uncertainty of the operating environment (see Tuomenvirta et al., 2018) and shift the vulnerability and exposure of operations to, for example, extreme weather events, which raise issues such as energy security, logistics, transportation, geopolitical tensions and migration.

To manage cross-border impacts, cooperation between administrative branches and sectors must be strengthened. Geographically significant areas in terms of cross-border impacts are, for example, the Arctic region, transboundary waters bodies and the Baltic Sea region. Also, areas located further away can become relevant because of various

24 https://www.luontokunnat.fi/fi-FI (31.8. 2022, in Finnish)

chains of events. Therefore, more detailed examinations of indirect and cross-border impacts and impact chains are needed (see Carter et al., 2021). Thus far, limited attention has been paid to how cross-border impacts should be managed systematically.

Just adaptation

The EU's Green Deal emphasises the perspective of fairness as the Union pursuits carbon neutrality and climate resilience. Fairness is a multidimensional concept that can be approached in many ways in climate issues (Kivimaa et al., 2021). In relation to adaptation, just/ fair adaptation can be structured through four different dimensions (Juhola et al., 2022):

- through the concept of 'justice as recognition', it is possible to examine how the existing structures of society affect adaptation;
- the 'distributive justice' concept enables examination of how the impacts of climate change and adaptation measures are distributed;
- 'procedural justice' considers fairness through the participation of different groups in decision-making;
- 'restorative justice' is concerned with compensating injustices through adaptation.

The workshops identified challenges related to fairness that can arise if, for example, extreme weather events lead to significant property or business losses. This may require an assessment of current safety nets and systems considering the risks posed by climate change. Until recently, the general trend has been towards covering risks through private insurance, but it would be justified to look at combinations of private and public systems, such as the use of equalization funds in case of the biggest risks.

Fairness and consideration of the rights of indigenous peoples have been emphasized in the revised Climate Act (423/2022) and the Arctic Policy Strategy (2021). However, the concrete promotion of policies requires new coordination and division of responsibilities. For example, to become operational the provision on the Sámi Climate Council in the revised Climate Act requires that the role of this new body is specified in relation to other bodies and practice is developed accordingly.

Strengthening the knowledge in support of adaptation

Nationally and regionally, there is a demand for broader, but at the same time more detailed, scenarios that can be utilised in sectoral plans and in strengthening the adaptive capacity. It is important to connect contingency planning and adaptation to other social

developments. The KUITTI project (Perrels et al., 2022) compiled the first estimates of the economic consequences of the lack of adaptation, but more information is needed on the costs and benefits of different means of adaptation.

In the regional workshops of the KOKOSOPU project, the availability of relevant information (including, for example, checklists) and good practices to carry out practical actions in different sectors was seen as one important development target. This also makes it possible to evaluate the adequacy of the region's own activities. A key information need concerns the development of regional climate scenarios, but also the development of indicators related to monitoring the progress of climate change and adaptation is important to judge success in actions. Furthermore, cost estimates of adaptation or non-adaptation are needed in planning.

According to the KOKOSOPU workshops, in particular assessments of economic benefits support action by increasing the acceptability of specific measures. Such assessments would demonstrate the significance of adaptation actions jointly with mitigation measures. Also, a breakdown of different actions at different levels, preparing for physical change and wider changes in the operating environment, caused by, for example, cross-border impacts, could help to identify and divide concrete tasks between different parties. Therefore, information tailored to different operators is required, considering the users' needs and the current knowledge base.

As adaptation action should be based on local and regional characteristics (livelihoods, specific vulnerabilities), it is not meaningful to provide detailed ready-made content templates for adaptation action. Learning and applying both methods and contents from one area to another is possible, but simple direct copying of adaptation plans is not likely to lead to successful activities. Connecting climate change and adaptation as part of the regional development work of municipalities and regions requires participatory considerations and future visions that are developed in a cooperative manner by the actors of the municipality or region.

Policy coherence between different sectors

When developing legislation that ensures policy coherence and the integration of adaptation in other policy areas, it is necessary to find a balance between legal strength and flexibility. When adaptation regulations are added to substantive legislation (for example in the proposed Nature Conservation Act and the Buildings Act), there is a need to test the application in practice and to prepare guidelines. The guidance can partly also rely on other general legislation supporting planning, such as the EIA Act. This also highlights the importance of policy coherence. One precondition for policy coherence

is education and training. Educational contents related to climate change mitigation and adaptation should therefore be included both in basic education and training of professionals.

The continuous improvement and accumulation of climate data must be considered when assessing the appropriate extent of detail in guiding adaptation. The planning system of the Climate Act creates a framework for the development of concrete activities, and detailed substantive legislation defines practical implementation. For example, the Regional Development Act (Section 2, 756/2021) supports coordination by guiding the prioritisation of activities and funding from other perspectives beside regional development.

The crosscutting nature of wellbeing and health effects should be considered more carefully in different sectors in the future. This concerns the operationalisation of wellbeing services counties for adaptation action together with other regional actors and municipalities.

5.1.2 Regional adaptation activities

Regional councils, ELY centres and wellbeing services counties are key players in regional adaptation activities. Some of the regional councils and ELY centres have been very active in the strategic planning of adaptation and the development of activities. In 2023, the wellbeing services counties become operational, and thus clarifying their role and tasks in relation to other actors is important at the regional level.

Tasks, responsibility, and action chains of the regional state authorities

Drawing clear boundaries between the multiple tasks, responsibilities and authority of different authorities and levels concerning adaptation is challenging, especially in regional operations (PIRELY 2022). The ongoing administrative reforms (planned regional reform and the social and healthcare reform) and plans have not only increased uncertainty about the organisation of the operating environment, its responsibilities and future funding, but also contributed to the ambiguity in the roles of authorities. When the wellbeing services counties start their operations in 2023, it is important that their role and tasks in adaptation activities are defined concretely and that there is a suitable connection between them and other actors.

In the regional workshops of the KOKOSOPU project, the partly unstructured nature of adaptation tasks and responsibilities was pointed out as a factor that affects planning and funding. For developing adaptation activities, sufficiently clear guidance through regulations is needed as it would enable anticipation and identifying important tasks and obligations in implementing adaptation activities.

Integration of tasks and sectors in organising adaptation

In the regional workshops of the KOKOSOPU project, the need for integration of both tasks and sectors and closer cooperation between actors was emphasised. Currently, for example, flood protection is well integrated into building regulations, but actions connecting different sectors are missing. A national policy is needed to outline the roles of different actors, since the Climate Act, for example, does not define roles or responsibilities in detail. The clarity of roles, especially regionally, is seen as a key factor influencing the organisation of activities and participation. Adaptation should be included more clearly on the agenda of regional councils working group, municipalities, and ELY centres, along with mitigation.

The interaction between regional adaptation measures and research should be promoted in the future. For example, the Finnish Environment Institute has identified potential in conveying researched information to regions through, for example, expert and cooperation network of the Canemure project (https://www.hiilineutraalisuomi.fi/en-US/Canemure).

In considering the different roles of regional adaptation actors, their general task should be considered. The regional councils have responsibility over regional development, which naturally gives them a coordinating role. They could therefore take responsibility for integrating climate action (mitigation and adaptation) into general regional development, including future visions and regional planning. ELY centres are responsible for the implementation and supervision of specific sector legislation. Both organisations grant funding to projects where adaptation can be promoted in accordance with the funding programmes such as the regional development funds. The wellbeing services counties will focus on special tasks in adaptation measures, but it is important that cooperation between all authorities is smooth.

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5.1.3 Adaptation in municipalities

Clarifying the concrete activities and knowledge

In some municipalities, adaptation is perceived to be a complex activity and difficult to grasp, both in terms of terminology and at the level of practical operations. This is partly due to the large amount of climate-related information, and consequently, the activities of several municipalities focus on short-term contingency planning. Municipalities need especially context-bound descriptions of solutions, which can be used to identify the practices and actors who have addressed (and solved) similar problems. On the other hand, the needs of municipalities of different sizes and the different pace of climate action (big cities already do a lot independently) pose challenges to the coordination of joint activities, for example in the form of joint climate roadmaps.

According to the regional workshops of the KOKOSOPU project, one solution to the problem would be to set an obligation for municipalities to make climate plans, including adaptation. The regional and sub-regional levels would participate in the implementation of the plan, which would enable the steering of funding and prevent small municipalities from being overburdened.

Adaptation as part of strategic and long-term goals

Climate change has thus far been considered especially in municipal sectors where the impacts of climate conditions and related contingency planning have been part of normal operations. In other sectors, for example, in the social and health sector and welfare associations, identifying relevant climate impacts has been perceived to be challenging (see also Meriläinen et al., 2021, Mayern et al., 2020). There has been little dialogue between the sectors and climate experts. Long-term adaptation planning, such as ensuring the climate resilience of premises for health care, has so far received little attention.

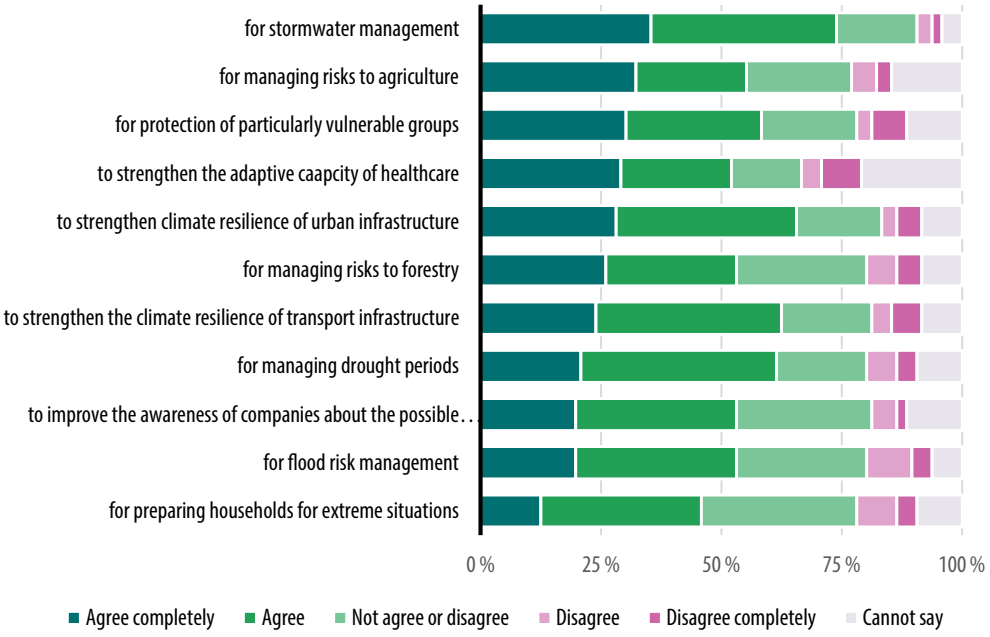
Adaptation should not only be thought of as combating physical threats and preserving the current state, because society changes and develops regardless of the climate. In adaptation planning and the integration of adaptation as part of regional development, opportunities that climate action offer (both in mitigation and adaptation) should also be considered. For example, some of the cross-border impact chains and the responses to them may offer opportunities that should be considered in the strategies of municipalities and regions.

Strengthening the coordination of climate action

Municipal adaptation activities should be coordinated with mitigation, which would allow combining resources and utilising potential synergies between mitigation and adaptation. Regional authorities could then support the practical work of the municipalities based on, for example, guidelines that integrate mitigation and adaptation measures (cf. the regions' effective climate roadmaps, see Saikku et al., 2022). Expert support and guidance should be implemented in a focused manner by ELY centres or regional councils. In networks municipalities that have opportunities to invest in climate action can support (smaller) neighbouring municipalities. By promoting regional cooperation and joint studies to manage regional risks, preconditions for learning are created through practical implementation of adaptation measures.

The municipalities have experiential knowledge about how the climate has changed and what they have had to adapt to already. The public debate on climate change has also helped municipalities to identify their own future adaptation needs (Figure 14). For example, stormwater management is a topic that concerns inhabitants and municipal authorities in a very concrete way. In the identified measures, there are, however, also topics that municipalities have not previously paid great attention to. For example, risks to agriculture and health have only become more visible in recent years, through experienced periods of heat and drought.

Figure 14. Measures that municipalities should focus on in their adaptation activities. "What do you think of the following statements? The municipality should focus especially on adaptation ..."



5.2 Resource needs of adaptation action

This subsection summarises resource needs that have been identified. Human resources are key but preparing for more severe impacts of climate change also requires opportunities to invest in solutions that strengthen adaptive capacity.

5.2.1 Strengthening human resources in the public sector

Estimates of the future resource needs by those actively involved in adaptation action are presented in chapter 3.5. Most of the answers emphasised the need to increase the current human resources from 10 to even more than 100 percent, depending on the authority in question and their current resources. In the Government, the increase would be a few person years in practice, in the regional councils a few person months per council, and in ELY centres a total of several or even tens of person years. However, the resource and needs assessment of the ELY centres also included human resources, for which adaptation is an additional substantive aspect of activities that must be maintained regardless of climate change. For example, water management or road maintenance may require changing some practices to increase the adaptive capacity, but most of the resources are needed to maintain basic operations irrespective of climate change. In changing practices to better address climate change, adaptation competence is, however, emphasised in all areas of administration.

The competence of different administrative sectors should be at such a level that adaptation needs are understood, and different adaptation measures can be planned, implemented, and monitored as part of the basic operations of each sector. This also sets requirements for research and development activities, which ideally should simultaneously serve the adaptation planning of as many different sectors as possible. To be able to do this, those involved in R&D for a sector need to be deeply familiar with the special issues of that sector from the perspective of adaptation measures.

In the national KOKOSOPU workshops, the need to develop skills related to adaptation in different sectors was highlighted. Competence of the private sector should also be increased. It would be necessary both to add adaptation content to the training of different sectors and to start a separate training program for adaptation professionals. Internationally, there are already examples of master's level adaptation training programmes (Berninger et al., 2021). Further education of experts on adaptation topics should also be organised systematically. Another focal point is strengthening the adaptation skills of the groups that implement adaptation measures in practice. Such groups include, for example, farmers, forest owners and constructors.

Along with competence, knowledge contents related to adaptation must be developed for different target groups in such a way that it is accessible and user-friendly. Although awareness of adaptation has increased in recent years, it is still necessary to increase it widely in our society. In addition, sharing sector-specific information and good practices is important for the development of adaptation action.

Assigning human resources to adaptation action is necessary in every organisation. It is typical that adaptation action takes place alongside other duties. The adaptation task may form such a small part of the total workload that there is not always enough time for it. If adaptation action is voluntary, for example, in municipalities, it is easily forgotten. On the other hand, setting new obligations may be problematic when the amount of other planning obligations is already large, given the scarce resources that are available. Permanent human resources for adaptation should be increased at different levels of administration although it is unlikely that significant additional new funding will be made available. Therefore, reallocation is important. To maximise effective use of resources, regional councils and ELY centres can develop network-like cooperation, which can guarantee that even small municipalities, where it is not realistic to hire people specialised in adaptation, will receive expert support. Permanent human resources at the regional level also enable more effective utilisation of project funding (for example, ERDF, ESF, LIFE, EAFRD) to support adaptation planning and implementation.

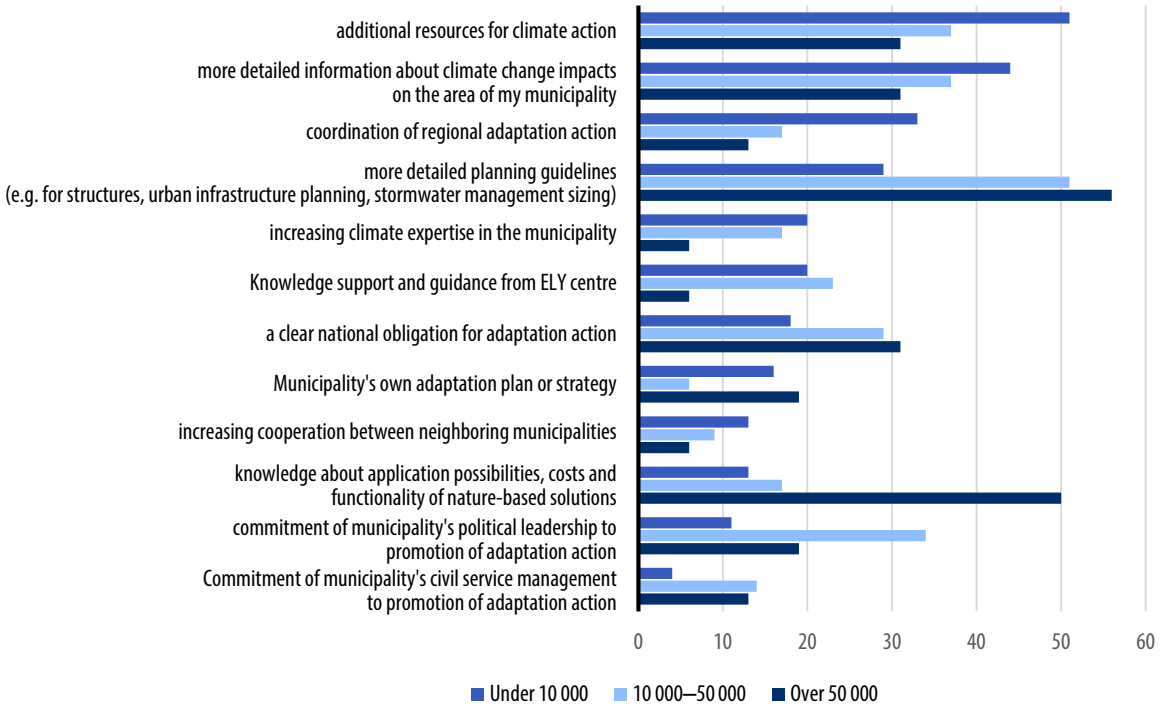
Supporting climate action in municipalities

Small municipalities have very limited financial resources, and they rely strongly on, for example, regional climate action. Large municipalities normally have the capacity to use available project funding, but knowledge support was also considered important (Figure 15). Many large municipalities are, for example, interested in nature-based solutions as a novel approach and resources are needed to try out new solutions.

Small municipalities have limited opportunities to take part in broader climate cooperation due to the lack of time and human resources. One solution is cooperation between municipalities. There are examples in Finland of central municipalities that support smaller municipalities in adaptation. The advantage of such arrangement is that the work can thus focus on the region's most important issues.

In addition to their own human resources, municipalities would need support and training for adaptation action (Figure 15). One model has been developed in Denmark, where a mobile expert team was established to support municipalities, offering training, workshops, seminars, customized advice, and encouraged cooperation between municipalities and provided information on various topics (Berninger et al., 2021).

Figure 15. Measures supporting municipalities' adaptation action, grouped according to size of the municipality's population. "The adaptation work of the municipality would be best supported by... (choose the three most important)", (N=96, percentage of the respondents that chose the option).



5.2.2 Other than human resources

Targeted funding for adaptation action is available from various sources, but usually there is no earmarked amount allocated for funding adaptation, instead funding varies each year or depends on the applicants' ability to justify the need for adaptation action. The exception is the new ERDF programme, where adaptation has its own special goal and its own indicative budget. A similar approach would be suitable for other funding sources as well. In allocating resources, new ways should be sought to identify investment targets that are as affordable as possible and strengthen adaptive capacity reliably. For example, greater use of systematic scanning of ideas could be favoured in implementing climate roadmaps.

According to the national KOKOSOPU workshops, there is a great need for investment funding to secure important functions of society, such as the maintenance of critical infrastructure, social services, and healthcare. These are permanent resource needs that cannot be replaced with short-term project funding. Special emphasis should be placed on investments that increase operational capacity to cope with extreme weather events. For example, improving the cooling of social service and health care premises

is a prioritised measure to ensure that the consequences of climate change do not disproportionately affect particularly vulnerable groups, such as elderly and chronically ill members of society.

Funding is also needed to produce new knowledge and develop interoperable information systems. With the help of interoperable information systems, better use could be made of existing and developing information and knowledge production. This would significant support adaptation planning by helping in the prioritisation and evaluation of adaptation measures.

5.2.3 Private sector

The KOKOSOPU project did not particularly explore adaptation resources of the private sector, but the private sector was represented in the workshops. Skills needs concerning the private sector were noted. Moreover, competence varies in the private sector, and therefore there is need for cross-sectoral networks to learn and enhance the sharing of best practices. The workshops also discussed the need for further education for those already in working life.

A better integration of private and public sector data (for example, in data on damage caused by extreme weather events) would be a resource that would significantly add value by helping to prioritise measures in the private sector as well. It would also support the assessment of adaptation measures and the development of climate services.

5.3 Monitoring and evaluation of adaptation action

Monitoring of climate change adaptation has not thus far been carried out widely or systematically in Finland. Within the framework of the revised Climate Act (423/2022), climate risk assessments must in the future be accompanied by sector-specific and administrative sector-specific and cross-cutting evaluations. In addition, the new content requirement of the National Adaptation Plan requires a regional risk assessment to be carried out as necessary. Besides mitigation, international agreements also require monitoring of adaptation measures to allow for evaluation of the implementation of the national adaptation policy.

To develop monitoring and evaluation of adaptation, a national monitoring plan must be created (incl. implementation, overall time span, time span of actions, scope) and targeted resources allocated for its implementation. In addition, monitoring and reporting responsibilities and obligations must be defined. There is also a need to specify what can

and should be monitored to evaluate the adaptive capacity (key questions include the goals of adaptation and how to evaluate the success of adaptation) both by administrative branches and by sectors. The monitoring and evaluation of adaptation can be connected to the national weather and climate risk assessment to evaluate how well the risks caused by climate change can be affected by adaptation measures (See Juhola et al., 2022). Moreover, efforts have been made to cover the consequences of climate change in nature in the Environmental State Monitoring Strategy 2030 (MoE 2022), but it does not cover at all the monitoring of adaptation actions.

Monitoring and evaluation must be based on the latest scientific information on the impacts of climate change and the effectiveness of adaptation measures (Juhola et al., 2022). A key area to be developed is to compile salient and sufficient information and make it available. Necessary new or existing indicators or evaluation criteria should be jointly defined. To obtain necessary information from, for example, existing databases, possible legal obstacles must be identified and overcome. On the other hand, personal data protection requirements should be taken into account (for example, health data). At the national level, a key goal is to activate and identify necessary sectors, so that indirect and cascading risks as well as actions directed to them can be monitored. Moreover, to adapt to cross-border impacts and to identify them, monitoring and evaluation of climate risks should be extended widely to, for example, health care and comprehensive security as well as industry and trade.

To implement adaptation monitoring, regional and local actors need to be trained and their know-how increased. Monitoring pilots are also needed. Regionally, the starting point is the accumulation of risk data and, subsequently, identification of the most significant risks to prioritise adaptation measures accordingly. In addition to climate change, risks are influenced by regional and local conditions, which affect vulnerability and exposure.

It is challenging to organise the monitoring of municipal adaptation. Surveys carried out at regular intervals and by the Association of Finnish Municipalities (Savikko 2009, Mattson 2012, Parviainen 2015, Puurula 2022) provide an overview of the actions that municipalities have taken and the challenges they encounter in adaptation action, but a comprehensive understanding of municipal adaptive capacity is missing. By developing the monitoring of different sectors and including the monitoring needs and data of the private sector, especially insurance, but also, for example, property management, it would be possible to get a more comprehensive picture of the practical challenges and solutions of adaptation.

Summary Chapter 5

Finland's adaptation policy must be developed so that administrative branches and sectors in Finland can actively prepare for climate change and the intensification of its consequences nationally and globally. This requires deepening the current awareness so that every branch of government and sector recognizes how climate change will change the operating environment of the sector in question and how it is possible to adapt to the upcoming changes as efficiently and innovatively as possible.

The ability of administrative branches and sectors to see the connections between the consequences of climate change and adaptation measures and other societal developments and events must be strengthened. This is key to more systematic management of cross-border impacts. Ensuring a just transition and preventing biodiversity loss also require understanding the connections between climate change and other societal developments.

Resourcing of adaptation work must be improved at all levels of administration compared to the current situation. In the case of the central administration, it concerns approximately a few person years of work. At the regional level, according to the authorities' own estimates, a total of several or even tens of person years are needed in the regional councils and ELY centres to handle adaptation tasks. However, part of the identified resource needs can be satisfied by strengthening competence. In addition, by identifying synergies between mitigation and adaptation, the efficiency of the overall resourcing of climate action can be improved.

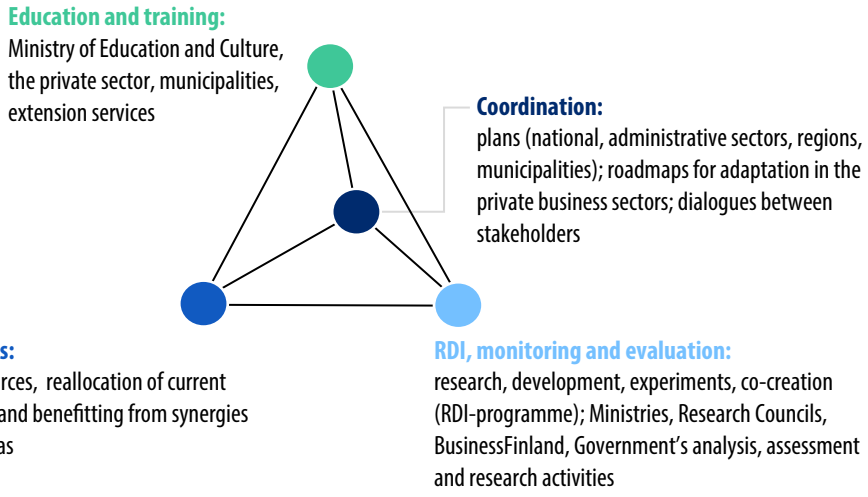
Many large pioneering municipalities have already invested in adaptation activities and are developing local applications and solutions. Small municipalities can direct additional resources to adaptation primarily by strengthening the skills of existing staff and by participating in regional cooperation networks and joint projects.

6 Recommendations for the development of Finland's adaptation policy and measures

This chapter presents recommendations for measures to be taken to develop adaptation activities and strengthen adaptive capacity in Finland in the light of the findings and analyses of the KOKOSOPU project.

Adaptive capacity consists of several interrelated areas (Figure 16). The national adaptation policy must be based on a balanced strengthening of different areas. The recommendations focus on topics whose inclusion in the national adaptation plan can be justified. Based on the research, the chapter aims to clarify what goals should be set (what kind, who, for whom?), and to identify possible concrete actions (at what level, who is the actor?).

Figure 16. Sub-sections strengthening adaptive capacity and examples of actors.



6.1 National adaptation policy and action– cross-cutting recommendations

Adaptation requires broad, systematic and proactive approaches

Climate change is a cross-cutting societal issue, and all administrative branches and sectors should be encouraged to systematically examine how to respond to change in a proactive and planned manner. In Finland, general awareness of climate change has deepened over the past few years, but adaptation to climate change often remains at the level of a general statement in the documents. Administrative branches and sectors should examine in sufficient detail how guidance, practices and investments should be directed to be able to respond in the best possible way to climate change and its various consequences. This also includes the identification of opportunities and a better joint examination of adaptation and mitigation aspects than at present. Broad assessments are also required to ensure the fairness of adaptation measures. The administrative branches and sectors should, in line with the provisions of the revised Climate Act, organise training and prepare sector-specific guidance to support adaptation planning.

Development of risk management methods

Adaptation should become an integrated part of broader analyses and assessments, in which various risks and development paths are evaluated. The Government's Report on Security Policy (MFA 2020) refers to the need to adapt to climate change, and risks are discussed in the National Risk Assessment (MoI 2019). Climate change is also acknowledged in the Joint Future Studies[25] of the Government. However, it is essential to progress from awareness of the issue to the promotion of concrete adaptation measures and the opportunities included in them through the cooperation of different administrative branches. At the regional and municipal level, more systematic adaptation planning is key to increasing the effectiveness of climate measures, and it should also be required in legislation.

It should be ensured that sufficient compensation mechanisms are available to cover unacceptable consequences of extreme weather events. Currently available insurance products do not necessarily guarantee that those suffering from harm will receive support to recover after extensive destruction caused by, for example, floods, storms, forest fires. One possible solution to supplement insurance coverage would be a national contingency fund that would function like the EU Solidarity Fund ((EC) 2012/2002). A national contingency fund would act as a compensation procedure when a

25 https://vnk.fi/en/foresight/ministries-joint-foresight-activities [31.8. 2022]

natural disaster affects a large area, but the economic losses fall below the limit values set in the EU solidarity fund. Establishing a fund or other mechanism requires clarification of its relationship with other compensation procedures, the fund's financing model, potential beneficiaries, and the role of adaptation or contingency plans guiding the use of the fund. Also, possible adverse consequences such as moral hazards (Mcleman & Smit 2006) need to be examined.

Contingency planning for cross-border impacts

A comprehensive evaluation should be carried out to identify possible cross-border impacts on Finland so that they can be managed in the detailed contingency plans of sectors and regions. Cross-border impacts are broadly understood as the consequences of climate change that occur elsewhere than where the physical change is verified. The evaluation requires a systematic examination in different administrative branches and sectors. The basis for this work could be in the Joint Future Studies of the Government or a special evaluation in the National Risk Assessment. Developing the management of cross-border impacts requires coordination between administrative branches. By ensuring that innovation policy and climate policy are mutually consistent, it is possible to increase the likelihood of innovations that serve adaptation to cross-border impacts.

To improve the management of cross-border impacts, it is important to integrate adaptation issues into trade, finance, development cooperation and security policies. Global adaptation issues have been emphasised in the Climate foreign policy action programme, but there is a need to strengthen and expand the examination. For example, the mutual harmonisation of development cooperation, trade policy and fiscal policy can help to reduce cross-border impacts endangering food security by targeting investments and funding to reduce production risks. Finland is committed to direct 0.7 percent of BNP to development co-operation, but the current level has varied between 0.4 and 0.5 percent.[26] It would be justified to direct a part of the increase to fulfil the commitment to, for example, support the adaptation measures of developing countries and small island states. The effectiveness of such funds can be improved by also funding R&D activities that develop appropriate solutions for the local context.

Specification of procurement criteria

To take adaptation aspects into account, concrete criteria and other guidance should be developed to support procurement units. Public procurements are significant in the economy (Kalimo et al., 2021). Some of the procurements are directly related to

26 https://um.fi/development-cooperation-appropriations [8.8. 1022]

adaptation, for example, procurements for security of supply, but it is more important that adaptation issues are considered in all relevant procurements. For example, by requiring capacity to cope with heat waves in social and healthcare procurement, it can be ensured that residential care homes do not overheat under any circumstances. Especially in new buildings and renovations, procurement can significantly influence the development of adaptive capacity in the long term. Until recently, the development work on the sustainability of procurement has produced material to promote carbon neutrality,[27] but the examination should be expanded to cover adaptation to climate change as well.

Expanding low-carbon roadmaps of the private sector to adaptation

Based on the National Adaptation Plan, the government should initiate a process with the private sector to supplement current low-carbon roadmaps with an adaptation perspective. All sectors will need to adapt to climate change, but each sector has its own special issues. Therefore, it would be justified to start a process that would help each sector to identify the adaptation issues and measures that are most important to them. It would be appropriate to supplement the existing low-carbon roadmaps because they already delve into the climate challenges. Roadmaps would also be one way to draw attention to sector-specific cross-border impacts.

6.2 Regional adaptation action

Regional authorities should continue the dialogue on the division of work and agree on how the coordination of adaptation action will be carried out in practice. The general lines of the division of work are based on the Regional Development Act and the special legislation of the administrative sectors, but on a practical level it is justified to continue the coordination effort. In particular, the role of the wellbeing services counties needs to be clarified when they begin to operate in early 2023. In practice, adaptive capacity should be strengthened through regular dialogues and by recording common policies in strategic plans or regional roadmaps.

Adaptation should be more strongly and clearly on the agenda of regional councils, municipalities, and ELY centres. In the future, also the cooperation groups of the wellbeing service counties need to address climate change. In the Government's proposal to amend the Climate Act with provisions regarding appeals and municipalities' climate obligations, it is generally stated that regional authorities can support municipalities. However, in the proposed sections, consideration of adaptation issues is entirely voluntary. The proposed

27 https://vm.fi/hankinnat-ekologinen-kestavyys [2.6. 2022]

sections do not require anything from the municipalities, and they do not support municipalities and regional organisations in getting resources to handle adaptation tasks (see section 6.6). However, by developing, for example, results agreements under the administrative sectors, it is possible to ensure that attention is paid to adaptation activities.

Climate change should be considered as a cross-cutting topic in the regional development work of the regional councils. Examining climate change as a subject that has a wide impact on the future of the regions enables the integration of mitigation and adaptation into the development visions of the regions. When adaptation is understood to be broader than the prevention of threats, the identification and promotion of new opportunities that open due to climate change will also be included in regional programmes and plans.

6.3 Promoting and supporting adaptation action in municipalities

The Climate Act's obligation on municipalities should be formulated in such a way that it encourages municipalities to set as concrete goals as possible, implement adaptation measures and monitor their effectiveness. In the published proposal,[28] planning for adaptation is completely voluntary. The 'obligation' is so light and flexible that it can be completely ignored. If the planning obligation is also missing from the final version of the Act, it will be especially important that regional councils, ELY centres and wellbeing services counties encourage and support municipalities in identifying the most relevant adaptation challenges. The Government should ensure that the funds intended to support climate plans can also be used to consider adaptation issues. Monitoring of the implementation should also be invested in, because it creates a basis for learning and the sharing of good practices among municipalities.

28 https://www.lausuntopalvelu.fi/FI/Proposal/DownloadProposalAttachment?attachmentId=17917 (Proposal for a bill to amend the Climate Act (in Finnish) [31.8. 2022])

Adaptation action should be strengthened by encouraging municipalities to maintain voluntary climate networks that enable continuous dialogues and sparring.[29] The Association of Finnish Municipalities plays an important role as the administrator of general network activities of municipalities. Regionally limited networks could, for example, jointly apply for resources to hire an adaptation expert so that even smaller municipalities could receive support for their adaptation action without hiring their own expert.

The possibilities to create an advisory service that would support the formulation and implementation of mitigation and adaptation measures in municipalities should be explored. The advisory service should have the resources to offer guidance in the design of climate action measures that are identified as the most suitable in local conditions. For example, in Sweden, the Energy Agency has funded the maintenance of municipal climate advisory services.[30] The survey by KOKOSOPU and the Association of Finnish Municipalities showed that adaptation communication is a demanding task, which therefore also requires skill development.

Ministries, the Association of Finnish Municipalities, regional authorities, and research institutes should, together with municipalities, improve the availability and applicability of knowledge supporting municipal climate action. The goal should be to improve and harmonise the current climate services used by municipalities, such as the ClimateGuide.fi and kestävyysloikka.fi online portals. Services should be developed, for example, by offering more specific descriptions of impacts and solutions, as well as planning guidelines and information on practices and actors (cf. Saikku et al., 2022). Possible funding instruments are, for example, the Government's analysis, assessment and research activities (VNTEAS), Life and separately allocated funds to support the implementation of the Climate Act**.**

29 For example, in Norway, networks based on an agreement between the state and municipalities have been systematically developed. https://www.miljodirektoratet.no/ansvarsomrader/klima/for-myndig heter/klimatilpasning/om-klimatilpasningsarbeidet/Storbynettverketlfront/. In Germany, municipalities can get support to their adaptation action from constituent state. [2.6. 2022]

30 https://www.energimyndigheten.se/energieffektivisering/program-och-uppdrag/kommunal-energi-och-klimatradgivning/ [2.6. 2022]

6.4 Adaptation innovations and R&D activities

Strengthening the knowledge base

Production of knowledge needed by adaptation activities should be continued, especially under the Government's analysis, assessment and research activities (VNTEAS) and other suitable funding. VNTEAS has been a significant financier of research needed for adaptation policy. Data on climate change improves constantly, and experience on adaptation measures is being accumulated as well. An up-to-date adaptation policy requires that the latest scientific information has been considered and interpreted for the needs of adaptation planning and policy.

Government should launch a targeted research and development programme like the Catch the carbon -programme,[31] **with a focus on increasing the adaptive capacity.** The program would aim for more long-term and in-depth research and innovations than the VNTEAS funding. For example, an in-depth analysis of cross-border impacts requires more time than normally is allocated for VNTEAS studies. The implementation of nature-based solutions also requires long-term studies. Goals of the programme could include the co-creation of new tools that can be added to existing online services and to improve networks and training. New tools may include, for example, easy-to-use methods for identifying climate risks or model solutions for integrating adaptation into the various tasks of municipalities. A long-term programme would also serve the development of monitoring and evaluation (see also 6.5).

Research institutes should allocate maintenance funding for climate services to guarantee the production of basic information on climate change for different user groups. The information should be produced in a form that would also enable the development of commercial customized services for specific stakeholders. In the development and production of climate services, cooperation is needed between R&D organisations, businesses, and the public sector. Climate services could be developed with project funding and as commercial solutions.

31 "Catch the carbon" -research and innovation programme to produce climate-sustainable land use solutions https://mmm.fi/en/-/hiilesta-kiinni-catch-the-carbon-research-and-innovation-programme-to-produce-climate-sustainable-land-use-solutions-extensive-call-for-applications-now-open [22.8.2022]

Utilisation of the innovation potential

Different sectors should systematically collect examples of implemented adaptation measures and assess their wider applicability in Finland and internationally. For example, the Finnish Water Forum[32] and Business Finland[33] could provide repositories for such information. Nature-based solutions exemplify solutions that have been developed and applied in Finland, but there are limited evaluations of their large scale applicability. It would be best to include evaluations in the normal planning and development of the sectors, and thus examine the potential of new solutions to change current practices. A prerequisite for the evaluation is an ability to combine the knowledge of adaptation with the specific expertise of the sector in question. To communicate the results, a 'solution website' could be developed, for example, as part of the ClimateGuide.fi website. Such information would provide inspiration for new activities and support the evaluation of funding proposals.

Cooperation between the private and public sector in the development of adaptation activities should be emphasised. This can be promoted by highlighting adaptation activity innovations as an opportunity, for example in the marketing of regional development funds and Business Finland's innovation and growth research funding. Successful adaptation is inevitably based on cooperation between the public and private sector and can also create new business. Innovation activity requires that both financiers and developers are aware of the opportunities that the development of adaptation-promoting innovations offers, also internationally.

Different sectors should examine what innovations would be needed improve the ability to respond to significant adaptation challenges (see also recommendation on roadmaps, 6.1). For example, to strengthen the adaptive capacity of the food system, the domestic production of protein and oil crops should be increased. This would reduce the need to import such crops and it would also decrease vulnerability to cross-border impacts. It requires R&D investment, experiments and their upscaling. However, upscaling also requires that the food and feed industry is willing to buy domestically produced crops.

32 https://www.finnishwaterforum.fi/wp/fi/ [6.6. 2022]

33 https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/rahoitus/horisontti-2020/yhteiskunnalliset-haasteet/ilmastotoimet-ymparisto-resurssitehokkuus-ja-raaka-aineet [6.6. 2022]

6.5 Development of monitoring and evaluation

The monitoring and evaluation system for adaptation required by the EU Climate Law should be more clearly linked to the National Risk Assessment[34] than at present, and the implementation of adaptation measures should also be monitored. In this way, the understanding of key climate risks (i.e., what to adapt to, how to adapt to and how adaptation affects the risk) could be brought together as part of monitoring and evaluation. The national system would serve both the preparation of the Annual Climate Report and reporting to the EU and the UN Climate Agreement.

Responsibilities and obligations regarding monitoring and evaluation, including supervision, must be defined in a coordinated manner at the national and regional level. Administrative branches have their own general monitoring and evaluation procedures for, for example, performance management. Monitoring and evaluation tasks concerning adaptation should be included in these procedures. The challenge is to ensure that the procedures and information of the different administrative branches are as consistent as possible. Therefore, each branch of government should be responsible for developing and piloting its own monitoring and evaluation procedures in accordance with mutually agreed principles so that they can be integrated into the national system.

The Government should fund the development of indicators for monitoring and evaluating adaptation action at different levels of government to create a set that is as comparable as possible. This requires interoperable systems and the identification of connections between levels of government in specific tasks. Continuous and long-term collection of relevant data and cost-effectiveness need to be ensured. Key monitoring data should be specified and the obstacles to their availability (at the national and EU level) need to be overcome. In some cases, legislative changes may be needed to remove obstacles. Each administrative branch should examine how the current reporting processes and monitoring data developed for different purposes can be utilised and developed to also serve the monitoring and evaluation of adaptation activities. This would maximize synergies between different purposes and avoid duplication of work.

34 https://intermin.fi/pelastustoimi/varautuminen/kansallinen-riskiarvio

6.6 Resources for adaptation action

Targeting and increasing resources

All administrative branches should more clearly identify the tasks that include adaptation activities. At the same time, other resources that are used for planning, promoting, and monitoring adaptation activities should be identified. The state budget already directs resources to adaptation activities, but most of the resources are not earmarked to adaptation. Integration is a strength, but at the same time there is a danger that adaptation activities remain partly invisible. This can lead to a neglect of issues that are essential to address in adaptation to climate change, such as long-time spans and changing basic conditions. Existing adaption know-how in the organisation may also be poorly used if an activity is not recognised as adaptation.

Authorities responsible for public incentive and support systems (for example, forest management, agricultural support, innovation support) should systematically examine how funds can also be used to promote adaptation. The State already directs resources to adaptation, but a systematic review would strengthen synergies between adaptation and other measures. This could also improve the possibilities to support new innovative adaptation measures, such as nature-based solutions. Funding programmes could have money earmarked for adaptation, as in the new ERDF program. Also, the development of criteria for considering adaptation in public procurement (see 6.1) can indirectly allocate resources to innovative adaptation activities.

Permanent resources should be targeted to adaptation activities in the public sector. In KOKOSOPU's resource analysis, the need for additional resources was clearly expressed. Practical adaptation is also the responsibility of the private sector, but the public sector plays a significant role in long-term guidance and as an infrastructure developer. Some of the additional resources can be secured through training, but without permanent funding it is difficult to direct activities in the long-term and utilise project funding that promotes adaptation. The development of new funding instruments aimed at the private sector also requires permanent resources in the public sector.

Funding instruments should be developed to support municipalities' adaptation activities. If the obligation for adaptation planning in municipalities is included in the Climate Act, it must be ensured that all municipalities are able to implement the obligation. The funding can be conditional on the preparation of an adaptation plan or the implementation of a set of measures stated in the plan. This would promote adaptation planning, the spread of adaptation innovations and effective targeting of adaptation measures.

The government should analyse, in cooperation with financial and insurance institutions, the consistency of different financial instruments with respect to adaptation. The starting point should be that all funding sources encourage different stakeholders to prepare for changes in such a way that damages and financial losses are minimised. This is especially important when the harmful effects of gradually developing long-term weather and climate conditions increase. Conventional insurance is not suitable for dealing with the losses that such changes may cause. Exceptional weather conditions can also lead to situations where the current insurance products fail. For example, overloading of healthcare and home care, weakened bearing capacity of soils, deterioration of grazing conditions for reindeer or the deterioration of the quality of household water are not covered by normal insurance.

Know-how and training

All administrative branches should review measures to improve competence for adaption in connection with mapping personnel competence and drafting training plans. Human resources are not just person months, and therefore the adaptation know-how of the personnel needs to be considered. Special expertise is needed to implement sector-specific adaptation measures. To strengthen adaptation know-how, authorities and the private sector can organise general personnel training as well as specific targeted courses for those working in positions that are particularly relevant for adaptation activities.

Adaptation contents should be included in vocational and higher education training programmes in key fields. The KOKOSOPU study identified the need to develop adaptation know-how in different sectors. The establishment of further education programmes for adaptation would ensure that there are enough adaptation experts for different sectors who also have special expertise in the sector in question. The training would also serve, for example, organisations for extension services, which have an important role in strengthening adaptation know-how among practitioners in various fields.

The need for and possibilities to implement dedicated expert training programmes for climate action in general and adaptation in particular should be examined. KOKOSOPU's analyses have shown that climate experts will be needed increasingly in the future. The training could be based on a joint programme of several universities and universities of applied sciences and train climate experts in a wide range of fields. It could

be based on strong international cooperation, because the management of cross-border impacts in particular requires international know-how. In this case, the programme could be integrated in international education opportunities.[35]

35 https://www.masterstudies.com/Masters-Degree/Climate-Change/ [6.6. 2022]

7 Striving for greater adaptive capacity

The primary goal of the 2014–2022 National Adaptation Plan was to strengthen the adaptive capacity of the Finnish society. In recent years the latest research results (IPCC 2021, 2022a,b) and the development of climate policy of the EU and under UN Climate Agreement have emphasised the importance of this goal.

However, the conditions for achieving the goal have partially changed. First, global and cross-border impacts are highlighted today even more in adaptation activities. Second, questions about fairness regarding the impacts of climate change and the societal changes needed to adapt to them have risen to the centre stage. Third, the overall sustainability of adaptation activities and climate action is considered more than ever before. Therefore, adaptation, mitigation, circular economy, and safeguarding biodiversity must be dealt with as parallel and mutually interacting goals. This supports comprehensive approaches in preparedness and risk management in which climate change is one, but not the only factor that affects Finland's future.

The changed operating environment of adaptation activities must be reflected in the strategic documents guiding adaptation. At the same time, the policies that have already been agreed upon must be implemented, which requires that the administration ensures the operating conditions and know-how, in particular at the local level.

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Appendices

Appendix 1. Organisations that took part in the national workshops

Finnish Forest Industries
Finnish Institute of International Affairs
Finnish Water Forum
Finnish Water Utilities Association (FIWA)
Ministry of Agriculture and Forestry
Ministry of Defence
Ministry of Economic Affairs and Employment
Ministry of Justice
Ministry of the Environment
Ministry of the Interior
Ministry of Transport and Communications
National Emergency Supply Agency
Prime Minister's Office
Sibelco Nordic Oy Ab
The Association for Finnish Municipalities
The Central Organisation of Finnish Trade Unions
The Finnish Association for Nature Conservation
The Finnish Grocery Trade Association (PTY)
The Finnish Innovation Fund Sitra
University of Helsinki
WWF Finland

Appendix 2. Questions addressed in the regional workshops

I Pre-survey to participants

In the survey, choose statements that fit your own expertise and answer from the point of view of your organization on a scale of 0–5. Regarding the question about challenges, 0 means "not significant at all" and 5 "very significant". Regarding the question about activities supporting adaptation action in the region represented by the respondent, 0 means "would not support at all" and 5 "would support very much".

1. **How significant are the climate change adaptation challenges described below in your area?**

- Residents' attitudes and values or little interest in adaptation
- Little interest of municipalities towards adaptation
- The management of my organisation has little interest in adaptation
- Residents are not ready to implement adaptation measures
- Businesses are not ready for adaptation measures
- Land owners are not ready for adaptation measures
- Polarisation of the climate debate
- The general economic situation of the region and its municipalities
- Industrial structure of the region
- Lack of human resources in my organisation to promote adaptation measures
- Lack of financial resources to implement concrete adaptation measures
- Lack of information and examples of concrete adaptation solutions
- There is no information on the impacts of climate change in the area and adaptation needs have not been identified
- Adaptation measures have not been planned
- The cost of the necessary adaptation measures
- Lack of expertise on the impacts of climate change in the region

2. **Evaluate how well the following actions would support adaptation action in your region**

- More detailed information about climate change impacts on the region
- More detailed planning guidelines than the current ones (e.g. for planning the urban infrastructure, stormwater management dimensioning)
- Knowledge of the application possibilities, costs and functionality of nature-based solutions
- Increasing and strengthening cooperation between all regional public sector organisations
- Coordination of regional adaptation action (e.g. Climate Task-Force or forum involving the public and private sector)

- Increasing cooperation between regional councils in adaptation issues
- Knowledge support and guidance from ELY centre
- Obligation set in legislation for regional adaptation action
- Obligation set in legislation for municipalities' adaptation action
- Increasing climate expertise in regional organisations
- The commitment of the political leadership of the region to the promotion of adaptation action
- Your own regional adaptation plan or strategy or a climate roadmap containing adaptation
- Integration of adaptation issues into all relevant regional planning (land use, natural resources, transport, security, etc.)
- Additional financial resources in the state budget for regional adaptation measures (investments, maintenance, grants)
- Allocation of regional development funds to regional adaptation action
- Strengthening competence resources for regional adaptation action (planning, advice)
- Something else, what?

II Evaluation of the current state of adaptation in the workshop:

- How has adaptation action progressed in your region? At what stage are you?
- What kind of challenges (legislation, knowledge, cooperation, authority, resources) have you encountered in adaptation action at the regional level?
- Available methods/means to integrate adaptation to different substance areas
- The roles of ELY centres, regional councils and other actors in adaptation action

III Future adaptation activities considered in the workshop:

Goals and paths to achieve them:

- How should cooperation and roles of regional actors be developed?
- What would activate adaptation planning in your region?
- In what form / in what context are you going to plan adaptation action?
- What kind of knowledge and other support do you need in the adaptation action and in its planning for the future?
- How would you like to receive information about good practices identified elsewhere?

Solving resource challenges, i.e. resourcing and securing resources:

- What would promote active engagement in adaptation planning in the regions? (activity of regional actors, mandatory legislation, something else?)
- How could adapting to climate change be better incorporated into strategic planning at the regional level?
- What kind of additional resources do you need for adaptation action?
- Ensuring the human resources of your own organisation in adaptation action. To which targets?
- Funding for the implementation of adaptation measures (e.g. investments). To which targets?
- Information sources, models and instructions. On what subject area?
- Other resources

Appendix 3. Interview questions used in the resource survey

1. **Estimate the effort/amount of work (hours/days) invested in issues related to adaptation to climate change in your organisation on?**
   a. In practice, my organisation does not use working time for tasks that deal with adaptation
   b. In my organisation, working time is used for tasks that deal with adaptation: give either a quantitative estimate or a magnitude-category estimate, broken down into different sub-tasks or as an overall estimate.

Task	Estimate Person months (PM)/year	Less tham 5 person days (PD) /y	5-20 PD/y	1 – 6 PM/y	More than 6 PM/y
Preparation of guidelines for adaptation measures of your organisation					
Planning adaptation measures, financial decisions or advice in the organisation's area of responsibility					
Implementation of adaptation measures in the organisation's area of responsibility					
Monitoring and evaluation of adaptation measures in the organisation's area of responsibility					
Reporting of adaptation measures in the organisation's area of responsibility					
Something else, what?					
In total, for activities related to adaptation to climate change					

Is the resource

permanent
temporary

Describe the activity in more detail:

2. **Annual need for personnel over a period of 5–10 years**
   a. The current person-year (PY) resource is sufficient
   b. personnel resources should be increased slightly (10–20% increase compared to the current situation)
   c. personnel resources should be clearly increased (about a 50% increase compared to the current situation)
   d. personnel resources should be increased significantly (at least twice compared to the current state.
   e. I cannot estimate

The greatest need is for:

3. **How much money does your organisation spend on or allocate to activities that maintain or improve the ability to adapt to the impacts of climate change?**
   a. In practice, my organisation does not use or direct money to adaptation;
   b. In my organisation, funds are used on or allocated to activities that deal with adaptation: give either a quantitative estimate or a magnitude-category estimate, broken down into different sub-tasks or as an overall estimate.

Activity	Aggregated estimate 1000 € /year	< 10 000 €/y	10 000 – 100 000 €/y	100 001 – 1 M€/y	> 1 M€/y
Maintaining or increasing the adaptive capacity of your organisation					
Directing funding to maintain or increase the adaptive capacity of other organisations					
Directing funding to adaptation supporting RDI activities					

Activity	Aggregated estimate 1000 € /year	< 10 000 €/y	10 000 – 100 000 €/y	100 001 – 1 M€/y	> 1 M€/y
Directing funding to training or communication that supports adaptation					
Something else, what?					
In total, for activities related to adaptation to climate change					

Is the resource

permanent

temporary

Describe the use of current funding in more detail:

4. **Annual need for financial resources over a period of 5–10 years**
   a. Current funding is sufficient
   b. Funding should be increased slightly (a 10–20% increase compared to the current situation)
   c. Funding should be clearly increased (about a 50% increase compared to the current situation)
   d. Funding should be increased significantly (at least twice compared to the current state
   e. I cannot estimate

The greatest need concerns (for example, maintenance, new investments, training needs):

5. **Future funding for adaptation measures in your organisation's area of responsibility should come**
   a. From the EU (structural funds/Life/interreg etc.)
   b. From the state (targeted budget funding),
   c. The region's own funding
   d. From the private sector (financial institutions, citizens' and companies' own funds)

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