

344

Stakeholder perceptions of climate change and the need to adapt

Susanna Kankaanpää, Timothy R. Carter and Jari Liski

FINADAPT Working Paper 14

STAKEHOLDER PERCEPTIONS OF CLIMATE CHANGE AND THE NEED TO ADAPT

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FINADAPT WORKING PAPER 14

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Preface

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as "Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities"¹. The IPCC lists two reasons why adaptation is important in the climate change issue. First, an understanding of expected adaptation is fundamental in evaluating the costs or risks of climate change. Second, adaptation is a key response option or strategy, along with mitigation. Even with reductions in greenhouse gas emissions, some climate change is regarded as inevitable, and it will be necessary to develop planned adaptation strategies to deal with the associated risks as a complement to mitigation actions.

In Finland, there has been substantial progress during the past decade in investigating the potential impacts of climate change on natural and human systems. In contrast, there has been much less attention paid to adaptation. This was recognised by the Finnish Parliament as early as 2001, when it recommended that a separate programme for adaptation to climate change be initiated. As a result, a task force co-ordinated by the Ministry of Agriculture and Forestry completed Finland's first National Strategy for Adaptation to Climate Change in 2005.²

At about the same time as the Strategy document was being drafted, a research consortium named FINADAPT also began its work. The goal of the consortium, involving 11 partner institutions co-ordinated by the Finnish Environment Institute, was to undertake an in-depth study of the capacity of the Finnish environment and society to adapt to the potential impacts of climate change. FINADAPT was funded for the period 2004-2005 as part of the Finnish Environmental Cluster Research Programme, co-ordinated by the Ministry of the Environment. It comprised 14 work packages (WP) covering: 1) co-ordination, 2) climate data and scenarios, 3) biodiversity, 4) forests, 5) agriculture, 6) water resources, 7) human health, 8) the built environment, 9) transport, 10) energy infrastructure, 11) tourism and recreation, 12) economic assessment, 13) urban planning, and 14) a stakeholder questionnaire. The primary objective of FINADAPT was to produce a scoping report based on literature reviews, interactions with stakeholders, seminars, and targeted research.

This report presents the findings of work package 14, which conducted a questionnaire of stakeholders thought likely to be affected by climate change and to be well placed to advance adaptation. With well over 500 respondents, the results provide an interesting cross-section of Finnish opinions and perceptions about climate change, as well as some illuminating insights into the preparedness of individuals and organisations to adapt to its future effects.

Timothy Carter, Consortium Leader
Helsinki, December 2005

¹ IPCC, 2001. *Climate Change 2001: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change* [McCarthy, J.J., O.F. Canziani, N.A. Leary, D.J. Dokken, and K.S. White (eds)]. Cambridge University Press, Cambridge and New York, p. 982.

² MMM, 2005. *Ilmastomuutoksen kansallinen sopeutumisstrategia* (Finland's National Strategy for Adaptation to Climate Change) [Marttila, V., Granholm, H., Laanikari, J., Yrjölä, T., Aalto, A., Heikinheimo, P., Honkatuki, J., Järvinen, H., Liski, J., Merivirta, R. and Paunio, M. (eds)], Ministry of Agriculture and Forestry, Helsinki (available in Finnish, 276 pp., Swedish 212 pp. and English, 280 pp.) <http://www.mmm.fi/sopeutumisstrategia/>

Table of contents

Preface	i
Table of contents	iii
Executive Summary	1
1. Introduction	3
2. Methods	4
2.1. Questionnaire	4
2.2. Stakeholders in the study.....	4
2.3. Responses	7
3. Results	7
3.1. General perceptions of climate change and its impacts	7
3.2. Stakeholder information needs.....	8
3.3. Climate change impacts and their significance to the sectors.....	10
3.4. Adaptation to climate change.....	13
3.5. Climate change issues in planning	13
3.6. Adaptive capacity of different sectors in Finland	15
3.7. Global impacts of climate change and their significance to Finland	15
3.8. Measures to enhance adaptation in Finland	16
3.9. Comments by stakeholders.....	17
4. Conclusions	19
5. Acknowledgements	20
6. References	21
Appendix 1: Questionnaire in English (translation)	22
Appendix 2: Questionnaire in Finnish (original)	27
Appendix 3 Sectoral estimates of adaptive capacity	32

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Executive Summary

This study solicited stakeholders' opinions on climate change adaptation and their needs for information on the issue through a questionnaire survey. Stakeholders were identified as: 1) those affected by climate change and 2) those positioned most effectively to advance adaptation.

Questionnaire

The questionnaire comprised 21 questions, mostly multiple-choice, but also some open questions. They included questions on general perceptions about climate change, its potential impacts and their significance, current preparedness, coverage of climate change issues in current plans, the need to respond and the measures required. The questionnaire was Internet based and anonymous, and was sent to 1133 persons working in 23 sectors. Respondents were asked to fill in the questionnaire from the point of view of their sector or work, and not as private citizens.

Of the 532 persons who replied (47% response rate), natural resource and environmentally-related sectors each made up about a quarter, with 13 other sectors also represented. A majority of respondents worked in government at different levels, about one tenth were from the private sector, with NGOs, research and educational institutions making up the remainder. Regionally, 62% were from Southern Finland, 16% from Western Finland, 8% from both Eastern Finland and Oulu Province, and 6% from Lapland.

Main findings

More than 90% of the respondents agreed with the statement that climate change is caused by human actions and 69% thought that the climate has already changed. A majority believed that most sectors in Finland are able to cope with climate variability and the impacts of climate change fairly or very well, or were ambivalent on this point (i.e. they estimated their adaptive capacities to be neither good nor poor). Of all the sectors listed in the survey, reindeer husbandry and nature conservation were the those estimated to be least capable of adapting to climate change. Agriculture, forestry, energy, transport and health sectors were considered by most to be quite capable of coping, though 19% of respondents considered the adaptive capacity of the forestry sector to be fairly poor.

Climate change issues have so far not been taken into account in just over half of the operational plans of organisations or sectors represented in the survey (52% of respondents). Nevertheless, 37% of the plans did cover climate change issues, and of these most dealt with both mitigation and adaptation (41%). 32% of the plans treated only mitigation issues, and 23% only adaptation. 4% of the plans covered other climate change issues that could not be classified as either mitigation or adaptation.

Information and research needs

A majority (53%) of the stakeholders considered that they had already received sufficient information on climate change issues to support their decision-making and planning at work. The stakeholders were given a list of alternative information needs. Of these alternatives, the responses emphasize

information on impacts on Finland (62%), on probabilities of occurrence of extreme events (57%), uncertainties of estimates (56%) and regional impacts (50%).

Other information needs listed by the respondents, included information on:

- *Adaptation*: in general; adaptation of fisheries; local measures; advice on what individuals can do, costs, maladaptation issues
- *Impacts*: Nordic region impacts; global impacts and their indirect effects on Finland; a range of sectoral impacts; economic impacts; more detailed local and regional impacts; linkages between sectors; identification of critical impacts and thresholds, including impacts of mean warming exceeding 2°C
- *Scenarios*: national scenarios; sectoral scenarios; more detailed scenarios
- *Extreme weather events and abrupt climate change*: maximum wind speeds; droughts; changes in the Gulf Stream; methane eruptions; melting of continental glaciers and sea level; probabilities and time frames
- *Construction*: studies on construction regulations and practices and the need to change them due to a changing climate
- *Management and use of natural resources*: research on how natural resources should be managed to enhance adaptation (especially from the point of view of nature conservation, agriculture and forestry); research on water quality and water management practices, taking into account extreme weather events (floods, storms); research on agricultural practices, plant breeding, production systems;
- *Planning*: studies on how to incorporate information on climate change impacts and adaptation into planning practices; integration of different planning systems over sectors and governmental levels; research on land use systems and climate change
- *Monitoring systems*: detection of climate change; early warning of extreme climate events
- *Behavioural changes*: need for regular surveys of the population regarding e.g. health, recreation, economic activity
- *Guidelines*: for adaptation research; for developing adaptation strategies in sectors; for identifying critical thresholds; development of risk analysis methods

Half of the respondents (50%) thought that measures taken so far in Finland to adapt to climate change have not been sufficient while 24% of the respondents considered the actions adequate and 26% did not have an opinion or could not estimate the sufficiency of the measures. 285 persons answered the open question "What kinds of measures should the authorities (central, regional and local) take to adapt to the impacts of climate change?". Many of the responses suggested several types of measures. These included (ranked according to the number of responses):

- *research* on adaptation, on climate change impacts and scenarios (98)
- *integration of climate change issues into planning* at all levels, integrating sectoral planning, cooperation (90)
- *information dissemination* on climate change and adaptation issues and research results (80)
- *regulation* and new legislation to enhance adaptation (76)
- *economic measures* and creating incentives for private sector (33)
- *enhancing innovations* and technological development (18)
- *education and training* on climate change and adaptation (18)
- *risk assessment*, monitoring and evaluation systems (18)
- *international activities*, with more participation in international adaptation work (16)
- *decision support systems* for adaptation to assist decision making (13)

1. Introduction

Climate researchers have generated an impressive amount of evidence over recent decades in support of anthropogenic climate change (e.g. IPCC, 2001; ACIA, 2005). Their conclusions, are fairly unequivocal, that:

- climate is changing and that humans are at least partly responsible for these changes
- climate will continue to change in the future, an inevitable consequence of historical greenhouse gas emissions
- these changes are certain to cause impacts
- adaptation will be required to avert the most damaging impacts.

However, in spite of clear signals from the scientific community, it remains unclear how effectively these messages have been communicated to and understood by those individuals and organisations who will be at the forefront in dealing with the issue.

Stakeholders are important actors in adaptation (Conde and Lonsdale 2005). They are individuals and groups who have the current and past experience of coping with and adapting to climate variability and extremes. Stakeholders can provide information on climate change impacts and adaptations; they can also assess the viability of proposed adaptive measures. The research community and stakeholders can develop adaptation strategies together, by combining scientific information and local knowledge and experiences of change and responses. Adaptation occurs through public policy making and decisions made by stakeholders. Analysing the capacity of stakeholders to cope with and adapt to climatic events is fundamental to characterising current and possible future vulnerability. Understanding the role of stakeholders in the decision-making process will assist in implementation of adaptation policies. (Conde and Lonsdale 2005, p. 49)

In Finland, previous studies of public perceptions of the climate change issue have focused on climate change research and policy (Tikkonen and Wilenius, 1996), on the need for scenarios of future climate and other global changes (Bärlund and Carter, 2001) and two studies commissioned by the Climate Change Communications Programme on awareness of climate change (Taloustutkimus 2002, 2005). The issue of how to respond to climate change has been raised in some of these studies, but invariably in relation to mitigation actions to reduce greenhouse gas emissions. The issue of adaptation to climate change, and its relevance to key stakeholders, has scarcely been touched upon.

The purposes of this study were threefold:

1. to survey stakeholder perceptions of their capacity to adapt to a changing climate
2. to identify stakeholders' information needs regarding adaptation to climate change
3. to raise awareness of the issue of adaptation to climate change among stakeholders.

In this report, we first outline the methods employed in the designing the questionnaire, in identifying potential stakeholders to be surveyed and in analysing the responses. We then describe the main results of the study and finally we summarise these and attempt to draw some broad conclusions.

2. Methods

2.1. Questionnaire

The questionnaire was created by the Webropol programme and it was Internet based. Draft versions of the questionnaire were tested twice by small testing groups prior to sending the questionnaire to the recipients. The questionnaires were sent by e-mail in May (weeks 18 and 19) and August (week 31) 2005 to the recipients personal e-mail addresses at their work. The respondents received a personal e-mail message with a covering letter explaining the study and the purpose of the questionnaire with a link to the questionnaire at the end of the message. The questionnaire could be answered through the link only once. Respondents were given 1-2 weeks time to fill in and send the form. The full questionnaire is presented in Appendix 1 in English (translated) and in Appendix 2 in the original Finnish.

It comprised 21 questions, mostly multiple-choice, but also some open questions. The questions were on the stakeholders' general perceptions about climate change, their opinions about the credibility of climate scenarios for Finland, their climate information needs, potential impacts of climate change and their significance, their current preparedness to climate change and its impacts, coverage of climate change issues in current plans, and the need to respond and the needed measures to be taken.

When formulating the questions, determinants of vulnerability and adaptive capacity were identified according to previous studies on adaptation and vulnerability (O'Brien et al. 2004, Brooks et al. 2004, Lim and Spanger-Siegfried 2005). Potential adaptation measures were partly identified based on a UKCIP study (Willows and Connell 2003).

An attempt was made to find out the stakeholders' opinions about the adaptive capacity of their own sectors. However, conclusions of the adaptive capacities of the sectors were difficult to make based on the results, as for most indicators the responses did not give a clear answer as to if it described the sector or not. It would also have been difficult to get but indicative results of the question (no. 13) as the significance and weight of the factors in forming the adaptive capacity of a sector are unclear. Another question that was omitted from the analysis was question 6 that asked the stakeholders' opinions of the reliability of different media. This proved to be a difficult question both to the stakeholders to answer and to analyse.

2.2. Stakeholders in the study

Stakeholders are those who have interests in a particular decision, either as individuals or as representatives of a group. They are people who influence a decision, or can influence it, as well as those affected by it. (Ebi et al. 2005, p. 37) In this study, stakeholders were defined as: 1) those affected by climate change, 2) those positioned most effectively to advance adaptation (Lim and Spanger-Siegfried 2005).

The target sectors of the study were the sectors that climate change was assumed to have the largest impact on, and/or those sectors that would be potential actors in adaptation. The National Adaptation Strategy (MMM 2005) and international adaptation assessments and strategies (Lemmen and Warren 2004, Ebi et al. 2005, p. 38-39) were also used as sources in identification of the target sectors.

The questionnaire was sent to 1133 persons representing about 15 different sectors (Figure 1). The sectors chosen for the study were natural resources, environment, community planning, land use and zoning, construction, industry, energy, transport, commerce, health care, tourism and recreation and insurance. The questionnaire was also sent to some respondents representing emergency services, development aid, social and social policy sectors. The respondents were mainly identified from the Internet pages of the individual organisations.

The respondents were asked to fill in the questionnaire from the point of view of their sector or work, and not as private citizens (such as summer home owners, private car owners, recreational fishermen or hunters etc.). The questionnaire was targeted to the users of climate change information.

The group of stakeholders chosen for this study are not a sample of their sectors (for example natural resources sector) but constitute an example. Therefore the results of this survey cannot be generalised to indicate the opinions of the whole sector. The results only show the opinions of the group of stakeholders that comprised the respondents in this study. They were asked to answer as representatives of their sectors to the survey, but the results can be considered only indicative at best of the opinions of the whole sector.

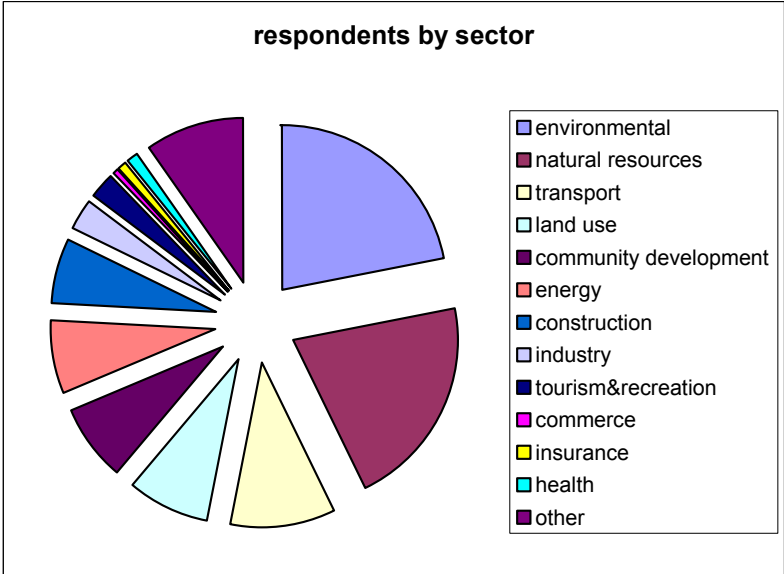


Figure 1 Respondents by sector.

In this study, the natural resources sector comprised agriculture, forestry, fishery and reindeer husbandry. The environment sector included areas such as environmental management and nature conservation. Transport sector included road and rail transport, air traffic and seafaring. The land use sector comprised of areas such as regional planning, urban planning and zoning. Community development sector included waste management and water management. In this study, the category other sectors includes sectors such as emergency planning, social policy and development aid. Some sectors (namely insurance, commerce, health, industry and tourism and recreation) had few respondents. This was partly due to the difficulty of identifying and finding the stakeholders to answer the questionnaire and partly to wishing to avoid overlapping stakeholder activities within the FINADAPT Consortium as Work Packages on health and tourism and recreation carried out their own stakeholder activities.

The respondents represented mainly the public sector (70%) (Figure 2), which comprised of central and regional government (both regional government organisations such as forest and environment centres and provinces and regional planning organisations) and municipalities. The private sector comprised of representatives of companies, unions and central organisations and non-governmental organisations. As the questionnaire was targeted to the users of climate information, representatives of research institutions were quite few. The questionnaire was also send to some secondary schools and gymnasiums as well as to polytechnic institutes (AMK).

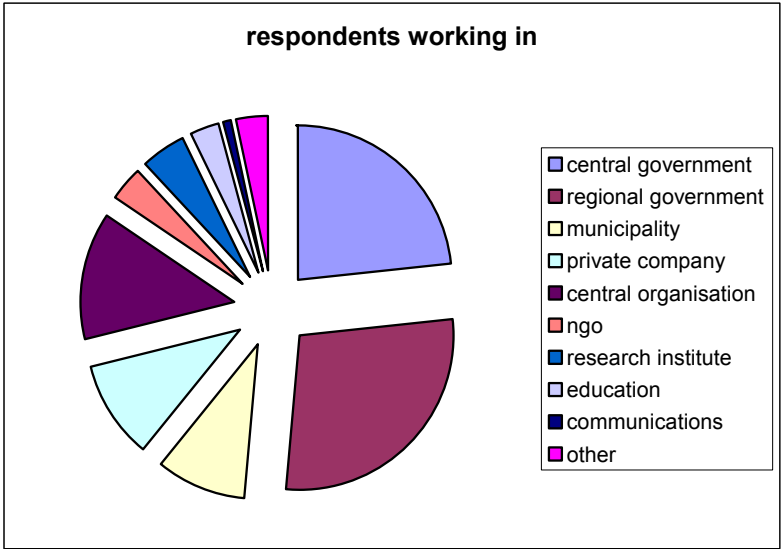


Figure 2 Respondents working in public/private sector.

The respondents were mainly from the province of Southern Finland, but also regional coverage of the responses was attempted (Figure 3).

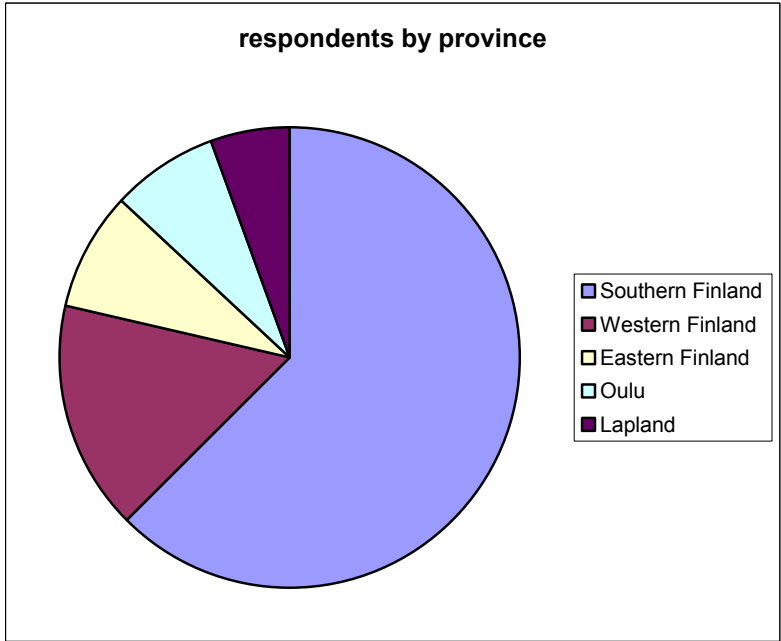


Figure 3 Respondents by province.

2.3. Responses

532 persons answered to the questionnaire, a response rate of 47%. Responses were collected and stored by the Webropol programme. The answers were collected as anonymous answers and the persons could not be identified from them. Results were analysed by SPSS and Webropol programmes. Open questions were coded by a simple and subjective coding system.

At the end of the questionnaire the respondents were invited to comment the questionnaire. The reasons some respondents found the questionnaire difficult to answer, were the following:

- The questions were difficult to answer from the point of view of their sector (climate change issues were not discussed within the sector or they were not considered important to the sector)
- The respondents did not have enough knowledge of the subject
- The stakeholders felt the questions were not targeted to their area of work (administration)
- The questions were not commensurate and unequivocal
- The impacts given were not clearly either positive or negative for the sector
- Climate change can have both positive and negative impacts to the sectors
- It was hard to answer the questions as there are so many uncertainties concerning climate change and its impacts, the rate and magnitude of changes.
- Some of the respondents were not convinced that climate change is happening or they thought that it is part of natural variability
- The questionnaire was too long and the time to complete the questionnaire given in the covering letter (10-15 minutes) was too optimistic.

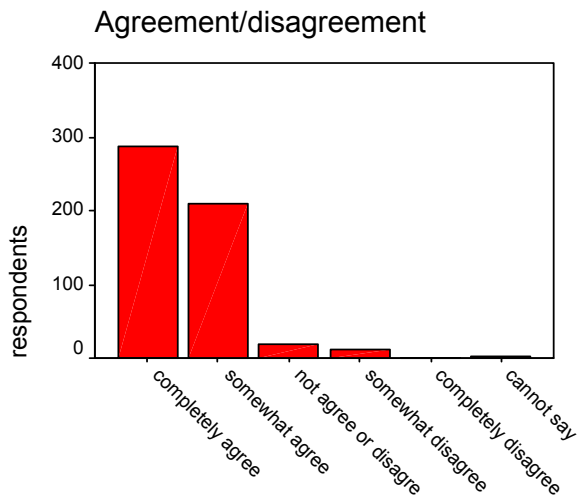
3. Results

3.1. General perceptions of climate change and its impacts

The questionnaire started with two questions on general perceptions about climate change. The vast majority of the respondents agreed with the statement that climate change is caused by human actions and they also thought that the climate has already changed (69% - Figure 4).

The respondents generally thought that the climate scenarios for Finland (FINSKEN, Jylhä et al. 2004) that projected smaller changes in temperature and precipitation up to the year 2040 were more credible than the scenarios that projected larger changes. 67% of respondents thought that a temperature rise of maximum 2 degrees was very or quite likely to happen, but only 16% thought that a temperature rise of at least 3 degrees is likely to happen. 48% of respondents thought that a maximum 2% rise in precipitation is likely, but only 21% considered an at least 15% increase in precipitation likely.

"Human actions cause climate change"



Has climate already changed?

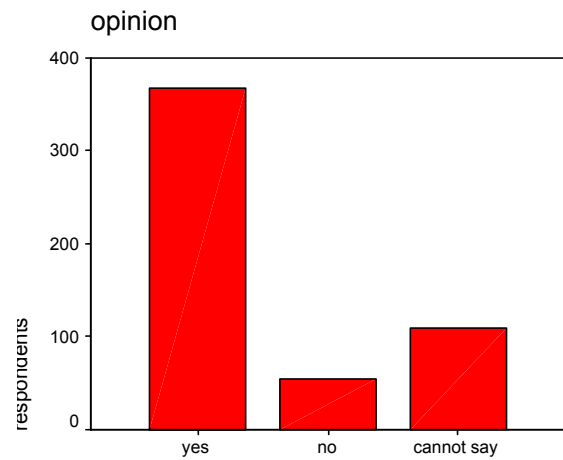


Figure 4 General perceptions of climate change.

3.2. Stakeholder information needs

A majority (53%) of the stakeholders said that they have so far received enough information on climate change issues to support their decision-making and planning at work. (Figure 5).

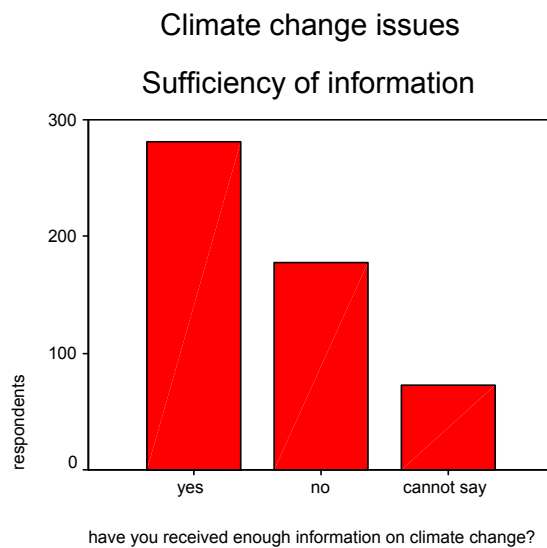


Figure 5 Sufficiency of climate information.

The stakeholders were given a list of alternative information needs on climate change issues. Of these alternatives, the responses emphasize information on impacts on Finland (62% of respondents), on probabilities of occurrence of extreme events (57%), uncertainties of estimates (56%) and regional impacts (50%) (see Figure 6).

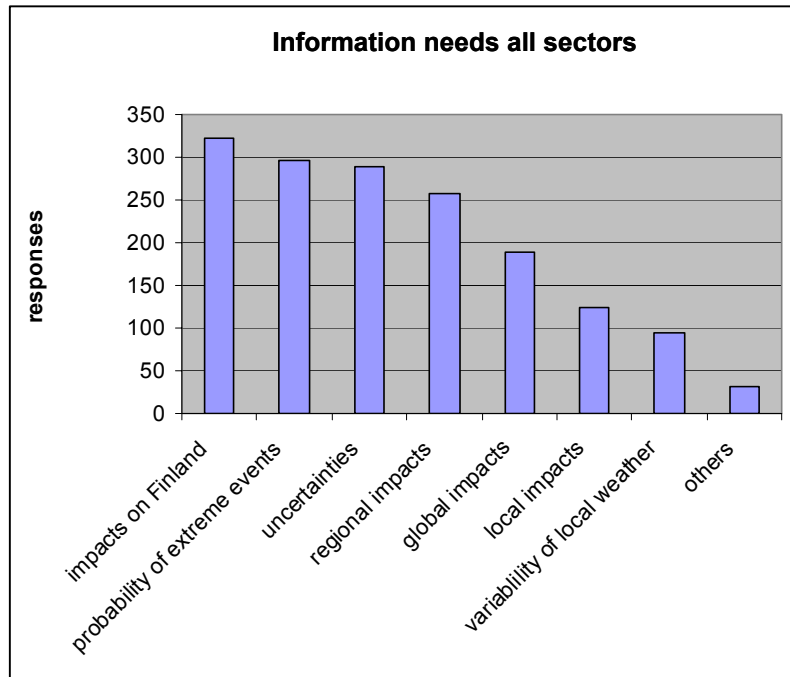


Figure 6 Information needs (all sectors).

Other information needs listed by the respondents, included information on:

- *Adaptation*: in general; local measures; what can I do; maladaptation; costs; adaptation of fishes
- *Impacts*: global impacts of climate change and their indirect effects on Finland; sectoral impacts; local impacts; more detailed impacts; linkages between sectors; synergy and combined effects; identification of critical impacts and thresholds; on fishes; on Nordic countries; species changes; economic impacts; on snow conditions; chains of impacts; pests (of plants)
- *Scenarios*: sectoral scenarios, scenarios on Finland, identification of positive and negative impacts; classification of future climate into climate types or zones, more detailed scenarios; the differences between them; impacts of higher average temperature rise than 2 degrees
- *Extreme events*: probabilities; the future of the Gulf Stream, methane eruptions, continental glaciers;
- *Changes*: changes and their direction, identification of critical changes, thresholds; in winter conditions; sea level, also oceans; maximum wind speeds; wind conditions; dry periods, droughts; how much of the change is natural and how much human induced
- Research on *probabilities and time frames*
- *Applied research*: as a result of the research, recommendations, limits, critical thresholds and guidelines for different sectors; adaptation guidelines; critical and reliable research
- *Stakeholder involvement*
- Development of *risk analysis* methods
- Links between biodiversity and climate change
- How much weather affects the stream of environmental refugees
- Finnish political priorities concerning climate change

- *Management and use of natural resources*: research on how natural resources should be managed to enhance adaptation (especially nature conservation, agriculture and forestry)
- *Adaptation of agriculture*: research on agricultural practices, plant breeding, production systems
- *Adaptation in the waters sector*: research on water quality and water management practices, taking into account extreme weather events (floods, storms)
- *Planning systems*: studies on how to incorporate information on climate change impacts and adaptation into planning practices; integration of different planning systems over sectors and governmental levels; consideration of several alternatives in planning, long term planning practices; development of monitoring systems to take into account climate change; applying information to different sectoral guidelines and regulations
- *Land use*: research on land use systems and climate change; how should land use planning systems respond?
- *Community development systems and climate change*
- *Construction*: studies on construction regulations and practices
- Research on *behaviour changes*
- Development of insurance systems

3.3. Climate change impacts and their significance to the sectors

The respondents considered that some of the changes and impacts, such as mean temperature rise, milder winters and lengthening of the growing season will have positive impacts from the point of view of their sectors. For most sectors, increases of possibility of major floods, weather extreme events, increases in windiness and precipitation were considered negative. Changes in snow conditions and increase in dry periods were also considered negative, but for many respondents they were also neutral (having not positive or negative impacts).

Respondents in the natural resources sector estimated that increase in mean temperature would have positive impacts to the sector. Also lengthening of the growing season would have a positive impact to the sector. Increase in total precipitation and windiness would have negative impacts.

Energy sector stakeholders estimated that increase in mean temperature, lengthening of growing season and milder winters would have moderate positive impacts to the sector. Increase in occurrence of extreme weather events and floods would have negative impacts. Global impacts of climate change would have negative impacts to the sector.

In the transport sector, increase in mean temperature and milder winters would have moderate positive impacts as well as changes in ground frost conditions. Increase in windiness and total precipitation would have negative impacts to the sector according to the responses.

For tourism and recreation, increase in occurrence of extreme weather events, milder winters and increase in windiness would have negative impacts. Also increase in total precipitation, dry periods and changes in snow conditions would be negative changes from the point of view of the sector. Lengthening of the growing season would have moderately positive impacts or be neutral.

Tables 1-7 present detailed sectoral results. Percentages describe the share of respondents of each sector choosing a given alternative.

Table 1 Significance of increase of mean temperature (sectoral).

Sector	great impact	pos moderate impact	pos not pos, not neg impact	moderate neg impact	great impact	neg cannot say
Natural resources	5.5 %	57%	11%	18.9%	3.9%	3.9%
Environment	3.7%	27.9%	21.3%	27.9%	12.5%	6.6%
Energy	6.8%	36.4%	22.7%	20.5%	9.1%	4.5%
Construction	7.9%	47.4%	31.6%	10.5%	2.6%	-
Land use	4.1%	49%	20.4%	18.4%	6.1%	2%
Community development	-	52.3%	27.2%	15.9%	4.5%	-
Transport	1.7%	46.9%	29.7%	14.1%	6.3%	1.7%
Tourism and recreation	-	21.4%	21.4%	28.6%	14.3%	14.3%

Table 2 Significance of milder winters (sectoral).

Sector	great impact	pos moderate impact	pos not pos, not neg impact	moderate neg impact	great impact	neg cannot say
Natural resources	0.8%	31.5%	12.6%	36.2%	16.5%	3.1%
Environment	4.4%	22.8%	16.2%	35.3%	52.8%	7.4%
Energy	11.4%	43.2%	11.4%	18.1%	9.1%	6.8%
Construction	12.8%	46.1%	20.5%	10.3%	10.3%	-
Land use	6.1%	40.8%	22.4%	24.5%	4.1%	2%
Community development	11.1%	53.3%	8.9%	13.3%	8.9%	4.4%
Transport	6.3%	42.3%	14.1%	28.1%	4.7%	4.7%
Tourism and recreation	-	14.3%	7.1%	35.7%	28.6%	14.3%

Table 3 Significance of increase in windiness (sectoral).

Sector	great impact	pos moderate impact	pos not pos, not neg impact	moderate neg impact	great impact	neg cannot say
Natural resources		1.6%	19.5%	50.8%	25.8%	2.3%
Environment	1.5%	5.1%	19.1%	45.6%	22.1%	6.6%
Energy	4.7%	23.3%	25.6%	27.9%	16.3%	2.3%
Construction	-	-	23.1%	56.4%	21.1%	-
Land use	-	2%	12.2%	63.3%	22.4%	-
Community development	-	2.2%	40%	42.2%	13.3%	2.2%
Transport	-	3.1%	20.3%	57.8%	14.1%	4.7%
Tourism and recreation	-	-	-	57.1%	35.7%	7.1%

Table 4 Significance of increase of extreme weather events (sectoral).

Sector	great impact	pos moderate impact	pos not neg impact	pos, not moderate impact	neg great impact	neg cannot say
Natural resources	-	0.8%	4.7%	44.1%	48.8%	1.5%
Environment	1.5%	2.9%	4.4%	37.5%	48.5%	5.1%
Energy	2.3%	2.3%	4.5%	47.7%	36.4%	6.8%
Construction	2.6%	-	15.4%	38.5%	41%	2.6%
Land use	-	-	4.1%	32.7%	61.2%	2%
Community development	-	2.2%	6.7%	37.8%	46.7%	6.7%
Transport	-	4.7%	9.4%	31.3%	48.4%	6.3%
Tourism and recreation	-	-	7.1%	28.6%	42.9%	21.4%

Table 5 Significance of increase in total precipitation (sectoral).

Sector	great impact	pos moderate impact	pos not neg impact	pos, not moderate impact	neg great impact	neg cannot say
Natural resources	0.8%	9.4%	24.4%	45.7%	16.5%	3.1%
Environment	2.9%	8.8%	18.4%	38.2%	25.7%	5.9%
Energy	9.1%	31.8%	15.9%	29.5%	11.4%	2.3%
Construction	-	7.7%	12.8%	59%	21.1%	-
Land use	4.1%	2%	12.2%	57%	24.5%	-
Community development	4.4%	13.3%	15.6%	33.3%	33.3%	-
Transport	-	4.7%	28.1%	12.5%	18.8%	4.7%
Tourism and recreation	-	7.1%	21.4%	21.4%	35.7%	14.3%

Table 6 Significance of change in snow conditions (sectoral).

Sector	great impact	pos moderate impact	pos not neg impact	pos, not moderate impact	neg great impact	neg cannot say
Natural resources	-	6.3%	28.1%	43.8%	15.6%	6.3%
Environment	1.5%	8%	24.3%	36%	19.1%	11%
Energy	2.3%	6.8%	31.8%	38.6%	11.4%	9.1%
Construction	2.6%	21.1%	28.2%	35.9%	10.3%	2.6%
Land use	2%	14.3%	28.6%	44.9%	8.2%	2%
Community development	2.2%	15.6%	40%	28.9%	11.1%	2.2%
Transport	1.6%	28.6%	23.8%	33.3%	6.3%	6.3%
Tourism and recreation	-	-	7.1%	35.7%	42.9%	14.3%

Table 7 Significance of global impacts (sectoral).

Sector	great impact	pos moderate impact	pos not neg impact	pos, not moderate impact	neg great impact	neg cannot say
Natural resources	1.6%	5.6%	21.4%	28.6%	26.2%	18.3%
Environment	0.7%	1.5%	16.2%	19.9%	41.9%	19.9%
Energy	2.3%	-	15.9%	29.5%	27.2%	25%
Construction	-	-	36.8%	10.5%	36.8%	15.8%
Land use	-	-	16.3%	32.7%	34.7%	16.3%
Community development	2.3%	-	29.5%	27.3%	27.3%	13.6%
Transport	-	1.7%	45.3%	21.9%	15.6%	14.1%
Tourism and recreation	-	14.3%	7.1%	28.6%	28.6%	21.4%

3.4. Adaptation to climate change

Most of the respondents felt that mitigation was the most efficient adaptation measure. The respondents also considered planning, research, development of new technology and preparing for extreme events to be among the most efficient measures to adapt to climate change. The full set of responses are shown in Figure 7.

3.5. Climate change issues in planning

In just over half of operational plans of the organisations or sectors that the respondents represented (52% of respondents), climate change issues had not already been taken into account. 37% of the plans covered climate change issues. Most of the plans dealt with both mitigation and adaptation (41%). 32% of the plans treated only mitigation issues, and 23% only adaptation. 4% of the plans covered other climate change issues, that could not be classified as either mitigation or adaptation.

The respondents (135 persons answered the question) also described briefly the goals of the plans that treat climate change issues. Many of the plans had goals and tasks that covered both mitigation and adaptation. The plans had also other climate change related goals or issues that could not be categorised as either mitigation or adaptation. Most of the goals described covered mainly mitigation (94), but also adaptation goals were described (51). 42 climate changes related goals could not be categorised to either mitigation or adaptation.

Many of the goals described treated either energy or transport issues. The energy related goals of the plans included: improving energy efficiency; decreasing greenhouse gas emissions of energy production and use; saving energy; using less energy; enhancing use of renewable energy; increasing efficiency of energy production; information dissemination; training.

The transport goals included: planning transport systems in order to increase the use of public transportation and enhancing bicycle and pedestrian traffic; decreasing greenhouse gas emissions of transport, monitoring; changing planning guidelines to take into account climate change; applying new technology; using economic driving methods; realising concrete savings by doing mitigation measures; optimising driving routes.

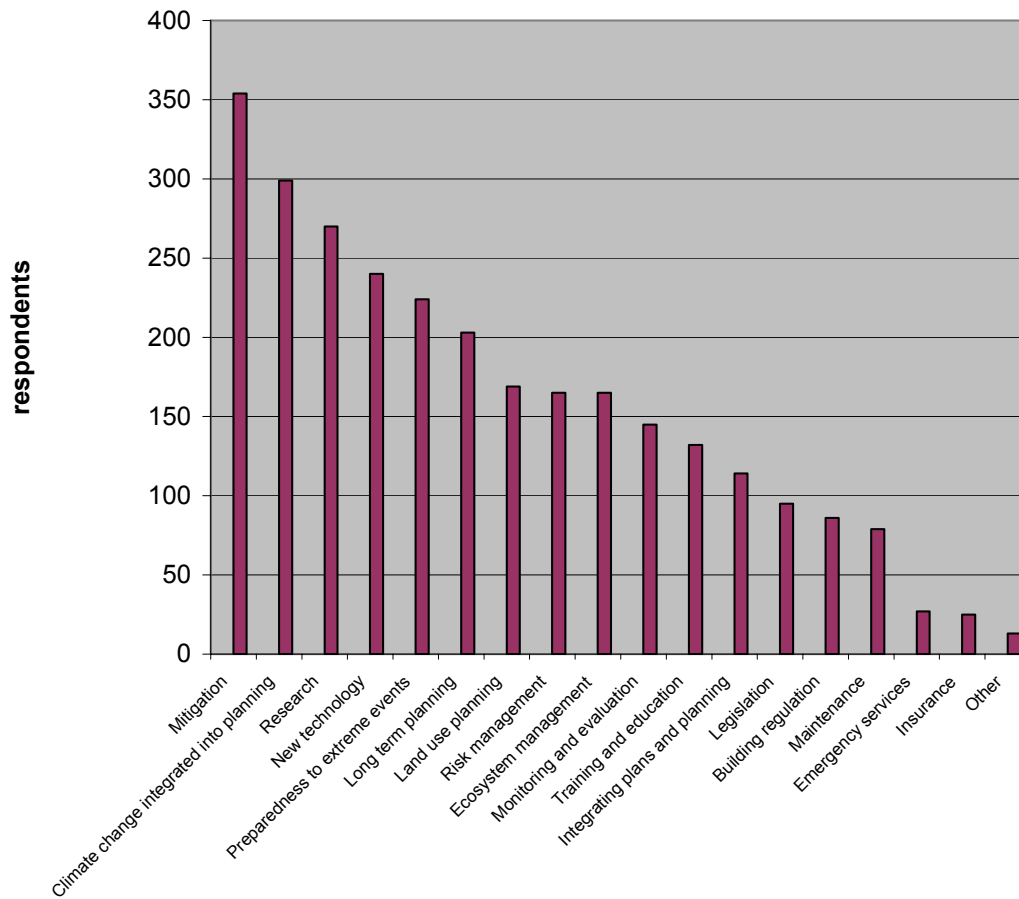


Figure 7 Adaptation measures (all sectors).

Other goals on mitigation included:

- implementing the national climate strategy
- avoiding spread out community structure by community and regional planning
- decreasing emissions from waste management and landfills
- new technology
- education and training
- information dissemination
- monitoring

Adaptation goals included:

- implementing the national adaptation strategy
- increasing preparedness for extreme weather events (such as floods, storms)
- innovative solutions
- management of change and being prepared
- risk management
- information gathering and analysis
- training
- guidance and planning practices
- to move from monitoring to preparedness, developing methods for projecting future changes

- enhancing biodiversity
- planning and preparing for changes in demand for services (tourism)
- using land use planning and building regulations to prepare for consequences of climate change (floods, heavy rains)
- increasing variability in tree species
- choosing new plant species for agriculture

3.6. Adaptive capacity of different sectors in Finland

The stakeholders were asked to assess the capacity of different sectors in Finland to cope with climate variability and impacts of climate change (Table 8). The stakeholders estimated that most sectors are able to adapt fairly or very well to a changing climate, or the stakeholders considered the sectors to be neither good nor poor in their capacity to adapt. Agriculture, forestry, energy, transport and health sectors were considered to be quite capable to cope with a changing climate. However, 19% of respondents also thought that capacity of forestry sector is fairly poor in adapting to changes in climate. Of the sectors listed in the question, reindeer husbandry and nature conservation were estimated to be the least capable of adapting. More sectoral results are presented in Appendix 3.

3.7. Global impacts of climate change and their significance to Finland

Most of the respondents (78%) considered global impacts of climate change to have significance to their sector. Global impacts of climate change affected the costs of the operations most (62% of respondents chose the alternative, of the total of 399 persons answering the question). Other areas affected were energy demand (53%), domestic production (48%), demand of goods and services (47%), supply of goods or services (43%) and maintenance security (34%) (Figure 8).

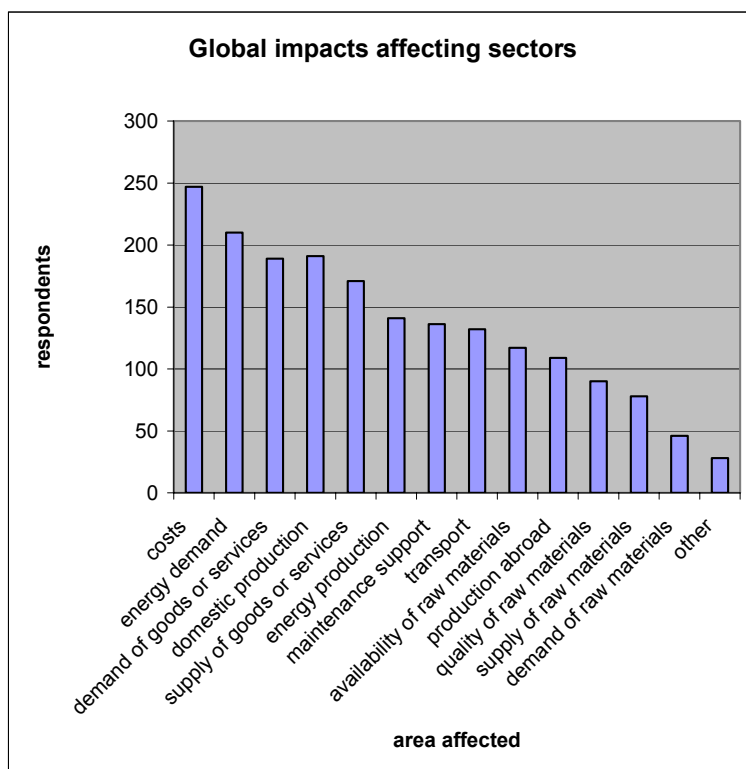


Figure 8 Global impacts (all sectors).

Table 8 Adaptive capacity of different sectors in Finland

Sector	very good %	fairly good %	not good nor poor %	rather poor %	very poor %	cannot say %
Plant production	7.7	56.5	12.9	11.3	0.8	10.8
Animal husbandry	9.6	58.1	17.5	3.5	0.4	11.0
Garden production	11.1	58.3	12.7	7.7	0.6	9.6
Forestry	5.9	42.0	22.6	19.2	1.9	8.4
Fishery	3.3	30.4	31.0	17.1	1.9	16.3
Reindeer husbandry	1.9	14.6	21.3	35.3	10.7	16.1
Nature conservation	1.9	27.1	31.1	21.9	5.8	12.3
Community development	4.6	40.4	27.5	16.9	1.5	9.0
Land use	4.2	34.0	31.1	17.9	2.7	10.2
Industry	6.4	41.2	28.7	12.3	1.2	10.2
Energy	8.5	47.2	20.4	14.8	1.9	7.1
Commerce	7.9	38.9	31.4	6.6	1.0	14.3
Road transport	5.8	35.2	29.2	19.5	1.9	8.3
Air traffic	7.7	36.2	27.7	10.6	3.7	14.1
Rail transport	8.1	35.8	30.2	13.0	1.9	11.0
Seafaring	8.7	45.6	24.1	8.9	1.9	10.8
Building	6.8	39.2	26.3	18.3	1.9	7.5
Health care	6.6	35.5	31.4	9.1	1.2	16.3
Emergency services	6.7	39.0	26.7	14.6	1.0	11.9
Tourism and recreation	4.2	34.9	25.7	21.8	2.7	10.6
Insurance	2.1	21.4	31.6	22.6	5.8	16.4

3.8. Measures to enhance adaptation in Finland

Half of the respondents thought that measures taken so far in Finland to adapt to climate change have not been sufficient. 24% of the respondents considered the actions adequate and 26% did not have an opinion or could not estimate the sufficiency of the measures. 285 persons answered the open question "What kinds of measures should the authorities (central, regional and local) take to adapt to the impacts of climate change?". Many of the responses suggested several types of measures. The types of measures were classified with a simple coding system according to the type of measure. The types measures suggested were:

- research on adaptation, on climate change impacts and scenarios (in 98 responses)
- integration of climate change issues into planning at all levels, integrating sectoral planning, cooperation (90)
- information dissemination on climate change and adaptation issues and research results (80)
- regulation and new legislation to enhance adaptation (76)
- economic measures and creating incentives for private sector (33)
- enhancing innovations and technological development (18)
- education and training on climate change and adaptation (18)
- analysing risks, risk assessment, monitoring and evaluation systems (18)
- international activities, with more participation in international adaptation work (16)
- decision support systems for adaptation to assist decision making (13)

3.9. Comments by stakeholders

At the end of the questionnaire, the respondents were invited to give comments on the questionnaire itself and/or on adaptation to climate change issues. The comments given on the questionnaire are presented in section 4.

The comments on climate change issues were classified into four broad categories: comments on adaptation, mitigation, other climate change related issues, and comments about doubts or uncertainties. Many comments treated several subjects and therefore were often classified to several of these categories. Altogether 160 comments were given, of which adaptation was treated in 30, mitigation in 33, other climate issues in 29 and uncertainties and doubts in 41.

The comments on uncertainties treated mainly two questions: 1) doubts about climate change as a phenomenon, and 2) uncertainties concerning changes and impacts.

1. The following kinds of comments were given on *doubts about climate change*: "It is unclear how much of the change is human induced and how much natural variability"; "Information and research results of climate change are partly conflicting and it is hard to build an opinion based on them"; "Time frames are too short – climate varies naturally and climate should be studied on much longer time frames than presently is done".
2. Examples of comments on *uncertainties concerning changes and impacts*: "Extreme and catastrophic events (fate of Gulf stream as an example) are uncertain and difficult to project – there is also little information available on them"; "The scenarios are so far quite uncertain and it is difficult to compare them"; "There are many variables involved as well as uncertainties and we have to rely mainly on the information the media disseminates"; "Is it possible to mitigate or stop climate change?"

On adaptation, three types of comments could be identified. In one group the respondents emphasized the need for action and/or information. In the second group they expressed problems and uncertainties concerning adaptation, and in the third group they thought that adaptation is not a problem in Finland.

1. The following kinds of comments emphasized the *need for action*: "Adaptation is first of all adaptation to uncertainty. Therefore open information about the risks and enhancing adaptive capacity of different actors is central"; "An important issue that should also guide Finnish climate policy"; "Integration of planning and measures in different sectors is crucial"; "Clear instructions are needed from the government; investments are potentially large and they should not be started unnecessarily. From scenarios to clear guidelines"; "We should start to act in good time to secure business opportunities"; "Already in winter tourism we are close to threshold limits: even a change of one degree could affect the business a lot"; "Adaptation of for example different tree species should be studied and adaptation recommendations given as soon as possible".
2. Examples of comments expressing *uncertainty or problems* concerning adaptation: "Impacts of climate change are both positive and negative (for example certain fish species benefit, others suffer)"; "Adaptation seems to contain an element of giving in and accepting the change"; "Mitigation should be emphasized. Adaptation seems to take for granted that climate is changing. This might be the case, but still mitigation should be the most important issue"; "Adaptation should not lead to increased

emissions (for example increase in electricity consumption)"; "Adaptation to changes means that we should be able to observe the difference between cyclic, temporary and long-term changes"; "It is difficult to plan adaptation as the changes are uncertain and the direction and rate of climate change unknown".

3. Examples of comments on *adaptation are not a problem for Finland*: "It is good that the issue is discussed. However, so far there has been little actions in my sector as the changes come so slowly and take a long time anyhow, so need for action now does not seem important"; "Negative impacts of climate change in other parts of the world should be reported. Climate change does not mean just more beneficial conditions for agriculture here in Finland. Adaptation in Finland is not a problem. More important is to act to stop the change as the global impacts are unpredictable"; "Forests are quite adaptable to minor changes in climate"; "We should bear in mind that not all sector in Finland will be affected even if the sea level rises"; "Climate changes in Finland can be small and therefore it is not necessary to act, effects of climate change on some sectors are expected to be minor".

The comments on mitigation could be divided into three groups: 1) comments emphasizing mitigation as the primary objective; 2) doubts about the effectiveness of mitigation measures, and 3) comments on alternative measures

1. Examples of comments emphasizing *mitigation as a primary objective*: "Mitigation should be the primary objective, only after that adaptation"; "Climate convention is a great achievement on global level and it is crucial to work to support and develop it. Change is possible, both in energy consumption and production"; "Mitigation is the absolute prerequisite of adaptation. It is also the best measure to adapt: avoiding catastrophes is always cheaper than cleaning the mess"; " In reporting climate change, the choices private persons as consumers make should be emphasized"; "Efficient mitigation measures should be employed such as decreasing emissions from transport, energy production and increasing energy efficiency of buildings"
2. Examples of *doubts of effectiveness of mitigation* expressed: "Possibilities of Finland to affect the matter are limited; the large polluters should be involved in mitigation efforts. Mitigation should be a global action. The real polluters should be involved – only way to get a change is to get the large countries involved. Small countries like Finland do not have a role in global mitigation"; " Mitigation is more important than adaptation in the end. If the change is slow then also starting to act happens slowly. International actions seem too slow and inefficient"; "Climate change mitigation is not credible – it is mostly political manoeuvres to get national benefits without any concrete actions to mitigate climate change"; "Emissions trading should be discarded, it only affects negatively the competitiveness of the Nordic areas. We should stop spending money as Kyoto is useless as long as the large polluters are out of it";
3. Examples of comments on *alternative measures*: " We should also be talking about sinks, not just emissions"; "Use of wood energy should be supported"; "Alternative forms of energy should be studied".

On general issues concerning climate change, the respondents' comments could be divided into two groups: 1) comments on the need to take action and the phenomenon seriously, and 2) comments on the need for a more critical approach to climate change questions.

1. Examples of comments on the *need to take action*: "The threat should be taken more seriously than is done presently"; "In Finland, the opinion about climate change seems to be quite positive: impacts to Finland are seen beneficial mostly. The catastrophic events (Gulf stream) are not taken into consideration – there should be more information on them"; "Climate change is a complicated global problem. If greenhouse gas emissions reductions are really seen as crucial, then mitigation should be prioritized"; "Presenting the results of research is crucial – people are selfish and will not act unless they find it absolutely necessary"; "Monitoring of the impacts of climate change should be started – this should be incorporated into current monitoring programmes"; "Climate change issues should also be covered in schools"; "The phenomenon is true and happening but citizens should get more information on how they can act to mitigate climate change"; "Climate change is still a distant subject in local administration. Information on impacts is important"; "It is important to approach the climate change issue both from the local level and the national level"; "Long term planning and preparedness are very rare in the world nowadays and short-term profits are the only thing that interests politicians and decision makers– therefore climate change is such a difficult issue to deal with"
2. Examples of comments on the *need for critical approaches*: "A critical approach to the results of climate change research is needed. Climate change is complicated and therefore all measures should be carefully evaluated and also compared to other needs. Haste is not good".

4. Conclusions

The stakeholders and sectors were selected for this study based on the assumption that they are either affected by climate change most and/or they are in the position to act in adaptation. However, from the point of view of the national economy, some of the significant sectors are under-represented in this study. Also, the share of the national economy of some of the sectors covered in this study is quite small (for example, agriculture and fishery form only a small part of the GDP). Some parts of the industry and service sectors in Finland might not be directly affected by climate change very much. However, indirect effects to these sectors could be larger if the whole production chain is taken into consideration. Including a larger share of representatives of these sectors therefore would have been justified. Also, it would have been good to more representatives of the social policy sector in this study, as they are important potential actors in adaptation policies and plans. The questionnaire was sent to representatives of trade unions and to political parties, however. The number of representatives from these sectors was small partly due to difficulties in identifying and involving the respondents.

Due to the many different sectors and backgrounds the stakeholders represented, the questionnaire was general one. Some of the respondents found the questionnaire hard to answer, mainly for two reasons. Firstly, for some sectors or stakeholders the issue of climate change and its impacts are still distant, and the issue is not discussed or treated within the sector and in its plans. Secondly, some stakeholders found the questions difficult to answer as they were not targeted clearly to their sector or type of work. The representatives of sectors, such as energy, natural resources and environment, mostly know the climate change issue well and the issue is also widely discussed within these sectors and between them. Therefore, for the stakeholders from these sectors, the questionnaire was easier to answer.

The response rate to the questionnaire was quite good. Many respondents had also taken time and effort to answer the questions with care. The stakeholders wrote down in the open questions ideas, opinions and views on climate change and adaptation and also much information on sectoral issues. It seems that many stakeholders have already thought about and discussed adaptation and climate change questions in their work within their sectors, and also concrete measures – mainly in mitigation, but also some adaptation measures – are implemented or planned. The need to take action was often stressed and the importance of mitigation was emphasised. Another issue often mentioned was uncertainties. There are still many uncertainties concerning the changes, their direction and magnitude, the impacts, time frames, causes of the phenomena and extreme events. Therefore, the need for research and information to support decision-making and planning was often stressed. The stakeholders also expressed the need for guidelines, recommendations and new regulation to guide decision-making at the local or regional levels.

The stakeholders estimated that the adaptive capacity of the different sectors in Finland is generally rather good. Sectors like agriculture, energy, transport, industry and health care were expected to be able to cope quite well with climate variability and change. Some sectors, such as reindeer husbandry, nature conservation, and also tourism and recreation were assumed to face some difficulties. Stakeholders representing tourism and recreation sector in this study estimated, however, that their sector is able to cope quite well.

The stakeholders seemed to be in general quite well aware of climate change issues in general and they seemed to be also aware of adaptation as an issue. It seems, however, that in many sectors the issue has not been discussed and concrete measures or plans have not been made so far, but the issue has been acknowledged. Most respondents had received enough information on climate change issues to support their work so far. It is possible, though, that those stakeholders that were not so familiar with the climate change questions, did not respond to the questionnaire in the first place. Even though aware of the issue, many uncertainties about climate change and its impacts and information needs were expressed. The need for research on adaptation, impacts and climate change, information dissemination and education was also often emphasised (cf. section 3.2).

Many stakeholders responding to the study also said that measures taken in Finland so far to adapt to climate change have not been sufficient. The types of measures suggested that authorities should take were: research on adaptation, research on climate change impacts and scenarios; integration of climate change issues into planning at all levels, integrating sectoral planning and cooperation; information dissemination on climate change and adaptation issues and research results; regulation and new legislation to enhance adaptation; economic measures and creating incentives for private sector; enhancing innovations and technological development; education and training on climate change and adaptation; analysing risks, risk assessment, monitoring and evaluation systems; taking more a active part in international negotiations and work; and developing decision making systems.

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Appendix 1: Questionnaire in English (translation)

ADAPTATION TO CLIMATE CHANGE

1. "Human actions cause climate change" To what extent do you agree or disagree with the statement?

- completely agree
- somewhat agree
- do not agree or disagree
- somewhat disagree
- completely disagree
- cannot say

2. In your opinion, has the climate already changed?

- Yes
- No
- Cannot say

3. How credible do you find the scenarios that have been presented about the future climate of Finland?

In the following, some estimated changes of the mean temperature and precipitation in Finland to the year 2040 have been presented (according to the FINSKEN scenarios, <http://www.finessi.info/finsken>). How credible do you think the estimates are? 1= very likely, 2= somewhat likely, 3= not likely, not unlikely, 4= somewhat unlikely, 5= very unlikely, 6= cannot say

- annual mean temperature rises max 1.5 degrees
- annual mean temperature rises at least 3 degrees
- annual precipitation increases max 2%
- annual precipitation increases at least 15%

4. Have you received sufficient information about climate change and its impacts to support decision-making and planning in your work?

- Yes
- No
- Cannot say

5. On what subjects related to climate change would you need more information for your work?

- global impacts
- impacts on Finland
- regional impacts
- local impacts
- variability of local weather (for example daily and monthly temperature values)
- probability of occurrence of extreme events (such as heavy rains and storms)
- uncertainties of estimates
- others, what?

6. How reliable, in your opinion, is the information on climate change from different sources?

Is the information you get from the source, in your opinion, 1= very reliable, 2= somewhat reliable, 3= not reliable, not unreliable, 4= somewhat unreliable, 5= very unreliable, 6= cannot say

- magazines, newspapers
- tv
- radio
- literature
- Internet
- colleagues
- seminars

7. How do you estimate in your own sector the significance of climate change and its impacts?

1= large positive impact, 2= mild positive impact, 3= not positive, not negative impact, 4= mild negative impact, 5= great negative impact, 6= cannot say

- mean temperature rises
- winters become milder
- ground frost conditions change
- windiness increases
- extreme weather events increase
- total precipitation increases
- possibility of large floods increase
- drought periods increase
- snow conditions change
- ice conditions change
- growing season lengthens
- expansion of new plant and animal species to Finland
- risk of leaching of nutrients increases
- global impacts

Means to respond to climate change are mitigation and adaptation. Mitigation is human actions that decreases greenhouse gas emissions or enhances their sinks. Adaptation to climate change is adaptation of humans or nature to expected or realised impacts of climate change.

8. In your opinion, what would be efficient measures to adapt to climate change? Choose from the list below the 5 measures that you think would be the best.

- Taking climate change into account in planning
- Long term planning
- Risk management practices
- Integration of sectoral planning
- Land use planning and regulation
- Changes in building regulations
- Development of monitoring and evaluation practices
- Development of new technology
- Research
- Education

- Taking care of maintenance (constructions, equipment, networks)
- Development of emergency services
- Preparedness to extreme weather events
- Changes in insurance practices
- Management of natural ecosystems
- Changes in legislation
- Efficient mitigation of greenhouse gas emissions
- Others, what?

9. Is climate change taken into account already now in planning of your work?

- Yes
- No
- Cannot say

10. Do the plans in your work that treat climate change include mitigation or adaptation issues?

- Mitigation
- Adaptation
- Both
- Neither

11. Describe shortly the goals of the plans or programmes that treat climate change at your work.

12. How would you estimate the ability of different sectors in Finland to adapt to climate variability and change?

1= very good, 2= quite good, 3= not good, not weak, 4= quite weak, 5= very weak, 6= cannot say

- Plant production
- Animal husbandry
- Garden production
- Forestry
- Fishery
- Reindeer husbandry
- Nature conservation
- Community development
- Land use
- Industry
- Energy production
- Trade
- Road transport
- Air traffic
- Rail transport
- Seafaring
- Construction
- Health care
- Emergency services
- Tourism and recreation
- Insurance

This question is about your sector's capacity to adapt to climate change. Adaptive capacity describes the capacity of the system to adapt to climate change, minimise the damages, take advantage of the benefits and cope with the consequences. Adaptive capacity is determined, inter alia, by the characteristics of the system.

13. Estimate on a scale of 1 – 5 how well the statements describe your sector, when 1= describes very well – 5= does not describe at all, 6= cannot say

- Climate and weather conditions have an impact to the sector
- Reliability and smooth working of transport and deliveries are important
- The sector can react to external changes rapidly
- Investments are made for long term
- The sector is flexible and changes its practices when needed
- Change of practices is slow
- Investments are large
- Planning time frame is short
- It is easy to access climate information
- Climate and environmental information is used in planning
- It is possible to get insurance for natural damages
- Sector is dependent of nature and its services for its operations
- Mitigation is part of operations

14. Are the global impacts of climate change significant for your sector?

- Yes
- No
- Cannot say

15. To what parts of the operations do the global impacts of climate change have an impact in your sector? Choose the appropriate alternatives from the ones below.

- demand of products or services
- supply of products or services
- domestic production
- production abroad
- transport
- energy demand
- energy supply
- quality of raw materials
- availability of raw materials
- demand of raw materials
- supply of raw materials
- maintenance performance
- costs
- others, which?

16. In your opinion, have the measures to adapt to climate change taken in Finland so far been sufficient?

- Yes
- No
- Cannot say

17. What kinds of measures should the authorities (central, regional, local) take in your opinion to enhance adaptation to the impacts of climate change?

18. Comments? All opinions of adaptation to climate change and this questionnaire are welcome and valuable.

Background information. Finally three questions about your background information for statistical analysis of results.

19. Sector you work in

- natural resources
- environment
- community development
- land use and zoning
- construction
- industry
- energy
- transport
- commerce
- health care
- tourism and recreation
- other, what?

20. Is your work in

- central government
- regional government
- municipality
- private enterprise
- central organisation or union
- non-governmental organisation
- research institute
- university
- other education
- information
- other, what?

21. Province where your working place is situated

- Province of Southern Finland
- Province of Western Finland
- Province of Eastern Finland
- Province of Oulu
- Province of Lapland

Appendix 2: Questionnaire in Finnish (original)

SOPEUTUMINEN ILMASTONMUUTOKSEEN

1. "Ihmisen toiminta aiheuttaa ilmastonmuutosta" Missä määrin olet samaa tai eri mieltä väittämän kanssa?

- täysin samaa mieltä
- jokseenkin samaa mieltä
- en samaa enkä eri mieltä
- jokseenkin eri mieltä
- täysin eri mieltä
- en osaa sanoa

2. Onko ilmasto mielestäsi jo muuttunut?

- Kyllä
- Ei
- En osaa sanoa

3. Uskotko Suomen tulevasta ilmastosta esitettyihin skenaarioihin?

Seuraavassa on esitetty arvioituja keskilämpötilan ja sademäärän muutoksia Suomessa vuoteen 2040 mennessä (FINSKEN-skenaarioiden mukaan, <http://www.finessi.info/finsken>). Miten todennäköisinä pidät arvioita? 1= erittäin todennäköinen, 2= jokseenkin todennäköinen, 3= ei todennäköinen, ei epätodennäköinen, 4= jokseenkin epätodennäköinen, 5= erittäin epätodennäköinen, 6= en osaa sanoa

- vuoden keskilämpötila nousee korkeintaan 1,5 astetta
- vuoden keskilämpötila nousee ainakin 3 astetta
- vuotuinen sademäärä lisääntyy korkeintaan 2%
- vuotuinen sademäärä lisääntyy ainakin 15%

4. Oletko saanut tarpeeksi tietoa ilmastonmuutoksesta ja sen vaikutuksista päätöksenteon ja suunnittelun tueksi työssäsi?

- Kyllä
- Ei
- En osaa sanoa

5. Mistä ilmastonmuutokseen liittyvistä aiheista tarvitsisit lisää tietoa työtäsi varten?

- maailmanlaajuisista vaikutuksista
- koko Suomea koskevista vaikutuksista
- alueellisista vaikutuksista
- paikallisista vaikutuksista
- paikallisään vaihtelusta (esim. lämpötilan vuorokausi- ja kuukausiarvoista)
- ääri-ilmiöiden (kuten rankkasateiden ja myrskyjen) esiintymistodennäköisyydestä
- arvioiden epävarmuuksista
- muista, mistä?

6. Miten luotettavana pidät eri lähteistä saamaasi tietoa ilmastonmuutoksesta?

Onko lähteestä saamasi tieto mielestäsi 1= erittäin luotettavaa, 2= jokseenkin luotettavaa, 3= ei luotettavaa, ei epäluotettavaa, 4= jokseenkin epäluotettavaa, 5= erittäin epäluotettavaa, 6= en osaa sanoa

- lehdet
- tv
- radio
- kirjallisuus
- internet
- kollegat
- seminaarit

7. Miten arvioit omalla toimialallasi ilmastonmuutoksen ja sen vaikutusten merkitystä?

1= suuri positiivinen vaikutus, 2= lievä positiivinen vaikutus, 3= ei positiivista, ei negatiivista vaikutusta, 4= lievä negatiivinen vaikutus, 5= suuri negatiivinen vaikutus, 6= en osaa sanoa

- keskilämpötila nousee
- talvet muuttuvat leudommiksi
- routatilanne muuttuu
- tuulisuus lisääntyy
- sään ääri-ilmiöt lisääntyvät
- kokonaissademäärä kasvaa
- suurtulvien mahdollisuus kasvaa
- kuivuuskaudet lisääntyvät
- lumiolosuhteet muuttuvat
- jääolot muuttuvat
- kasvukausi pitenee
- uusia kasvi- ja eläinlajeja levittäytyy Suomeen
- ravinteiden huuhtoutumisriski kasvaa
- vaikutukset muualla maailmassa

Keinoja vastata ilmastonmuutokseen ovat ilmastonmuutoksen hillintä ja siihen sopeutuminen. Hillintä tarkoittaa ihmisen toimintaa, joka vähentää kasvihuonekaasujen päästöjä tai lisää niiden nieluja. Sopeutuminen ilmastonmuutokseen tarkoittaa luonnon tai ihmisen mukautumista odotettuihin tai jo tapahtuneisiin ilmastonmuutoksen vaikutuksiin.

8. Mitkä olisivat mielestäsi tehokkaita keinoja sopeutua ilmastonmuutokseen? Valitse allaolevasta listasta mielestäsi viisi parhaita keinoja.

- Ilmastonmuutoksen huomioiminen suunnittelussa
- Pitkän aikavälin suunnittelu
- Riskien hallintamenettelyt
- Eri hallinnonalojen suunnittelun integrointi
- Maankäytön suunnittelu ja ohjaus
- Rakentamismääräysten muutokset
- Seuranta- ja arviointimenettelyiden kehittäminen
- Uuden teknologian kehittäminen
- Tutkimus
- Koulutus
- Kunnossapidosta huolehtiminen (laitteet, rakenteet ja verkostot)
- Pelastustoimen kehittäminen

- Sään ääri-ilmiöihin varautuminen
- Vakuutuskäytäntöjen muuttaminen
- Luonnon ekosysteemien hoito
- Lainsäädännön muutokset
- Kasvihuonekaasupäästöjen tehokas rajoittaminen
- Muut, mitkä?

9. Otetaanko ilmastonmuutos jo nyt huomioon työssäsi toiminnan suunnittelussa?

- Kyllä
- Ei
- En osaa sanoa

10. Sisältävätkö työpaikkasi ilmastonmuutosta käsittelevät suunnitelmat ja ohjelmat ilmastonmuutoksen hillintää vai siihen sopeutumista?

- Hillintää
- Sopeutumista
- Molempia
- Ei kumpaakaan

11. Kuvaile työpaikkasi ilmastonmuutosta käsittelevien ohjelmien tai suunnitelmien tavoitteet lyhyesti

12. Minkälaiseksi arvioit Suomessa eri alojen tai sektoreiden kyvyn selviytyä nykyilmaston vaihtelusta ja ilmastonmuutoksen vaikutuksista?

1= erittäin hyvä, 2= melko hyvä, 3= ei hyvä, ei heikko, 4= melko heikko, 5= erittäin heikko, 6= en osaa sanoa

- Kasvintuotanto
- Eläintuotanto
- Puutarhatuotanto
- Metsätalous
- Kalatalous
- Porotalous
- Luonnonsuojelu
- Yhdyskuntatekniikka
- Maankäyttö
- Teollisuus
- Energiantuotanto
- Kauppa
- Tieliikenne
- Lentoliikenne
- Raideliikenne
- Merenkulku
- Rakentaminen
- Terveystieteet
- Pelastustoimi
- Matkailu- ja virkistyskäyttö
- Vakuutustoiminta

Tämä kysymys selvittää oman toimialasi sopeutumiskykyä ilmastonmuutokseen. Sopeutumiskyky kuvaa järjestelmän kykyä sopeutua ilmastonmuutokseen, minimoida ilmastonmuutoksen haittoja, hyödyntää sen etuja tai selviytyä sen seurauksista. Sopeutumiskykyyn vaikuttavat mm. järjestelmän ominaisuudet.

13. Arvioi asteikolla 1 – 5 miten osuvasti väittämät kuvaavat toimialaasi, jolloin 1= kuvaa erittäin hyvin – 5= ei kuvaa lainkaan, 6= en osaa sanoa

- Ilmasto ja sääolot vaikuttavat alaan
- Kuljetusten sujuvuus ja varmuus on tärkeitä
- Ulkoiisiin muutoksiin voidaan reagoida nopeasti
- Investoinnit tehdään pitkälle aikavälille
- Toimiala on joustava ja muuttaa käytäntöjään tarvittaessa
- Toimintatapojen muuttaminen on hidasta
- Investoinnit laitteisiin, rakenteisiin ym. ovat suuria
- Suunnittelujänne on lyhyt
- Ilmastotiedon saanti on helppoa
- Ilmasto- ja ympäristötietoa käytetään hyväksi suunnittelussa
- Luonnonvahinkojen varalta on mahdollista saada vakuutuksia
- Toiminta on riippuvaista luonnosta ja sen tarjoamista palveluista
- Ilmastonmuutoksen rajoittamistoimet ovat osa toimintaa

14. Onko ilmastonmuutoksen maailmanlaajuisilla vaikutuksilla merkitystä toimialallasi?

- Kyllä
- Ei
- En osaa sanoa

15. Mihin osaan toiminnasta maailmanlaajuisilla vaikutuksilla on merkitystä toimialallasi? Valitse allaolevista sopivat vaihtoehdot.

- palveluiden tai tuotteiden kysyntään
- palveluiden tai tuotteiden tarjontaan
- tuotantoon kotimaassa
- tuotantoon ulkomailla
- kuljetuksiin
- energian kulutukseen
- energian tuotantoon
- raaka-aineiden laatuun
- raaka-aineiden saatavuuteen
- raaka-aineiden kysyntään
- raaka-aineiden tarjontaan
- huoltovarmuuteen
- kustannuksiin
- muihin, mihin?

16. Ovatko Suomessa tähän asti tehdyt toimet ilmastonmuutokseen sopeutumiseksi olleet mielestäsi riittäviä?

- Kyllä
- Ei
- En osaa sanoa

17. Minkälaisia toimia viranomaisten (valtion, alueellisten ja paikallisten) tulisi mielestäsi tehdä edistääkseen ilmastonmuutoksen vaikutuksiin sopeutumista?

18. Kommentteja? Kaikki mielipiteet sopeutumisesta ilmastonmuutokseen tai tästä kyselystä ovat tervetulleita ja arvokkaita.

Taustatiedot. Lopuksi kolme kysymystä taustatiedoistasi vastausten tilastollista käsittelyä varten.

19. Toimiala tai sektori, jolla työskentelet

- luonnonvara-ala
- ympäristöala
- yhdyskuntatekniikka
- maankäyttö ja kaavoitus
- rakentaminen
- teollisuus
- energia-ala
- liikenne
- kauppa
- terveydenhoito
- matkailu ja virkistyskäyttö
- vakuutustoiminta
- muu, mikä?

20. Onko työpaikkasi

- keskushallinnossa
- aluehallinnossa
- kunnassa
- yrityksessä
- keskusjärjestössä tai edunvalvonnassa
- kansalaisjärjestössä
- tutkimuslaitoksessa
- korkeakoulussa
- muussa opetuksessa
- viestinnässä tai tiedotuksessa
- muualla, missä?

21. Lääni, jonka alueella työpaikkasi sijaitsee

- Etelä-Suomen lääni
- Länsi-Suomen lääni
- Itä-Suomen lääni
- Oulun lääni
- Lapin lääni

Appendix 3 Sectoral estimates of adaptive capacity

Percentage values represent the share of respondents of a particular sector who chose a given alternative.

Adaptive capacity: Natural resources sector

Sector	very good %	fairly good %	not good nor poor %	rather poor %	very poor %	cannot say %
Plant production	10.2	65.4	10.2	9.4	-	4.7
Animal husbandry	14.2	63	15.7	1.6	-	5.5
Garden production	18.1	62.2	7.9	6.3	-	5.5
Forestry	7.9	41.7	25.2	19.7	1.6	3.9
Fishery	4.7	33.1	28.3	18.9	0.8	14.2
Reindeer husbandry	2.4	17.3	19.7	39.4	7.1	14.1
Nature conservation	3.9	28.3	25.2	22	7.9	12.6
Community development	6.3	36.2	29.1	15.7	0.8	11.8
Land use	7.9	33.1	33.1	12.6	0.8	12.6
Energy	12.6	44.1	18.9	11.8	2.4	9.4
Road transport	5.5	37	25.2	21.3	0.8	10.2
Air traffic	7.9	38.1	24.6	9.5	4	15.9
Rail transport	9.6	36.8	20	18.4	0.8	14.4
Seafaring	8	44.8	25.6	7.2	0.8	13.6
Construction	8.7	37.3	27	16.7	0.8	9.5
Tourism and recreation	4.8	42.1	26.2	16.7	1.6	8.7

Adaptive capacity: Environment sector

Sector	very good %	fairly good %	not good nor poor %	rather poor %	very poor %	cannot say %
Plant production	6	50.8	16.7	15.2	0.8	10.6
Animal husbandry	8.3	56.8	19.7	3	0.8	11.4
Garden production	8.3	53	18.3	11.4	-	9
Forestry	5.3	36.1	21.1	28.6	3	6
Fishery	1.5	27.8	35.6	21.2	2.3	13.6
Reindeer husbandry	-	11.4	16.7	37.1	21.2	13.6
Nature conservation	3	25.6	36.4	20.3	7.5	7.5
Community development	4.6	35.9	26.7	25.2	0.8	6.9
Land use	3.8	30	30.8	24.8	4.5	6
Energy	4.5	47.4	23.5	6	3.8	6.8
Road transport	6.9	25.2	35.1	23.7	2.3	7.6
Air traffic	9.8	26.5	31.1	12.1	4.5	15.9
Rail transport	8.3	27.3	35.6	16.7	1.5	10.6
Seafaring	9.8	40.9	23.5	12.9	3	9.8
Construction	6	35.6	25.8	25	3.8	3.8
Tourism and recreation	3.1	30.5	26.7	33.8	1.6	5.3

Adaptive capacity: Construction

Sector	very good %	fairly good %	not nor	good poor %	rather poor %	very poor %	cannot %	say
Plant production	15.4	53.8	12.8		7.7	-	10.3	
Animal husbandry	12.8	61.5	12.8		2.6	-	10.3	
Garden production	17.9	61.5	10.3		2.6	-	7.7	
Forestry	10.3	48.7	12.8		23.1	-	5.1	
Fishery	5.1	35.9	23.1		25.6	2.6	7.7	
Reindeer husbandry	2.6	28.2	38.5		12.8	10.3	7.7	
Nature conservation	-	33.3	30.8		17.9	5.1	12.8	
Community development	12.8	38.5	33.3		12.8	2.6	-	
Land use	7.7	43.6	33.3		10.3	2.6	2.6	
Energy	7.7	64.1	20.5		2.7	-	5.1	
Road transport	7.7	51.3	25.6		7.7	2.6	5.1	
Air traffic	7.7	48.7	33.3		-	-	10.3	
Rail transport	12.8	46.2	25.6		5.1	2.6	7.7	
Seafaring	10.3	64.1	15.4		2.6	-	7.7	
Construction	10.3	66.7	15.4		7.7	-	-	
Tourism and recreation	5.1	53.8	20.5		12.8	-	7.7	

Adaptive capacity: Energy

Sector	very good %	fairly good %	not nor	good poor %	rather poor %	very poor %	cannot %	say
Plant production	13.6	50	6.8		11.4	2.3	15.9	
Animal husbandry	10.4	50	15.9		6.8	-	15.9	
Garden production	20.5	45.5	13.6		4.5	2.3	13.6	
Forestry	9.1	47.7	11.4		18.2	-	13.6	
Fishery	2.3	40.9	20.5		13.6	-	22.7	
Reindeer husbandry	2.3	18.2	18.2		34.1	4.5	22.7	
Nature conservation	-	36.4	27.3		18.2	-	18.2	
Community development	2.3	52.3	25		15.9	2.3	2.3	
Land use	4.5	40.9	34.1		13.6	4.5	2.3	
Energy	13.6	52.3	15.9		18.2	-	-	
Road transport	2.3	40.9	15.9		22.7	2.3	15.9	
Air traffic	2.3	43.2	20.5		9.1	4.5	20.5	
Rail transport	4.5	43.2	29.5		4.5	2.3	15.9	
Seafaring	4.5	50	20.5		6.8	2.3	15.9	
Construction	11.4	36.4	29.5		13.6	-	9.1	
Tourism and recreation	2.3	36.4	20.5		20.5	4.5	15.9	

Adaptive capacity: Transport

Sector	very good %	fairly good %	not nor	good poor %	rather poor %	very poor %	cannot %	say
Plant production	3.1	57.8	10.9		10.9	-	17.2	
Animal husbandry	1.6	60.9	18.8		4.7	-	14.1	
Garden production	3.1	62.5	14.1		6.3	-	14.1	
Forestry	3.1	45.3	18.8		17.2	3.1	12.5	
Fishery	1.6	26.6	31.3		20.3	1.6	18.8	
Reindeer husbandry	-	14.1	23.4		31.3	9.4	21.9	
Nature conservation	-	18.8	28.1		32.8	1.6	18.8	
Community development	1.6	45.3	34.4		9.4	3.1	6.3	
Land use	-	34.4	32.8		15.6	3.1	14.1	
Energy	1.6	50	25		15.6	-	7.8	
Road transport	1.6	42.9	31.7		17.5	3.2	3.2	
Air traffic	3.2	39.1	35.9		9.4	4.7	7.8	
Rail transport	1.6	40.6	40.6		7.8	4.7	4.7	
Seafaring	6.3	43.8	37.5		6.3	3.2	3.2	
Construction	1.6	46	28.1		14.1	1.6	7.8	
Tourism and recreation	3.2	25	26.6		20.3	7.8	17.2	

Adaptive capacity: Tourism and recreation

Sector	very good %	fairly good %	not good nor poor %	rather poor %	very poor %	cannot say %
Plant production	-	61.5	15.4	7.7	-	15.4
Animal husbandry	7.7	53.8	30.8	-	-	7.7
Garden production	6.4	64.3	6.4	14.3	-	6.4
Forestry	-	64.3	14.3	21.4	-	-
Fishery	-	21.4	35.7	42.9	-	-
Reindeer husbandry	7.1	28.6	7.1	57.1	-	-
Nature conservation	7.1	14.3	28.6	42.9	7.1	-
Community development	-	57.1	14.3	21.4	7.1	-
Land use	-	35.7	28.6	21.4	-	14.3
Energy	21.4	28.6	21.4	14.3	14.3	-
Road transport	7.1	21.4	35.7	21.4	7.1	7.1
Air traffic	14.3	35.7	28.6	7.1	7.1	7.1
Rail transport	14.3	35.7	14.3	21.4	-	14.3
Seafaring	14.3	35.7	21.4	-	14.3	14.3
Construction	7.1	42.9	21.4	28.6	-	-
Tourism and recreation	7.1	50	-	35.7	7.1	-

Adaptive capacity: Land use

Sector	very good %	fairly good %	not good nor poor %	rather poor %	very poor %	cannot say %
Plant production	6.3	60.4	10.4	10.4	-	12.5
Animal husbandry	12.5	62.5	14.6	-	-	10.4
Garden production	6.3	72.9	4.2	8.3	-	8.3
Forestry	4.2	43.8	22.9	16.7	-	12.5
Fishery	2.1	33.3	27.1	20.8	-	16.7
Reindeer husbandry	2.1	16.7	18.8	35.4	12.5	14.6
Nature conservation	6.3	33.3	29.1	16.7	6.3	10.4
Community development	4.2	47.9	22.9	22.9	2.1	-
Land use	2.1	50	35.4	14.6	-	-
Energy	4.2	54.2	22.9	14.6	-	4.2
Road transport	2.1	58.3	20.8	14.6	-	4.2
Air traffic	4.2	47.9	31.3	10.4	-	6.3
Rail transport	8.3	43.8	33.3	10.4	-	4.2
Seafaring	10.4	56.3	20.8	6.3	2.1	4.2
Construction	4.2	43.8	25	22.9	2.1	2.1
Tourism and recreation	2.1	56.3	18.9	14.6	-	8.3

Documentation page

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Abstract	<p>This study solicited stakeholders' opinions on climate change adaptation and their needs for information on the issue through a questionnaire survey. Stakeholders were identified as: 1) those affected by climate change and 2) those positioned most effectively to advance adaptation. The questionnaire comprised 21 questions. They included questions on general perceptions about climate change, its potential impacts and their significance, current preparedness, coverage of climate change issues in current plans, the need to respond and the measures required. The questionnaire was Internet based and anonymous, and was sent to 1133 persons working in 23 sectors. Respondents were asked to fill in the questionnaire from the point of view of their sector or work, and not as private citizens. Of the 532 persons who replied (47% response rate), natural resource and environmentally-related sectors each made up about a quarter, with 13 other sectors also represented.</p> <p>More than 90% of the respondents agreed with the statement that climate change is caused by human actions and 69% thought that the climate has already changed. A majority believed that most sectors in Finland are able to cope with climate variability and the impacts of climate change fairly or very well. Climate change issues have so far not been taken into account in just over half of the operational plans of organisations or sectors represented in the survey (52% of respondents). Nevertheless, 37% of the plans did cover climate change issues, and of these most dealt with both mitigation and adaptation (41%). A majority (53%) of the stakeholders considered that they had already received sufficient information on climate change issues to support their decision-making and planning at work. Of a given list of alternative information needs, the responses emphasize information on impacts on Finland (62%), on probabilities of occurrence of extreme events (57%), uncertainties of estimates (56%) and regional impacts (50%). Half of the respondents (50%) thought that measures taken so far in Finland to adapt to climate change have not been sufficient. The stakeholders suggested several types of measures that the authorities should take.</p>	
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Julkaisun nimi	Intressiryhmien käsityksiä ilmastonmuutoksesta ja tarpeesta sopeutua siihen	
Julkaisun osat/ muut saman projektin tuottamat julkaisut		
Tiivistelmä	<p>Työssä selvitettiin kyselytutkimuksen avulla intressitahojen näkemyksiä ilmastonmuutokseen sopeutumisesta sekä tiedon tarpeista. Intressiryhmällä tarkoitettiin 1) sellaisia tahoja, joihin ilmastonmuutos vaikuttaa, 2) tahoja, jotka voivat parhaiten vaikuttaa ilmastonmuutokseen sopeutumisen edistämiseen. Vastaajat edustivat noin viittätoista eri toimialaa. Kyselyn aiheina olivat yleiset näkemykset ilmastonmuutoksesta, ilmastonmuutoksen mahdolliset vaikutukset ja niiden merkitys, nykyinen varautuminen ilmastonmuutokseen, ilmastonmuutoksen käsittelemisen toimialan suunnitelmassa, tarve varautua ja tarvittavat toimenpiteet. Kysely oli verkkopohjainen ja se oli tehty Webropol-ohjelmalla. Kysely lähetettiin 1133 henkilölle. 532 henkilöä vastasi kyselyyn (vastauprosentti 47). Vastaukset koottiin anonymieina. Lähes kaikki vastaajat olivat samaa mieltä väittämän kanssa, että ilmastonmuutos aiheutuu ihmisen toimista. Suurin osa oli myös sitä mieltä, että ilmasto on jo muuttunut (69%). Vastaajat arvioivat, että suurin osa suomalaisen yhteiskunnan sektoreista pystyy sopeutumaan ilmaston vaihteluun ja muutokseen erittäin tai melko hyvin, tai sitten sektoreiden sopeutumiskyvyn katsottiin olevan neutraali, ei hyvä eikä huono. Suurimassa osassa vastaajien organisaatioita (52%) ilmastonmuutosta ei vielä ole otettu huomioon toiminnan suunnittelussa. 37% vastaajista kuitenkin ilmoitti, että ilmastonmuutos huomioidaan jo nyt suunnitelmassa. Ilmastonmuutosasioita sisältävistä suunnitelmista suurin osa käsitteli sekä ilmastonmuutoksen hillintää että sopeutumista (41%). Yli puolet vastaajista (53%) oli saanut tarpeeksi tietoa ilmastonmuutoksesta työtään varten. Monet vastaajat kuitenkin ilmoittivat tarvitsevansa lisää tietoa seuraavista ilmastonmuutokseen liittyvistä aiheista: koko Suomea koskevat vaikutukset (62% vastaajista), ääri-ilmiöiden esiintymistodennäköisyyksistä (57%), arvioiden epävarmuuksista (56%) ja alueellisista vaikutuksista (50%). Puolet vastaajista oli sitä mieltä, että Suomessa tähän asti tehdyt toimet ilmastonmuutokseen sopeutumiseksi eivät ole olleet riittäviä ja monet vastaajat ehdottivat avoimessa kysymyksessä lukuisia toimia, joihin viranomais-ten tulisi ryhtyä sopeutumisen edistämiseksi</p>	
Asiasanat	ilmastonmuutokset, sopeutuminen, intressitaho, kyselytutkimus, Suomi	
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This study solicited stakeholders' opinions on climate change adaptation and their needs for information on the issue through a questionnaire survey. The questions covered in the survey included stakeholders' general perceptions about climate change, its potential impacts and their significance, current preparedness, coverage of climate change issues in current plans, the need to respond and the measures required. The stakeholders also listed information and research needs on adaptation to climate change and types of measures that the authorities should take to enhance adaptation to climate change in Finland.

Työssä selvitettiin kyselytutkimuksen avulla intressitahojen näkemyksiä ilmastonmuutokseen sopeutumisesta sekä tiedon tarpeista. Kyselyn aiheina olivat yleiset näkemykset ilmastonmuutoksesta, ilmastonmuutoksen mahdolliset vaikutukset ja niiden merkitys, nykyinen varautuminen ilmastonmuutokseen, ilmastonmuutoksen käsitteleminen toimialan suunnitelmissa, tarve varautua ja tarvittavat toimenpiteet. Vastaajat myös luettelivat tiedon tarpeitaan ilmastonmuutoksesta ja siihen sopeutumisesta sekä ehdottivat toimenpiteitä, joihin viranomaisten tulisi ryhtyä ilmastonmuutokseen sopeutumisen edistämiseksi.

This report is also available at the FINADAPT Web site:

<http://www.ymparisto.fi/syke/finadapt> or from www.environment.fi/publications

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