

Adaptation to Climate Change in the Administrative Sector of the Ministry of the Environment

Action Plan Update for 2011–2012

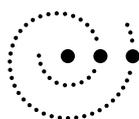


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Action Plan Update for 2011–2012

Helsinki 2011

MINISTRY OF THE ENVIRONMENT



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FOREWORD

Finland's National Strategy for Adaptation to Climate Change was drawn up in 2005. One of the first countries to prepare such an extensive adaptation strategy, Finland's strategy outlines numerous measures for various sectors, aimed at improving their readiness to predict the impacts of climate change, as well as to prepare for and adapt to them. A key policy outline in the strategy is that adaptation to climate change be a part of normal planning, implementation and development in these sectors.

In 2008, the Ministry of the Environment prepared an Action Plan for the implementation of the national adaptation strategy. The Action Plan contains concrete measures to be implemented within the environmental administration, with a focus on biodiversity, land use and construction, environmental protection and the use and management of water resources. The measures outlined in the adaptation strategy for the environmental administration formed the starting point for the Action Plan, which was prepared together with the Ministry of Agriculture and Forestry. The environmental administration was the first administrative sector to prepare its own action plan for adaptation to climate change.

Given that, both internationally and in Finland, further details are rapidly emerging on climate change and its impacts, it was decided that the Action Plan should be updated at regular intervals and that the first revision and update should be carried out at the end of 2010. This update work was conducted and coordinated by the environmental administration's network on adaptation to climate change. The update follows the Action Plan's thematic structure.

The environmental administration's Action Plan Update covers the years 2011 and 2012. It will provide a sound basis for updating Finland's National Strategy for Adaptation to Climate Change, scheduled to begin in late 2011. In conjunction with the updating of the strategy, it is necessary to address cross-sectoral horizontal issues. In this context, the changes in the environmental administration organisation can also be considered in more detail.

The updated Action Plan was prepared by the environmental administration's network on adaptation to climate change. From the Ministry of the Environment, its members include Antti Irjala from the Department of the Built Environment (network chairman), Katri Nuuja from the Department of the Built Environment, Jukka Bergman and Jaana Vormisto from the Unit for International and EU Affairs, Tuija Talsi and Ari Seppänen from the Environmental Protection Department, Pekka Salminen and Hannele Nyroos from the Department of the Natural Environment, Kirsi Pere from the Communications Unit, Research Director Laura Höijer, Juha-Pekka Maijala from the Department of the Built Environment (network secretary), and Professor Mikael Hildén from the Finnish Environment Institute.

The network members prepared the sections related to their area of responsibility. In addition, Marjo Nummelin from the Environmental Protection Department, Minna Perähuhta and Ville Koponen from the Department of the Built Environment, Pekka Harju-Autti from the Department of the Natural Environment, and Minna Hanski from the Ministry of Agriculture and Forestry contributed to the update. In the section 'National Developments', Kirsti Jylhä from the Finnish Meteorological Institute collaborated on the information on climate change in Finland.

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1 National developments

Climate change caused by humankind is underway. As the signs of climate change in the prevailing weather and its impact on the environment and society become clearer, it is more widely acknowledged that adapting to climate change is a necessity. Most of the variation in the climate can still be attributed to natural variability. However, warm periods over the past few years have been exceptionally warm, even record-breaking, which substantiates the forecasts on climate change. Although the natural variation in the climate over years and decades will from time to time accelerate and decelerate the pace of the change, the intensifying greenhouse effect will inevitably lead to a changed climate.

In Finland, it is estimated that climate change will have a multitude of consequences that will be seen in nature and will affect the use of natural resources and food production. Reducing the harm caused by climate change and taking advantage of the opportunities provided by it requires controlled adaptation to those climatic conditions which have already begun to change and to those which will continue to change into the future. When planning new systems, structures and ways of operating, it is necessary to assess the possible impacts of a changing climate and changes in weather conditions on resilience to disruptions, ability to function and economic efficiency in various administrative sectors.

As it currently appears that the planned reductions in emissions will not be sufficient to halt climate change, adaptation to climate change is a necessity. Even with the current situation, with a gradually but inevitably changing climate, weather and climate variation and extreme events should be prepared for, as this helps when adapting to future climate variations and changes. Statistics based on meteorological observations provide information on the average weather and climate values and the likelihood of the occurrence of extreme weather events in the coming years. However, when examining the occurrence of extreme temperatures in the current climate conditions, the global warming that has taken place thus far needs to be taken into account.

Future changes in the climate cannot be accurately predicted. In the long term, the greatest sources of error are the limitations in the climate models used for drawing up climate change scenarios, and uncertainty related to future emissions of greenhouse gases and particulate matter. With short-term climate forecasts, natural variability in the climate is the main cause of uncertainty, although the level varies greatly depending on the case. The smaller the area or the shorter the time period under examination, the greater the uncertainty caused by natural variability in the forecast. At the same time, natural variability is proportionally smaller in temperature forecasts than in precipitation forecasts. With regard to adaptation measures, estimates of Finland's future climate can be divided into categories on the basis of the degree to which the models used in preparing the forecasts are in agreement over them, and how big the changes are in comparison to natural variation.

Different areas have different economic and population structures, climatic conditions, geographic conditions, infrastructure and communities. Therefore, adaptation should be promoted with a regional orientation, taking into account the vulnerability factors, as well as the threats and opportunities, in each region. Such factors can include, for instance, accessibility (road, ferry and telecommunication connections) and habitation in areas which face new kinds of risks.

Climate change and adaptation to it affects various population groups in different ways. For instance, price rises have the greatest impact on people on low incomes. The most vulnerable population groups, such as older people, may experience difficulties in accessing resources that reinforce the ability to adapt; these include sufficient income, education or technology. Thus, adaptation to climate change has significant socio-political implications on vulnerability of social capital, new kinds of risks and fairness, among others. At an individual level, more attention needs to be paid to the most vulnerable groups and how they will cope.

In addition to ecological, technical and economic challenges, it is important to consider adaptation in view of social impacts.

Information on the present and future climate has come from the ACCLIM project (which addresses climate extremes in the present day climate and estimates on climate change, based on the most recent simulations(?), for adaptation research) and the subsequent ACCLIM II project (which addresses climate change estimates and specialist services for adaptation research). Under these projects, based on climate model experiments, climate change forecasts have been prepared separately for the next four decades, and for consecutive 30-year periods, using 1971–2000 as the climatological base period. The main project results are included in Annex 1. The projects were a part of ISTO, the Climate Change Adaptation Research Programme coordinated by the Ministry of Agriculture and Forestry.

2 International developments

Climate change is a global phenomenon and its impacts are not limited to national boundaries. According to the IPCC, the Intergovernmental Panel on Climate Change, temperatures will rise, precipitation will change and various extreme weather events, such as drought, floods and hurricanes will increase. Sea levels around the world will also rise, changing the lives of people who live on the coasts and on islands in many ways. Adaptation to the impacts of climate change poses a challenge to all countries, but particularly to the poorest and most vulnerable ones. International cooperation is therefore required for adaptation and for the funding of adaptation measures in developing nations.

2.1

Adaptation as part of international climate negotiations

In 1992, the United Nations Framework Convention on Climate Change was adopted at the UN conference held in Rio de Janeiro, and was complemented by the Kyoto Protocol in 1997. Adaptation, and the required knowledge base and technical issues, in particular, have been addressed in the climate convention within the framework of the Nairobi Work Programme, for instance. Negotiations on a climate convention for the period after the Kyoto Protocol are currently underway, with adaptation forming an important part of the negotiations.

The least developed countries have prepared their own national adaptation plans (National Adaptation Programme of Action, or NAPA), and the preparation process was funded by the Least Developed Countries Fund of the Global Environment Facility. In 2010, the Adaptation Fund established under the Kyoto Protocol started to fund the first concrete adaptation projects in developing countries. The fund is primarily financed through a levy on project activities under the clean development mechanism.

Alongside the reduction of emissions, adaptation has become a key issue in the negotiations on a future climate treaty. Many adaptation measures also advance the reduction of emissions. For instance, halting deforestation could reduce greenhouse gas emissions by as much as 25 per cent globally. The more emissions reductions achieved, the less need there is for measures and funds for adaptation. While adaptation is a challenge faced by all countries, in international climate negotiations the focus is on supporting the adaptation measures of the poorest and most vulnerable countries in particular.

In December 2010, the Conference of the Parties in Cancun reached a decision on the establishment of a Cancun Adaptation Framework and an international adaptation committee. In addition, a decision was made on drawing up a work programme for

a possible system to address loss and damage associated with the effects of climate change. This has been a very difficult issue in the negotiations, and the decision was therefore postponed until the next Conferences of the Parties. The decision underlines the integration of adaptation measures into other policy areas, especially into strategies for development and alleviation of poverty in developing countries, and the design(?) of sufficient methods of observation. In addition, emphasis is placed on the sharing of knowledge and best practices and the importance of regional and national cooperation.

Furthermore, the establishment of a new Green Climate Fund was agreed on at Cancun. In the future, mitigation and adaptation projects alike will be financially supported by the fund. A long-term climate funding objective of USD 100 billion by 2020 was set, comprising both public and private funding. It is clear that in the future, a large amount of public financing will be required for funding adaptation in the poorest, most vulnerable countries. The short-term funding pledge (USD 30 billion in 2010–2012) made in Copenhagen in 2009 for climate change measures in developing countries was officially taken note of as a part of the Cancun decision. The industrialised countries, including the EU member states, reported on the delivery of their own funding pledges in Cancun, while the developing countries emphasised that the funding should be distributed in a balanced way between mitigation and adaptation projects.

2.2

The European Union and regional cooperation in adaptation

In the international climate negotiations, the European Union has actively highlighted the importance of adaptation in the new climate treaty. Within the adaptation framework programme, each country would implement the common adaptation principles from their own national point of view, and adaptation should be integrated into their national development plans. National measures are supported by means of regional and international cooperation. The European Union emphasises that the focus of funding should be on supporting the poorest, most vulnerable countries, such as those in Africa and small island states.

The European Union's own strategy for adaptation to climate change has been presented in the White Paper that defines measures and policies to reduce the vulnerability in the EU region. Cooperation at the EU level is required for boosting nationally implemented measures, particularly in sectors where integration is advanced (agriculture, energy, water) or where there are cross-border issues (water areas, biodiversity).

The Ministry of the Environment is responsible for coordination of the international climate negotiations, in which Finland participates as part of the European Union. In the European Union, adaptation issues for international negotiations are prepared by the Council Working Party on International Environmental Issues (WPIEI/CC), with the Ministry of the Environment representing Finland, and by a special Expert Group on Adaptation (EGAD). In Finland, the Ministry of the Environment is responsible for coordinating national climate positions alongside other key ministries and various interest groups, while the Ministry of Agriculture and Forestry coordinates adaptation issues.

Finland also participates in regional cooperation, where adaptation to climate change has been addressed in various reports, projects and guidelines. A climate and air group (Klimat och luft-gruppen) operates under the auspices of the Nordic Council of Ministers. This group bases its operations on the Nordic Environmental Action Plan

and its defined focus areas, one of which is adaptation to climate change. The climate and air group carries out adaptation-related projects, such as the 'Benchmark for Best Practices in Climate Change Leadership in Municipalities' (NOBILITI) project, which aims at gathering information on the best municipal practices on emission reductions and adaptation. In 2005, the Committee of Senior Officials of the Barents Euro-Arctic Council adopted a document on climate change and relevant policy measures, entitled 'Arctic Climate Change: Policy Measures Relevant for the Barents Region'. At present, the preparation of an action plan related to climate change is underway, and adaptation occupies a central position also in this. In 2007–2008, the Arctic Council working group on sustainable development collected information to be used as a basis for decision-making in a project called 'Vulnerability and Adaptation to Climate Change in the Arctic (VACCA)'. The working group also runs a project related to reindeer herding under the title 'Reindeer Herding, Traditional Knowledge and Adaptation to Climate Change and Loss of Grazing Land (EALAT)'.

2.3

Adaptation and development cooperation

Climate change is taking place all over the world, which means that every country has to adapt to it. Since the impacts of climate change vary by country and region, and locally, it is important that adaptation measures are designed to correspond to the needs of each country and region. Although adaptation is required across the world, the poorest and least developed countries are in the weakest position. Climate change has considerable effects on the land, forests and water resources. Many developing countries depend on the income that is generated from these resources. Consequently, the impact on food production is also large. In addition, the impacts of climate change are linked to migration for environmental reasons and conflicts over natural resources in developing countries. Developing countries therefore feel the impact of climate change the most, although they produce the smallest amount of greenhouse gas emissions. Without support from the industrialised countries, the developing countries will not be able to meet the challenges of adaptation.

In the poorest countries, in particular, climate issues cannot be separated from development issues. Finland's Development Policy Programme thus places an emphasis on increasing development cooperation to mitigate climate change, with the aim of including the climate perspective in all related cooperation activities. At the seventh Conference of the Parties to the Climate Change Convention, held in Marrakesh in 2001, three new voluntary climate funds were established: the Least Developed Countries Fund (LDCF), the Special Climate Change Fund (SCCF) and the Kyoto Protocol Adaptation Fund (AF). The first two funds are managed by the Global Environment Facility (GEF). The funds complement climate measures in developing countries, supported by the GEF and other financiers. The Special Climate Change Fund has four windows: (a) the adaptation of developing countries to climate change, (b) transfer of technologies to developing countries, (c) key sectors in mitigating climate change (energy, transport, industry, agriculture, forestry and waste management) and (d) diversifying the economies of developing countries. Through the SCCF's adaptation window, adaptation measures can be supported in those developing countries that are most vulnerable to climate change and that are not counted among the least developed countries. The purpose of the LDCF is to support the work programme for the least developed countries, which was adopted by the Parties to the Climate Convention. The main focus of the programme is on adaptation to climate change and improving the operational capacities to implement

the treaty obligations. Initially, the Fund's primary task is to support the preparation of the national adaptation programmes in the least developed countries. Finland has also lent support to making the adaptation fund under the Kyoto Protocol operational. The adaptation fund is financed through a levy on the certified emission reduction credits issued by the clean development mechanism.

Finland supports climate measures in the developing countries through bilateral projects and multilateral channels of funding, such as the GEF or LDCF. In 2009, the support given by Finland was approximately 26.7 million euros, of which roughly eight million euros were targeted at adaptation. Furthermore, Finland supports adaptation measures through the International Union for Conservation of Nature (IUCN). The three-year adaptation project (2008–2010, approximately 2 million euros) was aimed at developing tools for adaptation to climate change, designed for Zambia, Mozambique and Tanzania, and at supporting decision-making, from the grass roots level of village communities to national development planning. The opportunities and operating models for developing measures and policy tools to support adaptation to climate change, particularly with regard to the sustainable use of forests and water resources, are being analysed in collaboration with national governments, local communities, private actors and non-governmental organisations. Finland provides approximately 500,000 euros of funding (in 2009–2011) through the Finnish Meteorological Institute, to support measures to increase the capacity of meteorological institutes in the Oceania region. The island states in the Pacific Ocean are particularly vulnerable to the impacts of climate change and extreme weather events. While their meteorological institutes are often undermanned and underfunded, more is being demanded of the services they provide. The project therefore aims to improve the capability of regional and national meteorological institutes to meet the expectations of their services.

3 Biodiversity and recreational use of natural areas

3.1

State of the operating environment and the implementation of the Action Plan

In the field of biodiversity, the general impacts of climate change are already rather well known. However, assessing and detecting more specific effects on certain habitats and species requires more detailed information and improved monitoring of the situation. In addition, it is necessary to further specify needed research on biodiversity that is central to adaptation to climate change. Such research needs should be integrated into the content and objectives of sectoral research.

A key measure is to make the monitoring of biodiversity more efficient, through general monitoring at the habitat level, which is complemented by monitoring at the species level. In this, the key is to identify the species and their habitats that are most threatened by climate change, as well as threatened biotypes, for example, on the basis of the assessments of threat status, and to define measures required to improve their chances of conservation and adaptation.

In addition, assessment of the state of protected areas and the effectiveness of their management should be enhanced. Based on this, possible changes in procedures and processes should be prepared for. When implementing legislation that promotes the conservation of biodiversity, as well as when planning various programmes and strategies to guide diverse land use, measures should be developed to prevent climate change and safeguard biodiversity while promoting its adaptation to climate change. Climate change impacts should be assessed with a view to preserving cultural landscapes and traditional biotopes. In addition, measures should be targeted at areas that face the greatest risks. Furthermore, changes in the recreational use of natural areas caused by climate change should be taken into account when renewing off-road traffic legislation, for instance, as well as in the planning and use of recreational areas.

The Action Plan has been implemented especially through the following measures: proposals have been completed for a monitoring system for biodiversity and the development of related information systems (final report 19 December 2008) and for increasing productivity in the protection of species (final report 12 December 2008). The action plan for the conservation and sustainable use of biodiversity in Finland was prepared in 2007 (the Finnish Environment 35/2007), and its implementation has been promoted by a broad-based monitoring group. In 2007, the report on the implementation of the Habitats and Birds Directives between 2001 and 2006 was presented to the European Commission. This report added to the knowledge of habitats and the status of species in Finland. In addition, a report has been prepared on the monitoring of habitat types and species (the Finnish Environment 14/2008).

Preparation of the strategies for invasive alien species and for sustainable use of mires and peatland has been carried out in broad-based working groups. The strategy for mires and peatland was completed on 16 February 2011 (working group memorandum, Ministry of Agriculture and Forestry 2011:3) and the invasive alien species strategy on 30 March 2011 (working group memorandum, Ministry of Agriculture and Forestry 2011:2).

In 2009, Metsähallitus (the state-run enterprise responsible for state-owned land and water areas) prepared new guidelines for the management and use of protected areas. Metsähallitus is also working to improve the monitoring of the state of protected areas, and the implementation of this work was launched in 2010. In addition, the collection of data on habitat type and species continues. A new assessment of threatened species was completed on 1 December 2010 (The 2010 Red List of Finnish Species, Ministry of the Environment and Finnish Environment Institute 2010) and the assessment of threatened habitat types was completed in 2008 (the Finnish Environment 8/2008). Based on this, an expert working group prepared an action plan for improving the state of threatened habitat types (completed on 16 December 2010) and for carrying out an overall assessment of the Nature Conservation Act (The Finnish Environment 27/2010).

The Finnish Environment Institute has also advanced research on biodiversity and its adaptation to climate change, in particular through its own research programmes. In addition, the Finnish Environment Institute has prepared a preliminary project list of key areas for further research.

3.2

Measures for 2011–2012

The monitoring of biodiversity and information management is being further developed and coordinated in a project group (SETI). The Finnish Environment Institute has launched a project, to be completed in 2012, to enhance prioritisation in the protection of species within the environmental protection administration. The project is aimed at increasing the cost-efficiency and effectiveness of protection with regard to key objectives that also promote adaptation to climate change. Metsähallitus intends to build a new, IT-based planning and monitoring system for the planning of the management and use of protected areas, and for planning and monitoring the state of Natura 2000 sites. Pilot versions will be running already in 2012. The purpose is to enhance and unify the planning and implementation of the management and use of protected areas. In addition, the system will enable more efficient and unified assessments of both impacts on and the state of protected areas and Natura 2000 sites, thereby promoting the implementation of the EU's Habitats Directive and related reporting. Promoting the capacity to adapt to climate change is one aspect of this.

In the coming years, further measures taken on the basis of the new assessment of threatened species, alongside the action plan aimed at improving the state of threatened habitat types, will enable better consideration of the opportunities to adapt to climate change in conjunction with protection and preservation of species and habitat types. Furthermore, the extensive species and habitat type inventory projects carried out by Metsähallitus in the protected areas complement the knowledge base also from the perspective of enhanced monitoring. The aim is to carry out, for key parts, the inventories of valuable landscape protection areas in cultural landscapes by 2012, which will provide better opportunities for developing the management and restoration of traditional rural biotopes.

4 Land use and communities

4.1

State of the operating environment and the implementation of the Action Plan

In the sectors of land use and communities, the impacts of climate change are rather well-known, and the need for adaptation measures is commonly acknowledged. Challenges are connected to the extensive incorporation of adaptation into common decision-making in these sectors, cooperation between various sectors and the launching of concrete measures for adaptation. A further challenge concerns the development of practical measures for the implementation of national land use guidelines, for instance. In the future, the utilisation of flood danger and flood risk maps in land use planning and construction will be vital.

Since the completion of the Action Plan, adaptation to climate change has been addressed in training organised by the environmental administration, in guidance on planning and in the performance management of the Centres for Economic Development, Transport and the Environment.

The most significant measure regarding land use and communities enacted after the completion of the environmental administration's Action Plan was the Government decision of 13 November 2008 on revising the national land use guidelines. Addressing the challenges posed by climate change was a key theme for the revision, and the new guidelines include the following objectives concerning adaptation to climate change:

General guidelines

- In land use planning, existing environmental inconveniences, or such to be expected, as well as exceptional natural conditions are to be identified, and their effects prevented. Land use should establish preconditions for adapting to climate change.

Special guidelines

- Land use should take into account flood risk areas, as reported by the authorities, and the aim should be to prevent the risk of flooding.
- In land use planning, new construction should not be located in areas that are prone to flooding. An exception can only be made if need and impact studies indicate that the risks of flooding can be controlled and that the construction work is in line with sustainable development.
- Land use planning must indicate, if necessary, alternative land use solutions for what are especially important activities in terms of the viability of the community, but which pose considerable risks to the environment or people.

- Local master and detailed planning should take account of the increasing possibility of storms, heavy rainfall and flooding in built areas. Sufficient distances should be left between functions and activities that can cause undesirable health effects or accident risks, on the one hand, and impact-sensitive activities, on the other.
- Industries that are at risk of major catastrophes and the transport routes for dangerous substances, as well as chemical rail-yards, should be placed sufficiently far away from residential areas, areas for communal functions and sensitive natural areas.

In addition, the following guideline concerns ecological corridors

- The preservation of ecological corridors between protection areas is to be promoted, and, where necessary, these areas and other valuable natural areas are also to be promoted.

Under the Land Use and Building Act the national land use guidelines must be taken into account and promoted in regional planning, municipal planning and the work of the state authorities.

In addition to the national land use guidelines, another key measure included in the 2008 Action Plan is the assessment of the need to revise the Land Use and Building Act. This has now been scheduled to be carried out in 2010–2011. The Flood Risk Management Act is one reason the Act may need to be revised. In conjunction with assessing the revisions needed with regard to adaptation to climate change, it is natural to examine the Land Use and Building Act in depth while keeping in mind the impacts of climate change. If the Land Use and Building Act is amended, guidelines concerning preparedness for climate change should be provided on land use and construction.

The Flood Risk Management Act (620/2010) came into force on 30 June 2010 and the Government Decree on Flood Risk Management on 7 July 2010. The Act aims to reduce flood risks, prevent and mitigate the adverse consequences caused by floods and promote the preparedness for floods. Its purpose is also to coordinate flood risk management and the management of river basins, taking into account the needs relating to sustainable use and the protection of water resources.

Among other things, the Act lays down obligations to perform a preliminary assessment of flood risks, specify significant flood risk areas, and prepare flood risk management plans. The Centres for Economic Development, Transport and the Environment bear the main responsibility for the planning of flood risk area management in river basins and coastal areas. Municipalities are responsible for the planning of managing floods in urban areas caused by heavy rain. According to the Act, the Finnish Environment Institute ensures that information on significant flood risk areas, flood hazard maps and flood risk maps and approved flood risk management plans are available to the public via information networks.

Flood risk management plans do not conclusively set measures to be taken to reduce risks, but the state and municipalities need to take the plans into account in their activities. Under the Decree, the preliminary assessment of flood risks needs to be completed and significant flood risk areas must be designated no later than 22 December 2011.

Measures for 2011–2012

In the sectors of land use and communities, the national land use guidelines and possible amendments to the Land Use and Building Act form the foundation of preparing for climate change. Implementation of the national land use guidelines is a precondition for preparedness for climate change in land use. This requires information on how the guidelines will be implemented in practice at various levels of land use planning. In this, pilot projects on various levels of planning could serve as a starting point, through which information on preparing for climate change in land use and construction could be disseminated and made more widely known.

A significant joint field of operation for land use and construction is preparation for the protection of properties and functions vital to society against flood impacts in flood risk areas, in areas that are being planned and particularly in areas that have already been built up. Furthermore, attention is paid to local storm water conditions.

When the adaptation programme for the administrative sector of the Ministry of the Environment was being prepared, the Ministry had separate departments for land use and housing and building, which were then merged into the Department of the Built Environment. In updating the Action Plan, the sections on land use and construction have been treated as separate thematic entities, presenting, to some degree, very similar measures. With regard to this, all measures concerning the Department of the Built Environment are presented at the end of the section on buildings and construction.

5 Buildings, construction and housing

5.1

State of the operating environment and implementation of the Action Plan

Those working in the construction sector and with the existing building stock (i.e. in the property maintenance and renovation sectors) are already aware of the key impacts of climate change and the need for adaptation. Efforts are underway to extend this awareness to those working with the built heritage and cultural landscapes. However, further research is still needed, as is the development of practicable procedures and information guidance.

High-quality planning and careful consideration to detail, the use of materials promoting sustainability, and meticulous implementation are preconditions for a building with a long life span. If the materials used or the execution of the work is of poor quality, or if structural solutions do not function as planned or are faulty, deterioration of a building can be rapid.

Current legislation regulating construction and other statutes include requirements for taking climate change into consideration. The use of local, regional and municipal-specific guidance instruments should be further reinforced. In conjunction with possible amendments made to the Land Use and Building Act and Decree regarding adaptation and land use, areas concerning construction and its prerequisites should also be examined.

Proactive maintenance based on knowledge of structures and damage mechanisms is a key approach for adapting buildings to the stresses resulting from climate change. Good methods exist for the systematic maintenance of buildings, and their use is continuously promoted.

Property owners are responsible for the safety of their buildings and their fitness for use. Therefore, increasing property owners' awareness of adaptation measures is one way of further improving the consideration of adaptation to climate change. A concrete set of measures includes shielding properties located in flood risk areas against flood impacts and ensuring that site-specific drainage systems for buildings function well. Local storm water conditions and preparation for them also at the level of individual properties are addressed in the manual on storm water management, which is now being completed.

Threats caused by climate change to the building stock, built heritage and cultural landscapes have been studied. Flood mapping and forecasting scenarios have been employed in the assessment of world heritage sites and cultural heritage sites of national importance. In these assessments, the impacts of climate change on the management and administration of cultural landscapes have been evaluated and research needs identified. In safeguarding the special characteristics of these cultural

landscapes, key challenges are related to cooperation at municipal and regional levels and between officials responsible for guidance on construction and for heritage services, and to the joint use of data in cultural landscape registers.

In terms of measures involving new construction, climate change and adaptation will be taken into consideration to some degree even in the planning stage. This is partly done through planning guidance. Local conditions that may affect construction are increasingly being taken into account through existing instruments, such as building ordinances and municipal instructions for building. Alongside planning guidance, these can be used in implementing the mapping results in high flood risk areas. In new construction, adaptation to climate change can be incorporated into the design values of load-bearing structures, for instance. Application of the European standards (Eurocodes) for the design of load-bearing structures requires the preparation of national annexes. Moreover, the development of materials and products increasingly takes into account known changes in load conditions.

New building projects and renovation work can also be guided through support of social housing production and renovation, with the Housing Finance and Development Centre of Finland (ARA) being responsible for granting the subsidies. Granting of subsidies for new construction requires that all work is in compliance with the required planning and construction regulations. If the purpose of use of a building is modified, or extensive renovation is carried out, a building permit should be obtained. Therefore, it can be concluded that climate change adaptation measures can be sufficiently taken into account already in official regulations on buildings and construction, and in the provision of information to property owners, without setting adaptation action as a separate requirement for subsidies granted by ARA. Subsidies particularly targeted at the systematic maintenance and renovation of enclosing structures promote preparedness for changes in climate and load conditions, along with keeping the building fit for use.

Cooperation between municipalities and environmental authorities (e.g. the Centres for Economic Development, Transport and the Environment) and the various branches of municipal administration should be enhanced with regard to adaptation in construction. Moreover, methods of land use monitoring can be utilised in the planning of adaptation measures concerning the building and real-estate stock. When planning local adaptation measures, the results of mapping carried out on flood risk areas, in line with the Floods Directive, provide a significant body of background material. Review of climate change effects for the purposes of gathering information required for providing guidance on land use and construction is being further enhanced.

The buildings and construction sectors also benefit from the multidisciplinary research that is carried out on climate change adaptation as a whole. There is also a need for meteorological statistical analysis producing long-term change forecasts on key stress conditions; their continuity is a precondition for predicting adaptation. A special characteristic in targeting research is the estimation of changes in local conditions and research that forecasts extreme weather events.

5.2

Measures for 2011–2012

When the adaptation programme for the administrative sector of the Ministry of the Environment was being prepared, the Ministry had separate departments for land use and housing and building, which were then merged into the Department of the Built Environment. In updating the Action Plan, sections on land use and construction

have been treated as separate thematic entities, presenting, to some degree, very similar measures. With regard to this, measures concerning the Department of the Built Environment are presented in this section as a whole.

- The need to amend the Land Use and Building Act and Decree as required by mitigation of, and adaptation to, climate change will be explored. Integrating adaptation into, for example, sections on the required content of plans (Sections 28, 39 and 54 of the Land Use and Building Act), and into the sections that deal with plan statements, keeping the plans up-to-date and impact assessment (Section 1 of the Land Use and Building Act) will be considered. In addition, any possible requirements for amending the Land Use and Building Act with regard to safeguarding already built-up areas against floods will be examined. It will also be investigated whether the consideration of risk from flooding, earth or rock falls, or landslides should also be included in the preconditions for a building permit in areas covered by local detailed plans (Section 116 of the Land Use and Building Act).
Responsible organisation: Ministry of the Environment/Department of the Built Environment Partners:
Schedule: 2011–2012
- As part of promoting the implementation of the national land use guidelines, a pilot project will be carried out on preprint for climate change in regional planning and general planning.
Responsible organisation: Ministry of the Environment/Department of the Built Environment Partners: Regional Councils, Association of Finnish Local and Regional Authorities
Schedule: 2011–
- The need for information on adaptation to climate change and the Need to provide guidance on land use and construction will be assessed.
Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment), Centres for Economic Development, Transport and the Environment (ELY Centres)
Schedule: 2010–2012
Resources: to be performed as part of public servants' official duties, study projects
- Information material in support of property maintenance and on construction guidelines will be produced. Use of the stormwater management manual will be promoted.
Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment), Centres for Economic Development, Transport and the Environment (ELY Centres)
Schedule: 2010–2012
Resources: to be performed as part of public servants' official duties
- A guide will be compiled on preparing for climate change in the buildings, construction and land use planning sectors.
Responsible organisation: Ministry of the Environment/
Department of the Built Environment Partners:
Ministry of Agriculture and Forestry, Association of Finnish Local and Regional Authorities Preliminary
Schedule: 2012–

- Information on adaptation to climate change will be made available on The environmental administration websites (e.g. flood risk maps, the Climteguide.fi portal, climate change section on the Rakennusperinto.fi site).
Responsible organisation: Ministry of the Environment/Department of the Built Environment
Partners: Finnish Environment Institute, Ministry of Agriculture and Forestry, Association of Finnish Local and Regional Authorities
Preliminary schedule: 2011–
- The Centres for Economic Development, Transport and the Environment will incorporate preparedness for climate change into their areas of responsibility. Climate change impacts and measures required for adaptation will be taken into account in the steering of planning and in other guidance on and monitoring of land use, as well as in matters related to construction and maintaining the building stock fit for use.
- The impacts of climate change and the need for adaptation will be systematically brought up in development negotiations conducted with municipalities (Section 8, Land Use and Building Act). Climate change impacts will also be considered in assessing how up-to-date plans are. In conjunction with this, maintaining buildings fit for use will be taken into account, as well as issues regarding sites of national importance.
Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment), Centres for Economic Development, Transport and the Environment (ELY Centres), Association of Finnish Local and Regional Authorities
Schedule: 2010–
Resources: to be performed as part of public servants' official duties
- Research on the changes in load conditions will be continued and will incorporate construction and the sustainability of property maintenance. Based on result analyses from research on climate change and extreme weather events, and construction research applying these results, assessments will be done on whether adaptation requires the amendment of statutes.
Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment)
Schedule: 2010–
Resources: to be performed as part of public servants' official duties and R&D projects
- Measures identified in studies that map threats facing the building stock, built heritage and cultural landscapes will be implemented. Projects will be carried out in those areas where further research is needed.
Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment), Centres for Economic Development, Transport and the Environment (ELY Centres), the National Board of Antiquities, regional and town museums
Schedule: 2010–2012
Resources: to be performed as part of public servants' official duties and R&D

6 Environmental protection

6.1

State of the operating environment and implementation of the Action Plan

On certain sites, floods caused by climate change pose an environmental pollution threat. Such sites located in flood risk areas include contaminated land areas, old landfill sites, various waste management sites such as composting fields, harbours and dockyards, as well as winter storage areas of boats, fuel and chemical warehouses, and overflow containment of wastewater pumping and wastewater treatment plants.

When a flood occurs, risk management systems may fail and harmful substances and micro-organisms may be carried by water outside the area or into ground water, for instance. Therefore, in the short term it is crucial to map sites located in flood risk areas. In the future, mapping should be improved so that measures for risk management are also defined.

Climate change might also have an effect on the need for pesticides and there may be substantial modifications in their quality. For the purposes of a longer-term assessment, it is necessary to anticipate how climate change may affect pesticide use.

6.2

Measures for 2011–2012

- When assessing the need to amend the Environmental Protection Act, adaptation to climate change will be taken into consideration.
Responsible organisation and partners: Ministry of the Environment (Environmental Protection Department)
Schedule: 2011–2012
Resources: to be performed as part of public servants' official duties and R&D
- The administration's information systems (the soil information system Maaperä, VAHTI, VELVET) should be used to investigate and identify sites that could pose a risk of possible sources of pollution, and the location of sewer network overflow and pumping sites in flood risk areas.
Responsible organisation and partners: Ministry of the Environment (Environmental Protection Department)
Schedule: 2011–2012
Resources: to be performed as part of public servants' official duties
- In addition, responsibility for matters concerning water and flood protection, which were previously under the Environmental Protection Department, will be transferred to the Department of the Natural Environment.

7 Use, management and protection of water resources

7.1

State of the operating environment and implementation of the Action Plan

Water, climate, flood risk management and drought

The greatest societal impacts of climate change are caused by an increase in extreme events related to floods, drought and the water cycle, as well as changes in the seasonal variation of runoff.

Winter flow rates and water levels of rivers and lakes will see a substantial increase, resulting in winter floods. At the same time, there will be fewer spring floods, particularly in southern and central Finland. The winter water levels of the central lakes of large water bodies, such as Saimaa and Päijänne, will rise significantly from the current level, raising the risk of winter floods. Along with heavier rainfall in the summer, summer floods will also become more common, especially in small water bodies and in urban areas. Prolonged summer seasons will also bring about a greater risk of dry summers, especially in southern and central Finland.

Given the changes in the timing of run-off and floods, regulatory permits for lakes should be amended. The need for amendments concerns a part of the current 220 regulatory permits. The working group on the flood decree, established by the Ministry of Agriculture and Forestry, has prepared a proposal on improving preparedness for flood and drought risks. Under the proposal, the Water Act would be amended to include provisions on revising permit conditions or issuing new ones, if flooding or drought has or is predicted to have adverse effects on a river basin from the public interest's point of view and these effects cannot otherwise be sufficiently addressed. The amendments would be preceded by a river basin specific report on how effective conditions in water resources management permits are in regulating backflow and discharge.

Low water flows in the summer season, important for water supply, will be reduced. It is estimated that the average summer flow will decrease by 10–40 per cent in the water bodies in southwestern Finland and Ostrobothnia. In the driest summers, notable difficulties could be experienced with regard to irrigation and other water supply in these water bodies.

Intensifying periods of drought will add to the risks and problems of water supply that relies on groundwater resources. Since a drop in the groundwater flow rate and slow recharge leads to oxygen deficiency and high concentrations of dissolved iron, manganese and metals, the quality of groundwater may weaken in small groundwater reservoirs. On the other hand, substantial percolation of surface water into groundwater in the autumn and winter also increases the risk of deteriorating groundwater quality.

Climate change has an effect on the transport of substances into inland water bodies and the Baltic Sea, and thereby also the state of waters.

Eutrophication is intensified by climate change, as leaching of nutrients increases along with runoff. Lack of snow on the fields is another factor likely to contribute to the leaching of nutrients into water bodies. Moreover, higher levels of nitrogen may leach from the forests. As water temperatures rise, the growth of blue-green algae will increase and oxygen conditions weaken in coastal waters and lakes, especially when there are low flow rates. During dry periods, bacteria concentrations in waters might increase. In the winter, shortening of the ice cover period is beneficial to the oxygen regime. In acid sulphate land areas, climate change will increase acidity and the leaching of metals.

Prevention and reduction of flood damage is the responsibility of the administrative sector of the Ministry of Agriculture and Forestry. The Act (620/2010) and Decree (659/2010) on flood risk management came into force in June–July 2010. According to the Act, significant flood risk areas need to be designated on the basis of a preliminary assessment. After this, flood danger and flood risk maps and flood risk management plans are prepared for the identified areas. The first plans will be prepared by the end of 2015. The EU's Floods Directive is implemented through the Act and the Decree. Implementation of the Floods Directive is under way, and a preliminary assessment of flood risks in river basins and coastal areas covering the entire country was completed by the end of 2010. In preparation for an assessment of flood risk from storm water, a survey is to be conducted with municipalities.

The dam safety regulations mentioned in the Action Plan have been revised through the Dam Safety Act (494/2009) and Decree (319/2010). The revised dam safety regulations require that, in conjunction with a periodic inspection carried out at least every five years, factors affecting dam safety are studied, with due account taken of the changes in weather and hydrological conditions. In other words, the structural design of the dam is evaluated to determine if the reservoir and discharge capacity are sufficient given the current conditions. Dam failure analyses for dams that could cause a significant danger are updated when necessary, and the emergency action plans must be kept constantly up-to-date. In addition, the Dam Safety Act allows for the classification of dams to be changed, should conditions change.

The Ministry of Agriculture and Forestry is preparing a government proposal to reform the flood damage compensation system. According to the proposal, compensation for flood damage caused to buildings and their contents would be paid by indemnity insurance, like other damage to property. The goal is that regardless of the cause of flooding, compensation for damage would be paid on a consistent basis, treating all citizens equally. The intention is to submit the Government proposal to Parliament in December 2010.

The impacts of climate change and adaptation to them will be taken into account in water resources management plans. The environmental objectives in the water resources management plans and the planning of water resources management measures might be influenced by climate change. As part of the implementation strategy for the EU Water Framework Directive, guidelines were prepared for drawing up the water resources management plans in a way that enables consideration of climate change impacts and adaptation.

The first water resources management plans for seven areas in mainland Finland were completed in December 2009, and they are valid until 2015. With regard to climate change, they were limited to mostly describing its impacts. In the second planning round, which covers the period 2016–2021, the intention is to assess water resources management measures in more detail while taking the effects of climate change into account. In addition, the aim is to promote climate change adaptation measures by carrying out a “climate check” of the measures and implementing

measures to mitigate the adverse effects. In conjunction with this, it should also be evaluated whether climate change affects the classification of water resources and monitoring programmes.

In water resources management plans, reducing harmful impacts caused by the regulation of water bodies and designing measures to decrease nutrient releases and the leaching of harmful substances occupy a central position. Nutrient leaching, for instance, can be reduced by increasing vegetation cover in fields in the winter, particularly in sloping fields, and by constructing wetlands.

Measures included in the water resources management plans and flood risk management plans should be coordinated to support each other, and be as sustainable as possible in the long term, with a view to managing the impacts of climate change. Furthermore, the efforts are influenced by measures planned in other sectors, such as agriculture and energy policy, and the need to take biodiversity into consideration.

In 2007, the Commission issued the communication "Addressing the challenge of water scarcity and droughts in the European Union". Council conclusions were adopted on this basis in 2007, and again in 2010. Since 2009, the Commission has prepared an annual estimate of the trends in(?) water scarcity and drought across Europe. The strategy on water scarcity and drought will be revised in 2012. Further measures to manage these issues are required particularly with regard to improving the efficiency of water use and water conservation. Issues related to managing water scarcity should be incorporated more efficiently into policy measures in other sectors, agriculture in particular. Water resources management should be enhanced especially in areas that suffer from scarcity. This also requires Finland to expand upon the estimates of areas that experience water scarcity and prepare plans for such areas, coordinating them with water resources management plans. With regard to this, an example study will be prepared for the Paimionjoki catchment, as part of pan-European development efforts.

The impact of floods, increase in runoff and the implications of drought on raw water supply and the functioning of water resources management are investigated in the ongoing project entitled *Ilmastomuutokseen sopeutuminen vesihuollossa (ILVES, Adaptation to Climate Change in Water Resources Management)*, to be completed in 2010. In addition, support for water resources management has been directed at investments that enhance preparedness in water resources management.

A flood warning system has been developed as part of LUOVA (National Early Warning System for Natural Disasters in Finland). The aim is to develop a service in collaboration between the Finnish Meteorological Institute, the Finnish Environment Institute and the Centres for Economic Development, Transport and the Environment for informing the authorities and citizens about floods (fluvial flood, sea-level rise, flooding caused by heavy rainfall), regardless of the type of flood. In September 2010, the LUOVA system was taken into test use, and the Finnish Meteorological Institute has started to give warnings of heavy rainfall as part of LUOVA and other warning services. On 17 June 2010, the Ministry of the Environment established a development group on hydrological services to ensure that the needs related to hydrological services and other hydrological activities, both immediate and in the long term, are safeguarded and coordinated in a purposeful way that takes the overall interests of society into account.

Adaptation to climate change demands improving the level of knowledge, both in the European Union and nationally, and specifying the water resources management plans in this respect in the next planning round. Climate change research on hydrology and water resources has been conducted in Finland already for a long time. National research projects on the topic include SILMU and Finnadapt, both now completed, and the ongoing Climate Change Adaptation Research Programme (ISTO) and its subproject Wateradapt. At least three Nordic climate change projects

have been implemented, of which the CES (Climate and Energy Systems) project is currently ongoing. Among individual Finnish research projects is the research project on design and construction of dams entitled "Climate Change and Dam Safety – Effect on Design Floods" (The Finnish Environment 21/2008, natural resources). The ongoing Wateradapt project under the ISTO programme and the CES climate change project analyse adaptation issues in the regulation of inland waters and changes in the recurrence of floods. As a follow-up to the Nordic CES project, a project called Climate Change Impacts and Adaptation is being planned, with combined seawater and fluvial floods in estuaries among the research targets. New research information has been produced on the impacts of climate change on the leaching of nutrients in catchments, on lake ecosystems, and on carbon and nitrogen substance flows in river basins. In addition, the impacts of climate change and adaptation strategies on the catchment–lake system are being investigated. The VACCIA Life+ project assesses the susceptibility of catchments and lakes to the impacts of climate change, as well as their capability to adapt to a changing climate. Through the analysis of experimental ecological research results, long-term monitoring data and modelling results, sector-specific, well-functioning management and adaptation methods and measures are sought for catchments and lakes. In the period between 2010 and 2012, the CATERMASS project under the EU LIFE+ programme is studying the reduction of environmental risks of acid sulphate land and ways to adapt to climate change.

7.2

Measures for 2011–2012

- Climate change impacts on the load of inland water bodies and the Baltic Sea will be specified, as will related adaptation measures in the agricultural sector and other sectors.

Responsible organisation and partners: Finnish Environment Institute, MTT Agrifood Research Finland, Centres for Economic Development, Transport and the Environment (ELY centres), municipalities
Schedule: 2011–2013
Resources: Separate projects

- In the planning of flood risk management and in the next planning round for water resources management, measures will be analysed for their climate impact and climate proofness in the long term (climate checking). Flood risk management and water resources management measures that enhance adaptation will be promoted. Measures included in water resources management plans and flood risk management plans will be coordinated to support each other.

Responsible organisation and partners: Ministry of the Environment, Ministry of Agriculture and Forestry, Finnish Environment Institute and Centres for Economic Development, Transport and the Environment (ELY centres)
Schedule: 2010–2015

- The compensation system for flood damages will be reformed so that it responds better to the needs arising from a changing climate and extreme weather conditions, and uniform compensation for flood damage to buildings and their contents will apply, so that citizens are treated equally regardless of the cause of flooding.

Responsible organisation and partners: Ministry of Agriculture and Forestry and Ministry of Social Affairs and Health
Schedule: 2010–2011

Resources: to be performed as part of public servants' official duties

- Flood warnings will be further improved as part of the national early warning system for natural disasters. A report will be prepared to ensure hydrological monitoring and the establishment of a warning service for real-time water height and flood risk.
 Responsible organisation and partners: Ministry of Agriculture and Forestry, Ministry of the Environment and Ministry of Transport and Communications
 Schedule: 2010–2011
 Resources: to be performed as part of public servants' official duties
- Old regulatory permits for each catchment area will be examined to see how effective they are in allowing response to changes in water conditions and, if necessary, measures will be taken in order to enhance the flexibility of permits.
 Responsible organisation and partners: Ministry of Agriculture and Forestry.
 Schedule: 2011–
 Resources: to be performed as part of public servants' official duties
- The need to revise the classification of waters in the water resources management plans and monitoring programmes while taking climate changes impacts into account will be assessed.
 Responsible organisation and partners: Ministry of the Environment and Centres for Economic Development, Transport and the Environment (ELY centres)
 Schedule: 2011–2012
 Resources: to be performed as part of public servants' official duties
- Instructions for the preparedness of water treatment plants for special situations resulting from weather conditions will be developed. Responsible organisations: Ministry of Agriculture and Forestry, Ministry of the Environment, Association of Finnish Local and Regional Authorities, Finnish Water and Waste Water Works Association, research institutes
 Schedule: 2011–2014

8 Communication

8.1

State of the operating environment and implementation of the Action Plan

Reliable information on the various aspects of climate change is in constant demand. Communication is needed on both climate change mitigation as well as on its impacts and adaptation. The aim is to make the concept of adaptation better known alongside mitigation, to enable more comprehensive communication on climate change. Adaptation should constitute an integral part of climate change communications by the environmental administration.

General objectives:

- To increase knowledge of adaptation to climate change and make the concept an integral part of climate policy.
- To communicate adaptation to climate change in Finland in collaboration with key stakeholders.
- To emphasise that climate change needs to be addressed through both mitigation and adaptation measures.

Key target groups for communications include decision-makers at the national and local levels, regional administration, citizens, organisations, the business world and the media. Between 2002 and 2007, the Ministry of Trade and Industry coordinated a communications programme on climate change. The programme raised the level of knowledge on climate change communications and expanded the scope of actors in the field of communications so that nowadays communication aimed directly at citizens is carried out by many organisations. This means that, to a large extent, organisations and the media are now disseminating factual information meant for the general public that is generated within the environmental administration. At the same time, the content of communications has expanded from explaining the basics of climate change to covering its consequences and the demands adaptation places on different actors.

The core messages that are highlighted in all communications are the following:

- In spite of mitigation measures against climate change, global warming will take place in any case, and therefore it is necessary to prepare for climate change.
- Adaptation to climate change does not mean giving up on mitigation measures, as it is not possible to adapt to all changes.
- Adaptation to climate change is required both nationally and at the local level.

- Finland needs to prepare for unprecedented extreme weather events, such as heavy rainfall, floods and storms, and changes in seasonal temperatures. We need to prepare for climate change now, as delaying will prove more costly later on.
- Adaptation measures need to be undertaken in all policy sectors.

In recent years, communications on adaptation to climate change in the environmental administration have largely been carried out in collaboration with the Ministry of the Environment, the Finnish Environment Institute and the Ministry of Agriculture and Forestry. A joint communications plan was prepared, which included training events for journalists and the publication of the brochure "Adaptation to climate change in Finland" in December 2009. The training events for journalists proved very popular, and they should be continued. Preparing new publications and updating the old brochure should be considered when the need arises.

The climate arena (formerly climate forum), established by the Ministry of the Environment, convenes about 2–3 times a year. The arena is tasked with promoting the implementation of climate policy and increasing awareness of climate issues in Finland. Among the members and experts in the climate arena, there is broad representation of various actors in society, such as the authorities, industry and commerce, organisations and research institutes. The aim of the climate arena is to distribute information and add to the debate on the mitigation of climate change and adaptation to it at various levels of society.

8.2

Measures for 2011–2012

Cooperation between various ministries and other actors in communications on climate change should continue and be further expanded. In addition, issues related to adaptation should feature more strongly in communications. Important themes in communications include non-indigenous species and preparation for flood risks.

In the autumn of 2008, the Ministry of the Environment and the Ministry of Agriculture and Forestry launched an unofficial climate change communications network to improve and promote communication and cooperation on communication issues between various branches of administration and research institutes. Based on this, a steering group for climate change communications was established and tasked with the coordination of climate change communications by central government. The steering group's term runs from 1 June 2010 to 31 December 2012. The aim of the steering group, which is coordinated by the Ministry of the Environment, is to enhance climate change communications by central government on common interests, distribute information and cooperate on communications on climate change. The purpose is not to alter the communication responsibilities of the organisations; rather, each member organisation will continue to cover communications in its own area of responsibility.

The steering group convened officially for the first time in August 2010. In the future, cooperation on communication issues related to adaptation to climate change will be carried out in the steering group, and journalist training, for instance, will be organised in cooperation within the steering group.

As regards online communications, information on adaptation to climate change will be shared on the website Climateguide.fi. The aim of this project is to compile, in a uniform manner and on one single website, practical, research-based information on climate change, its impact, mitigation and adaptation, to be used by municipalities

and citizens. Among other things, the website will contain articles, maps and graphs that illustrate the impacts of climate change and options for adaptation in various regions. The project is organised jointly by the Finnish Meteorological Institute, the Finnish Environment Institute and the Centre for Urban and Regional Studies at Aalto University and it has received EU Life+ funding for a period of three years. The steering group of this project includes a representative from the Ministry of the Environment's communications unit. The Finnish-language version of the website will go live in August 2011 and the Swedish and English versions in December 2011.

9 Research and development on adaptation

One of the key conclusions drawn from the National Strategy for Adaptation to Climate Change was that adaptation measures cannot be sufficiently planned on the basis of present knowledge. Although more information is needed on adaptation measures in particular, information is also needed on climate change and its impacts; therefore, studies on climate change and its impacts need to be closely connected to the planning of adaptation measures. Furthermore, information is required on the financial implications of adaptation measures, that is, on the costs of climate change impacts and adaptation measures and the benefits gained through these measures. Research therefore occupies a key position in the implementation of the adaptation strategy. The same also holds true more widely across the European Union, and it has targeted resources at adaptation research in various ways.

Adaptation research requires research data on the possible impacts and assessment of measures that can be taken to prepare for or adapt to these impacts. Studies that focus on the phenomenon itself and its natural scientific impacts have the longest tradition. Basic knowledge obtained in this way has been a prerequisite for consideration of issues related to adaptation. In the following section, the focus is on research that is directly related to adaptation to climate change.

9.1

National funding for research on adaptation to climate change

For the first time, climate change impacts and adaptation to climate change were examined in a summary preliminary report on adaptation to climate change in Finland, published by the Finnish Environment Institute in 2003. The FINADAPT research project, under the Environmental Cluster research programme, assessed the level of knowledge, gaps in knowledge and research needs concerning adaptation in Finnish nature and society. A summary for policy-makers was also compiled as part of the project. More information can be found at <http://www.ymparisto.fi/default.asp?contentid=365716&lan=EN>.

The Climate Change Adaptation Research Programme ISTO, which was coordinated by the Ministry of Agriculture and Forestry, spanned five years (2006–2010) and was aimed at increasing Finland's capacity to adapt to climate change by producing information required for the planning of practical adaptation measures. Funding for the research programme came from several sources. The Ministry of Agriculture and Forestry and the Environmental Cluster research programme under the Ministry of the Environment were the largest funders of the ISTO programme. More information can be found at www.mmm.fi/ISTO. In addition, the Academy of Finland, the Finnish

Funding Agency for Technology and Innovation TEKES and private foundations have funded research on adaptation to climate change. Research institutes have also allocated part of their own budgetary funding for adaptation research.

Research has been focused on issues that are most urgent for the planning of adaptation measures; for example, those where climate change has significant impact, those which can be addressed through adaptation measures, and those where adaptation should be started soon. Adaptation may be urgent either because climate change and weather-related events are having a significant impact already, or because decisions made now will have an impact far into the future. For instance, anomalous weather events are among those important changes that are having significant effects already and might become more common in the future.

The studies have also examined regional differences in Finland and paid attention to the reliability of data, both of which are vital in evaluating the risks related to adaptation measures. A synthesis of adaptation research conducted in Finland will be prepared in 2011 (as part of the SETUILMU research project, see below).

The Ministry of the Environment participated in the Climate Change Adaptation Research Programme by funding eight research projects implemented in the administrative sector of the Ministry in the fourth phase of the environmental cluster programme during the programme period 2006–2009 (www.ymparisto.fi/ymparistoklusteri). Some of the projects provide basic information on climate change and the probabilities of events related to it, which are essential in planning adaptation measures. The list below presents the funded projects:

- Climate extremes in the present day climate and estimates on climate change, based on the most recent simulations for adaptation research (ACCLIM) Natural hazards affecting infrastructure in a changing climate (EXTREMES II)
- Minimisation of flood damage: flood scenarios, damage assessment and risk maps (Extreflood II)
- Biodiversity and climate change: the functioning of networks of natural habitats and grasslands in preserving populations of species
- Consideration of climate change in zoning
- Adaptation of infrastructure to flood impacts caused by climate change – River Vantaanjoki case study
- Towards levels of required adaptation to cope with extreme weather events (TOLERATE)
- Land use and urban planning in managing flood risks in densely populated areas.

In addition, the WaterAdapt project implemented by the Finnish Environment Institute and funded by the Ministry of Agriculture and Forestry belongs to the Climate Change Adaptation Research Programme and to the environmental cluster programme. The project assesses the impacts of climate change on Finnish hydrology, water resources and regulatory procedures. In addition, it explores adaptation measures related to the use and management of water resources. The Finnish Environment Institute has carried out research on heavy rainfall and floods in urban areas in cooperation with the Finnish Meteorological Institute and Helsinki University of Technology (the RATU project). It may be possible to improve flood preparedness in urban areas on the basis of the project results.

In 2008, the Research Consortium for Natural Resources and the Environment, LYNET, was established (www.lynet.fi) by the sectoral research institutes under the Ministry of Agriculture and Forestry and the Ministry of the Environment. The Finnish Game and Fisheries Research Institute, the Finnish Forest Research Institute, the Finnish Food Safety Authority Evira, the Finnish Environment Institute, MTT Agrifood Research Finland and the Finnish Geodetic Institute are LYNET institutes.

By using a network-based approach, the aim of the LYNET consortium is to examine environmental issues and models for solutions in a versatile manner and to incorporate the results of recent research into policy preparation and social debate flexibly and productively. The LYNET institutes have joint research programmes and development projects.

The LYNET consortium's research programme on climate change brings together strong research expertise from various fields that particularly concern the impacts of climate change on nature, natural resources and the use of natural resources. The programme comprehensively examines the impacts of climate change on nature, and on renewable resources and their use, as well as the social issues related to climate change. The focus is on means of mitigating climate change and assessing the vulnerability to change, on adaptive capacity and on means of adaptation. One of the programme objectives is to develop and apply methods for pooling and versatile utilisation of the time series and GIS data of the LYNET institutions to examine sensitivity to change and adaptive capacity, and to assess various measures.

Between 2010 and 2012, the Sustainable Development Unit of the Advisory Board for Sectoral Research is providing funding for the research project in support of climate change mitigation and climate policy related to climate change adaptation (SETUILMU). The project is aimed at enhancing the efforts in society to mitigate climate change and adapt to it in all administrative sectors. In accordance with the principles of sectoral research, the SETUILMU programme seeks projects on a commissioned basis that would serve the information needs of the various ministries, and practical decision-making, as well as possible. Special areas of focus are the effectiveness and impacts of climate policy measures and instruments, and the cost-efficiency of measures, the coherence of policy measures and forecasting. Whilst the SETUILMU project is jointly funded by several ministries, the Ministry of the Environment is mainly responsible for project administration. More information can be found at <http://www.ymparisto.fi/default.asp?contentid=358895&lan=FI> .

The Academy of Finland has launched a research programme on climate change entitled FICCA (Finnish Research Programme on Climate Change). In the first round of applications, the Academy granted a total of 12 million euros to projects carried out between 2011 and 2014 under the FICCA research programme. Seven out of the eleven projects that received funding are designed to examine sensitivity to climate change or adaptation to climate change. More information on the programme can be found at <http://www.aka.fi/fi/A/Tutkimusohjelmat/kaynnissa/Ilmastonmuutos-ficca/>. The Finnish Environment Institute participates in five projects within the FICCA research programme. Among these, the project A-LACARTE: Assessing Limits of Adaptation to Climate Change and Opportunities for Resilience to be Enhanced is coordinated by the Finnish Environment Institute. Another project coordinated by the Finnish Environment Institute is MARISPLAN: Marine Spatial Planning in a Changing Climate, a project that also focuses on adaptation. In addition, issues related to adaptation occupy a central position in the joint project of the Finnish Meteorological Institute and the Finnish Environment Institute, entitled ClimWater: Climate Change and Water Cycle: Effects on Water Resources and their Utilization in Finland. Prior to this, the Academy of Finland funded the project MAVERIC: Map-based Assessment of Vulnerability to Climate Change Employing Regional Indicators, coordinated by the Finnish Environment Institute, where the aim is to utilise geographical data in evaluating sensitivity to climate change. For more information on MAVERIC 2009–2011: <http://www.environment.fi/default.asp?contentid=365718&lan=EN> .

International research funding

Environmental research, including climate change, is one of the ten themes under the European Union's seventh research framework programme for the period 2007–2013. Funding for the framework programme is substantial (1.8 billion euros). Furthermore, the programme supports research on adaptation to climate change. For instance, the project called Mediation (Methodology for Effective Decision-making on Impacts and Adaptation, <http://mediation-project.eu/>), in which the Finnish Environment Institute participates, was launched in 2010 and will continue until 2013.

Climate change and adaptation to climate change constitute a key focus area in the EU's LIFE+ programme for the period 2007–2013. Funding from the LIFE+ programme is provided for projects with a broad scope that aim at the practical application of research results. A typical LIFE project goes further beyond the basic research phase and results in either an extensive practical application (pilot project) or a substantial project to improve awareness. In the last two application rounds in 2008–2009, the LIFE+ programme granted a total of 11 million euros of funding to Finnish climate change projects. For instance, the projects 'Mitigation of and Adaptation to Climate Change in the Helsinki Metropolitan Area (Julia 2030)' and the joint project of the Finnish Meteorological Institute, the Finnish Environment Institute and Aalto University, 'Climate Change Community Response Portal (CCCRP)' receive funding through the LIFE+ programme. The LIFE projects can be purely national ones, and it is entirely possible to include funding from national climate change funding instruments (the Academy of Finland: FICCA, TEKES programmes, the sectoral research programme) in a LIFE+ project.

In the period 2007–2013, climate change and its regional impacts are also among the themes in the ESPON (European Spatial Planning Observation Network) research programme, related to EU cooperation in the field of spatial development. The ASTRA project of the EU's Interreg III B programme 2005–2007 (Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region, www.astra-project.org) has explored the impacts of climate change and adaptation to it in the Baltic Sea region, and developed related strategies, particularly concerning spatial planning. The project focused on various risks. Seven countries from the Baltic Sea region participated in the project and the lead partner was the Geological Survey of Finland. This work is being continued through various case studies under the BaltCICA project: Climate Change: Impacts, Costs and Adaptation in the Baltic Sea Region (<http://www.baltcica.org/index.html>).

A corresponding Interreg II B project on adaptation and spatial planning, ESPACE (European Spatial Planning Adapting to Climate Events, www.espace-project.org), was implemented in 2003–2007. Four countries in north-western Europe participated in the project, which aimed to provide recommendations on how adaptation to climate change can be incorporated into spatial planning policies, processes and practices. The project published a strategy containing a set of recommendations and a number of tools and materials for considering adaptation in spatial planning. Follow-up work on this is carried out partly under the Interreg IVb – Baltic Sea Region programme, in the Baltadapt 2010–2013 (Baltic Sea region climate change adaptation strategy) project, which aims to map out an adaptation strategy for the Baltic Sea region, among other activities.

The Nordic project Caravan 2008–2010: Climate change: a regional assessment of vulnerability and adaptive capacity for the Nordic countries (<http://www.environment.fi/default.asp?contentid=380099&lan=EN>) examines wider regional

sensitivity. The project is closely connected to the national MAVERIC project (see Section 9.1 on national funding).

Within the framework of the European ERA-Net scheme, a research programme called CIRCLE (Climate Impact Research Coordination for a Larger Europe) was launched in 2004. The programme lends support to national research programmes on adaptation, with the Academy of Finland and the Finnish Environment Institute as the Finnish participants. The follow-up project CIRCLE-2 was launched in the summer of 2010 and continues the work of its predecessor in promoting the coordination of European research.

Moreover, the cooperation between the Nordic Meteorological Services on climate activities (NORDKLIM) now includes adaptation issues. Research-based knowledge of the impacts of climate change and adaptation is provided and distributed by the NORDADAPT network. Financed by Nordforsk, the climate change research network NORDCLAD-NET brings together Nordic adaptation research in a series of meetings held in 2010–2012. In addition, the Finnish Meteorological Institute coordinates the Nordic Network on Adaptive Management in relation to climate change (NONAM) and the University of Oulu coordinates the network called People and Ecosystems in a Changing Environment.

A project called Clim-ATIC, which is financed by the Interreg programme, has been launched within the framework of Arctic cooperation. The objective is to set up an international cooperation network for distributing information on the impacts of climate change and adaptation to these impacts in the small communities of Northern Europe.

9.3

Research and support for climate policy regarding adaptation

Research serves the formulation of adaptation policy by providing new information on sensitivity to change and factors that influence adaptation. The Finnish Environment Institute has developed a web-based integrated modelling tool for climate change impacts and adaptation, which can be used in predicting the impact of various global changes on the Finnish environment (the FINESSI tool). The CCCRP project (Climate Change Community Response Portal), which is funded through the LIFE+ programme, created the Climateguide.fi web portal that provides direct support for the preparation of adaptation and mitigation policies. Starting from 2011, the Finnish Environment Institute will participate in the development of work carried out by the European Environment Agency's (EEA) Topic Centre on climate change impacts and adaptation. The Centre's aim is to support the work of the EEA and the European Commission related to the European adaptation strategy.

In addition to information and tools, researchers have been assigned tasks that guide policy development directly. Therefore, researchers from the Finnish Environment Institute, for instance, participate in the IPCC's work on assessing the impacts of climate change and adaptation to it, and in examining ways to enhance synergies between the biodiversity and climate change treaties.

Measures for 2011–2012

- R&D projects related to adaptation will be implemented.
Responsible organisation and partners: The Finnish Environment Institute, research cooperation with various institutes and universities
Schedule: In accordance with the resource plans of the projects:
resources from various financiers in accordance with project decisions and a percentage of self-financing
- Within the LYNET framework, R&D activities related to adaptation will be further developed, with a specific focus on the assessment of vulnerability and adaptive capacity.
Responsible organisation and partners: The Finnish Environment Institute and other LYNET institutes, with other research institutes and universities as partners
Schedule: Guidelines during 2011, implementation in 2011 and 2012
Resources: Percentage of self-financing and active fund raising of external resources through research proposals submitted to national and international research financiers.
- Research-based information on what is needed for adaptation and opportunities for adaptation will be provided through various platforms: the Climateguide website, other websites, trade journals, lay articles.
Responsible organisation and partners: The Finnish Environment Institute, research cooperation with various institutes and universities
Schedule: In accordance with the communications plans outlined in the projects
Resources: Allocating resources from the Finnish Environment Institute's communications unit and other units and projects for communications activities.

10 Summary of measures for 2011–2012

Biodiversity and recreational use of natural areas

Measures for 2011–2012

The monitoring of biodiversity and information management is being further developed and coordinated by a project group (SETI). The Finnish Environment Institute has launched a project to enhance prioritisation in the protection of species within the environmental protection administration, due for completion in 2012. The project is aimed at increasing the cost-efficiency and effectiveness of protection with regard to key objectives that also promote adaptation to climate change.

Metsähallitus intends to build **a new, IT-based planning and monitoring system for planning the management and use of protected areas, and for planning and monitoring the state of Natura 2000 areas.** With pilot versions ready in 2012, the system will enhance and unify the planning and implementation of the management and use of protected areas. In addition, it will enable more efficient and unified assessment of both impacts on and the state of these areas, thereby promoting the implementation of the EU's Habitats Directive and related reporting. Promoting the capacity to adapt to climate change is one aspect of this.

In the coming years, further measures taken on the basis of the new assessment of threatened species, alongside the action plan aimed at improving the status of threatened habitat types, will enable better consideration of the opportunities to adapt to climate change in conjunction with protection and preservation of species and habitat types.

Furthermore, the extensive species and habitat type inventory projects carried out by Metsähallitus in the protected areas complement the knowledge base from the viewpoint of enhanced monitoring. The aim is to carry out, for key parts, the inventories of valuable landscape protection areas in cultural landscapes by 2012, which will provide better opportunities for developing the management and restoration of traditional rural biotopes.

Land use and communities, and buildings, construction and housing

- The need to amend the Land Use and Building Act and Decree as required by mitigation of, and adaptation to, climate change will be explored. Integrating adaptation into sections on, for example, the required content of plans (Sections 28, 39 and 54 of the Land Use and Building Act), and into the sections that deal with plan statements, keeping the plans up-to-date and impact assessments (Section 1 of the Land Use and Building Act) will be considered. In addition, it will be examined whether the Land Use and Building Act needs to be amended with regard to safeguarding already built-up areas against floods. Furthermore, it will be investigated whether the

- consideration of risks from flooding, earth or rock falls or landslides should be included in the preconditions for a building permit in areas covered by local detailed plans (Section 116 of the Land Use and Building Act).
Responsible organisation: Ministry of the Environment/Department of the Built Environment
Partners: Schedule: 2011–2012
- As part of promoting the implementation of the national land use guidelines, a pilot project will be carried out on preparing for climate change in regional and general planning. Responsible organisation: Ministry of the Environment/Department of the Built Environment
Partners: Regional Councils, the Association of Finnish Local and Regional Authorities
Schedule: 2011–
 - The need for information on adaptation to climate change and the need to provide guidance on of land use and construction will be assessed.
Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment), Centres for Economic Development, Transport and the Environment (ELY Centres)
Schedule: 2010–2012
Resources: to be performed as part of public servants' official duties, study projects
 - Information material in support of property maintenance and on construction guidelines will be produced. Use of the stormwater management manual will be promoted.
Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment), Centres for Economic Development, Transport and the Environment (ELY Centres)
Schedule: 2010–2012
Resources: to be performed as part of public servants' official duties
 - A guide will be compiled on preparing for climate change in the buildings, construction and land use planning sectors.
Responsible organisation: Ministry of the Environment/Department of the Built Environment
Partners: Ministry of Agriculture and Forestry, the Association of Finnish Local and Regional Authorities
Preliminary schedule: 2012–
Communications: information on adaptation to climate change will be made available on the environmental administration websites (for instance, flood risk maps, the climateguide.fi portal, etc.). Responsible organisation: Ministry of the Environment/Department of the Built Environment
Partners: Finnish Environment Institute, Ministry of Agriculture and Forestry, the Association of Finnish Local and Regional Authorities
Preliminary schedule: 2011–
 - Preparedness for climate change will be integrated into the work of the Centres for Economic Development, Transport and the Environment. Climate change impacts and measures required for adaptation will be taken into account in the steering of planning and in other guidance on and monitoring of land use, as well as in matters related to construction and maintaining the building stock fit for use.
 - The impacts of climate change and the need for adaptation will be systematically brought up in development negotiations conducted with municipalities (Section 8, Land Use and Building Act). Climate change impacts will also be considered in assessing how up-to-date plans are. In conjunction with this, maintaining buildings fit for use will be taken into account.

Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment), Centres for Economic Development, Transport and the Environment (ELY Centres), Association of Finnish Local and Regional Authorities

Schedule: 2010–

Resources: to be performed as part of public servants' official duties

- Research on the changes in load conditions will be continued and will incorporate construction and the sustainability of property maintenance. Based on result analyses from research on climate change and extreme weather events, and construction research applying these results, assessments will be done on whether adaptation requires the amendment of statutes.

Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment)

Schedule: 2010–

Resources: to be performed as part of public servants' official duties and R&D projects

- Measures identified in studies that map threats facing the building stock, built heritage and cultural landscapes will be implemented. Projects will be carried out in those areas where further research is needed.

Responsible organisation and partners: Ministry of the Environment (Department of the Built Environment), Centres for Economic Development, Transport and the Environment (ELY Centres), the National Board of Antiquities, regional and local museums

Schedule: 2010–2012

Resources: to be performed as part of public servants' official duties and R&D

Environmental protection

- When assessing the need to amend the Environmental Protection Act, adaptation to climate change will be taken into consideration when.
Responsible organisation and partners: Ministry of the Environment (Environmental Protection Department)
Schedule: 2011–2012
Resources: to be performed as part of public servants' official duties and R&D
- The administration's information systems (the soil information system Maaperä, VAHTI, VELVET) should be used to investigate and identify the location of sites that could pose a risk of possible sources of pollution, and the location of sewer network overflow and pumping sites in flood risk areas.
Responsible organisation and partners: Ministry of the Environment (Environmental Protection Department)
Schedule: 2011–2012
Resources: to be performed as part of public servants' official duties
- In addition, responsibility for matters concerning water and flood protection, which were previously under the Environmental Protection Department, will be transferred to the Department of the Natural Environment.

Use, management and protection of water resources

- Climate change impacts on the load of inland water bodies and the Baltic Sea will be specified, as will adaptation measures in the agricultural sector and other sectors.
Responsible organisation and partners: Finnish Environment Institute, MTT Agrifood Research Finland, Centres for Economic Development, Transport and the Environment (ELY Centres), municipalities
Schedule: 2011-2013
Resources: Separate projects
- In the planning of flood risk management and in the next planning round of water resources management, measures will be analysed for their climate impact and climate proofness in the long term (climate checking). Flood risk management and water resources management measures that enhance adaptation will be promoted. Measures included in water resources management plans and flood risk management plans will be coordinated to support each other.
Responsible organisation and partners: Ministry of the Environment, Ministry of Agriculture and Forestry, Finnish Environment Institute and Centres for Economic Development, Transport and the Environment (ELY Centres)
Schedule: 2010–2015
- The compensation system for flood damages will be reformed so that it responds better to the needs arising from a changing climate and extreme weather conditions, and uniform compensation for flood damage to buildings and their contents will apply, so that citizens are treated equally regardless of the cause of flooding.
Responsible organisation and partners: Ministry of Agriculture and Forestry and Ministry of Social Affairs and Health
Schedule: 2010-2011
Resources: to be performed as part of public servants' official duties
- Flood warnings will be further improved as part of the national early warning system for natural disasters. A report will be prepared to ensure hydrological monitoring and the establishment of a warning service for real-time water height and flood risk.
Responsible organisation and partners: Ministry of Agriculture and Forestry, Ministry of the Environment and Ministry of Transport and Communications
Schedule: 2010–2011
Resources: to be performed as part of public servants' official duties
- Old regulatory permits for each catchment area will be examined to see how effective they are in allowing response to changes in water conditions and, if necessary, measures will be taken in order to enhance the flexibility of permits.
Responsible organisation and partners: Ministry of Agriculture and Forestry
Schedule: 2011–
Resources: to be performed as part of public servants' official duties
- The need to revise the classification of waters in the water resources management plans and monitoring programmes while taking climate changes impacts into account will be assessed.
Responsible organisation and partners: Ministry of the Environment and Centres for Economic Development, Transport and the Environment (ELY Centres)
Schedule: 2011–2012
Resources: to be performed as part of public servants' official duties

- Instructions for the preparedness of water treatment plants for special situations resulting from weather conditions will be developed.
Responsible organisations: Ministry of Agriculture and Forestry, Ministry of the Environment, Association of Finnish Local and Regional Authorities, Finnish Water and Waste Water Works Association, research institutes
Schedule: 2012–2014

Research and development on adaptation

- R&D projects related to adaptation will be implemented.
Responsible organisation and partners: Finnish Environment Institute, research cooperation with various institutes and universities
Schedule: In accordance with the project plans
Resources: resources from various financiers in accordance with project decisions and a percentage of self-financing
- Within the LYNET framework, R&D activities related to adaptation will be further developed, with a specific focus on the assessment of vulnerability and adaptive capacity.
Responsible organisation and partners: The Finnish Environment Institute and other LYNET institutes, with other research institutes and universities as partners
Schedule: Guidelines during 2011, implementation in 2011 and 2012
Resources: Percentage of self-financing and active fund raising of external resources through research proposals submitted to national and international financiers.
- Research-based information on what is needed for adaptation and opportunities for adaptation will be provided through various platforms: the Climateguide website, other websites, trade journals, lay articles.
Responsible organisation and partners: The Finnish Environment Institute, research cooperation with various institutes and universities
Schedule: In accordance with the communications plans outlined in the projects
Resources: Allocating resources from the Finnish Environment Institute's communications unit and other units and projects for communications activities.

ANNEXES

Annex I.

Research project results on climate change

Climate trends and extreme weather events in the current climate

- Variations in the Finnish mean temperature are rather well-known for the past 150 years. During this period of time, the annual mean temperature has risen by over one degree. Spring temperatures have seen the greatest increase, of approximately two degrees (March–May). Winter temperatures have increased about one degree and the summers and autumns are half a degree warmer. The observations also indicate great variation. For instance, the past decades include the cold winters of 1985 and 1987, the warm years of 1989, 2000 and 2005–2008, the record-breaking mild winter of 2007–2008 and the record-breaking warm summer of 2010.
- Although the warming experienced so far has been rather small compared to the large interannual temperature variability in Finland, it has nevertheless caused a several-fold increase in the probability of extremely high monthly and seasonal mean temperatures. For instance, the return period for the mean temperature of the record mild winter of 2007–2008 (or an even milder one) is about 200 years in Helsinki, without taking warming into consideration. However, when climate change is taken into account, the return period is only about 35 years. Return periods for the record warm July of 2010 in Helsinki are about 300 years with no warming, and 60 years, if climate change is taken into account.
- The long historical data series in Helsinki indicates that the probability distribution of the lowest annual temperature has shifted towards milder values. The return period for a temperature colder than -28°C in Helsinki is now about 20 years, whereas half a century ago it was about ten years.
- The probability of long-lasting intervals of very cold weather is clearly higher in northern Finland than in southern Finland. In the summer, however, the highest temperatures are distributed rather uniformly across Finland.
- The return periods for exceptionally heavy precipitation amounts are typically slightly longer in northern Finland than in central and southern parts of the country. By contrast, no clear south-to-north gradient can be found in the recurrence of prolonged periods with scant precipitation.

Projected future changes in climate in Finland

- The models used to construct Finland's climate change scenarios agree on the following matters either fully or to a great degree:
- Already during the next few decades, greenhouse-gas-induced warming will emerge relatively clearly from the background of natural interdecadal temperature variability. It is very likely (with a probability higher than 95 per cent) that the mean temperature of the next full decade (2011–2020) will be higher in Finland than the mean of the currently used baseline period (1971–2000). The current best estimate for the annual mean warming at this time horizon is about 1°C .

- The temperature increase will be greater in winter than in summer. This is likely already in the near-term, but since the natural variability of winter temperatures is great, the uncertainty of the forecast is also greater in winter.
- During the last decades of this century, the annual mean temperature is projected to be 2–6°C higher than the reference value during the period 1971–2000. Winters will get warmer by 3–9°C degrees and summers by 1–5°C. Wintertime changes in the north exceed those in the south, whereas summertime changes are rather uniform across the country. Assuming that the actual warming will fall close to the median of the projections, by the end of the century the temperatures in central Lapland would approximately match those in present-day southern Finland.
- Besides increases in temperature, precipitation amounts will also rise in Finland by the end of this century: in winter by 10–40 per cent, and in summer by 0–20 per cent, in comparison to the 1971–2000 period. In relative terms, the changes in the north will exceed those in the south. Although the relative increase in the precipitation amounts is the highest in winter, summertime rainfall will continue to be heavier than in wintertime. In spite of slight projected increases in summertime rainfall, water resources may not increase, since evaporation will also intensify in a warmer climate.
- Thermal winter (daily mean temperature below zero) appears to disappear completely near southern and south-western coastlines by the end of this century. In Lapland it will shorten by one and a half months. Both the thermal summer (mean temperature above 10°C) and the thermal growing season (mean temperature above 5°C) will lengthen by 1–1.5 months. The increase in the length of the growing season will be greatest in the south-western part of the country, where the thermal autumn will also be considerably longer than now. By the end of the century, the effective temperature sum in the thermal growing season will be about the same in Lapland as it currently is in southern Finland. In southern Finland, conditions presently occurring in northern parts of Central Europe will prevail.
- There will be a significant increase in the probability of high temperatures, as the frequency distributions of the mean maximum and minimum temperatures will shift towards warmer values. This means that record warm months and seasons are expected to become increasingly more common, with the largest change seen in the coldest values of daily minimum temperature in winter. Almost all models project less variability in winter temperatures along with warming. Extreme cold events will thus become less frequent and milder. At the same time, record-cold events become increasingly unlikely.
- In summer, hot days will become more common and hot periods longer. For instance, between 1971 and 2000 there were typically only a few summers with "very hot" days (mean temperature over 24°C); by the end of the century, these will occur more frequently than every two years, even under the average scenario (A1B) of warming. It has been estimated that by mid-century, in the projections for a changed climate, a summer like July 2010 will occur once every 10–15 years, and there is an 80 per cent probability that there will be at least one equally warm July before 2050.

- Based on model simulations, the number of frost days during the last three decades of this century is projected to be one third less than currently in northern Finland and about half of the present number in the south. The frost season (defined as the number of days between the first frost in autumn and the last frost in spring) will shorten by almost two months. Concurrently, thaw days will become more frequent during the frost season.
- Wintertime freezing point days, with a daily minimum temperature below zero, and maximum temperature above zero, first become more frequent across the whole country and later only in the north and east. As a consequence of the increase in temperature and the decrease in the number of freezing point days in the autumn and spring, towards the end of the century the annual number of freezing point days will be greater than now only in places in the north.
- Heavy precipitation (snow and rain) will intensify in all seasons. In the summer, heavy rainfall amounts will be relatively higher than the total precipitation amount for the entire summer.
- In winter, rainy and wet days will become more common and the length of dry periods will decrease. At the same time, in the future, there will be more winter days with cloud cover, and less solar radiation. The primary reason behind the decrease in total solar radiation reaching the Earth's surface is increased cloudiness, but the reduction in snow cover also contributes to this, because snow reflects the solar radiation and thereby enhances diffuse radiation.
- The snow cover will diminish especially in early and late winter months. By mid-century, the water equivalent of snow will decrease almost by a half in south-western Finland. In Lapland, where the amount of snowfall will slightly increase, the reduction in the water equivalent of snow will be limited to 0–15 per cent. By the last third of the century, the water equivalent of snow will generally be a half of the present amount in northern and eastern Finland. In south-western Finland, already in the coming decades there will be fewer snowy winters (a higher water equivalent of snow than the average in the reference period 1971–2000) and there will be more winters with hardly any snow. By the end of the century, the latter will be predominant. In Lapland, it is not likely that even by the end of the century there will be many winters with no snow. However, there will be a marked decrease in the number of winters with heavy snow cover.
- Along with warming, ground frost will diminish in areas both with and without snow cover. The amount of ground frost has already decreased in southern and central parts of Finland. If warming proceeds in line with the average scenario, ground frost will continue to diminish, and by the end of the century, the ground frost layer is likely to be very thin in southern and central parts of the country. In eastern and northern Finland, deep ground frost might be experienced in areas with snow cover, but the period of deep ground frost will be clearly shorter than at present.

The climate models agree to a large extent on the following matters; however, the changes are relatively minor:

- Changes in precipitation are expected to take place rather slowly in Finland. During the next few decades, changes in precipitation will still be affected more strongly by natural variability than by increasing greenhouse gas concentrations. As a result, there is still a probability of about 25 per cent that the mean annual precipitation in the second decade of this century will be lower than that in 1971–2000. Therefore, the influence of global warming on increases in precipitation in Finland is expected to be much weaker in comparison with natural variability than the influence on temperature.
- Climate change gradually adds to the likelihood of record-breaking amounts of precipitation. However, when considering rarely occurring, exceptionally heavy precipitation events in the present and near-future climate, the statistical uncertainty arising from determining extreme values may still form a greater source of uncertainty than not taking account of the changes in the climate.
- In summer, no major changes in cloud cover and radiation are expected.
- Already at present, winters in Finland are rather wet. Most models predict that warming will cause relative humidity to rise from the current level by a few percentage points by the end of the century. If greenhouse gas emissions are successfully reduced, this change will be somewhat more moderate.
- In 2081–2100, the average geostrophic wind will intensify in the windy season (September–April) by 2–4 per cent in southern, and, to some degree, also in central Finland. Additionally, the maximum geostrophic wind values will probably increase slightly. Relative changes in the actual wind values are likely to be of the same order of magnitude.

The climate models disagree on the following changes:

- The models show deviations in estimates of changes in the frequency of rainy days in the summertime and the maximum length of dry periods, particularly in northern Finland. In southern Finland, the frequency of precipitation days in the summertime may be lower.
- The results concerning changes in total solar radiation in autumn are rather uncertain.
- In the summer and early autumn, relative humidity will probably remain about the same in Finland, when looking at the average of the results obtained from various models. However, this conclusion is quite uncertain, as there is great variation between the results.

Uncertainties are inevitable in forecasts concerning climate change and its impacts. Risk management is one way to take account of these uncertainties. On the other hand, changes in the climate outside Finnish borders also have an impact on how much climate change in Finland affects agriculture, forestry and food production, for instance. Whereas in Finland precipitation will increase, more periods of drought will occur in southern Europe, and in summertime also central Europe. This may have a greater impact on agriculture in Finland than the increase in precipitation amounts and length of the growing season.

Table I. Trends in seasonal changes in climate variables in southern and northern Finland by the end of this century. (XII–II: December–February; III–V: March–May; VI–VIII: June–August; IX–XI: September–December). Source: Jylhä et al. The changing climate in Finland: estimates for adaptation studies. ACCLIM project report 2009. Reports of the Finnish Meteorological Institute 2009:4.

Variable	Region	XII-II	III-V	VI-VIII	IX-XI	Year	Notes
Mean temperature	North	+	+	+	+	+	Increase in temperature lowest in the summer.
	South	+	+	+	+	+	
Mean precipitation	North	+	+	+	+	+	
	South	+	+	/	+	+	
Thermal season length	North	-	/	+	/		
	South	-	+	+	+		
Daily maximum temperature	North	+	+	+	+	+	Increase in temperature lowest in the summer.
	South	+	+	+	+	+	
Daily minimum temperature	North	+	+	+	+	+	Increase in temperature lowest in the summer.
	South	+	+	+	+	+	
Number of frost days	North	-	-	-	-	-	
	South	-	-	-	-	-	
Number of freezing point days	North	+	-	-	-	/	At first, wintertime freezing point days become more frequent, with possibly minor changes visible also in the south.
	South	/	-	-	-	-	
Snow water equivalent	North	-	-		-	-	Decrease first evident in the south in the autumn and spring
	South	-	-		-	-	
Number of snow cover days	North	-	-		-	-	Decrease first evident in the south in the autumn and spring
	South	-	-		-	-	
Number of days with precipitation	North	+	+	()	+	+	
	South	+	()	-	()	+	
Intensity of heavy precipitation	North	+	+	+	+	+	
	South	+	+	+	+	+	
Number of consecutive dry days	North	/	-	()	-	-	
	South	-	()	()	()	()	
Cloudiness	North	+	/	(-)	/	+	
	South	+	/	(-)	/	+	
Ground frost	North	-	-		-	-	Calculations done for sites without snow cover (roads, airports, etc.)
	South	-	-		-	-	

+ = Increases
 + = Increases notably
 - = Decreases
 - = Decreases notably
 / = Little change
 () = Change very uncertain
 Empty = Unknown or irrelevant

Annex 2.

Concepts and definitions

Impact

The effects of climate change on human and natural systems. Distinction can be made between potential impacts that do not take adaptation into consideration, and residual impacts that take account of adaptation. An impact may be an advantage or a disadvantage, direct or indirect. An impact can be ecological, technical, economic or social in nature.

Sensitivity

Degree to which a system is affected, either adversely or beneficially, by climate-related stimuli.

Adaptive capacity

The ability of a system to adjust to climate change, to minimise damage caused by climate change and to take advantage of its opportunities or cope with the consequences.

Vulnerability

The degree to which a system is susceptible to, or unable to cope with, adverse impacts of climate change. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity.

Resilience

The ability of a system to absorb disturbances while retaining the same basic structure and ways of functioning.

Adaptation

Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Adaptation can be anticipatory, autonomous, planned or reactive. The terms provision or adjustment are sometimes used in other contexts.

DOCUMENTATION PAGE

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<i>Theme of publication</i>			
<i>Parts of publication/ other project publications</i>			
<i>Abstract</i>	<p>Finland's National Strategy for Adaptation to Climate Change was drawn up in 2005. In order to implement this strategy, the Ministry of the Environment issued an action plan in 2008. The environmental administration was the first administrative sector to prepare its own action plan for adaptation to climate change.</p> <p>Tangible measures within the environmental administration's action plan focused on biodiversity, land use, buildings and construction, environmental protection and the use and management of water resources. The action plan was prepared in collaboration with the Ministry of Agriculture and Forestry.</p> <p>Given that, both internationally and in Finland, further details are rapidly emerging on climate change and its impacts, it was decided that the action plan should be updated at regular intervals and that the first revision and update should be carried out at the end of 2010. This update work was conducted and coordinated by the environmental administration's network on adaptation to climate change.</p> <p>The update follows the thematic structure of the action plan. A greater role has been given to communication and research. It is vital that adaptation to climate change be part of normal planning, implementation and development in various sectors. These actions increasingly emphasise the management of horizontal issues across administrative boundaries. In addition to ecological, technical and economic challenges, it is important to consider adaptation from the viewpoint of social impacts.</p> <p>The environmental administration's Action Plan Update covers the years 2011 and 2012. It will provide a sound basis for updating Finland's National Strategy for Adaptation to Climate Change, scheduled to begin in late 2011.</p>		
<i>Keywords</i>	Adaptation to climate change, environmental administration, biodiversity, land use, buildings and construction, environmental protection, and the use and management of water resources		
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KUVAILEHTI

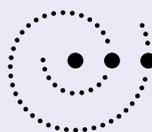
<i>Julkaisija</i>	Ympäristöministeriö Rakennetun ympäristön osasto		<i>Julkaisu-aika</i> Toukokuu 2011
<i>Tekijä(t)</i>			
<i>Julkaisun nimi</i>	Adaptation to Climate Change in the Administrative Sector of the Ministry of the Environment Action Plan Update for 2011–2012 (Ilmastonmuutoksen sopeutuminen ympäristöhallinnon toimialalla Toimintaohjelman päivitys vuosille 2011–2012)		
<i>Julkaisusarjan nimi ja numero</i>	Ympäristöministeriön raportteja 18en/2011		
<i>Julkaisun teema</i>			
<i>Julkaisun osat/ muut saman projektin tuottamat julkaisut</i>			
<i>Tiivistelmä</i>	<p>Suomessa laadittiin vuonna 2005 ilmastonmuutoksen kansallinen sopeutumisstrategia. Kansallisen sopeutumisstrategian toteuttamiseksi ympäristöministeriössä valmistui vuonna 2008 toimintaohjelma. Ympäristöhallinto oli ensimmäinen hallinnonala, joka valmisteli oman sopeutumisen ohjelmansa.</p> <p>Ympäristöhallinnon toimintaohjelman konkreettiset toimenpiteet ympäristöhallinnossa kohdentuivat luonnon monimuotoisuuteen, alueidenkäyttöön, rakennuskantaan ja rakentamiseen, ympäristönsuojeluun sekä vesivarojen käyttöön ja hoitoon. Toimintaohjelma valmisteltiin yhteistyössä maa- ja metsätalousministeriön kanssa.</p> <p>Ilmastonmuutosta ja sen vaikutuksia koskeva tieto tarkentuu suhteellisen nopeasti sekä kansainvälisesti että Suomessa, minkä vuoksi toimintaohjelmassa todettiin, että sitä tulee päivittää määräajoin ja että ensimmäinen läpikäynti ja päivitys tulisi tehdä vuoden 2010 loppupuolella. Päivitystyötä toteutti ja koordinoi ympäristöhallinnon ilmastonmuutoksen sopeutumista käsittelevä verkko.</p> <p>Päivitys noudattelee toimintaohjelmassa käytettyä teemakohtaista jaottelua. Viestinnän ja tutkimuksen rooli on lisääntynyt entisestään. Keskeistä on, että ilmastonmuutoksen sopeutuminen on osa toimialojen tavanomaista suunnittelua, toimeenpanoa ja kehittämistä. Toiminnassa korostuu lisääntyvässä määrin eri hallinnonalat ylittävät horisontaalisten asioiden hallinta. Sopeutumista on tärkeä tarkastella ekologisten ja teknis-taloudellisten haasteiden lisäksi myös sosiaalisten vaikutusten näkökulmasta.</p> <p>Toimintaohjelman päivitys on laadittu kattamaan vuodet 2011 ja 2012. Ympäristöhallinnon toimintaohjelman päivitys on hyvä pohja vuoden 2011 loppupuolella aloitettavalle kansallisen sopeutumisstrategian päivitykselle.</p>		
<i>Asiasanat</i>	Ilmastonmuutoksen sopeutuminen, ympäristöhallinto, luonnon monimuotoisuus, alueidenkäyttö, rakennuskanta ja rakentaminen, ympäristönsuojelu, vesivarojen käyttö ja hoito		
<i>Rahoittaja/ toimeksiantaja</i>	Ympäristöministeriö		
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<i>Julkaisun kustantaja</i>	Ympäristöministeriö		
<i>Painopaikka ja -aika</i>	Helsinki 2011		

PRESENTATIONSBLAD

Utgivare	Miljöministeriet Avdelningen för den byggda miljön	Datum Maj 2011
Författare		
Publikationens titel	Adaptation to Climate Change in the Administrative Sector of the Ministry of the Environment Action Plan Update for 2011–2012 (Anpassning till klimatförändringen inom miljöförvaltningens ansvarsområde Uppdaterat åtgärdsprogram för åren 2011–2012)	
Publikationsserie och nummer	Miljöministeriets rapporter 18en/2011	
Publikationens tema		
Publikationens delar/ andra publikationer inom samma projekt		
Sammandrag	<p>År 2005 utarbetades i Finland en nationell strategi för anpassning till klimatförändringen. Ett åtgärdsprogram för genomförandet av den nationella anpassningsstrategin inom miljöministeriet blev klart år 2008. Miljöförvaltningen var det första ansvarsområde som utarbetade ett eget åtgärdsprogram för anpassning till klimatförändringen.</p> <p>De konkreta åtgärder för miljöförvaltningen som ingick i miljöförvaltningens åtgärdsprogram hade att göra med biologisk mångfald, områdesanvändning, byggbeståndet, byggande, miljöskydd och nyttjande och vård av vattenresurser. Åtgärdsprogrammet bereddes i samarbete med jord- och skogsbruksministeriet.</p> <p>Informationen om klimatförändringen och dess konsekvenser blir mer precis tämligen snabbt både internationellt sett och i Finland, varför det i åtgärdsprogrammet sägs att programmet ska uppdateras med jämna mellanrum och att den första genomgången och uppdateringen ska ske i slutet av år 2010. Uppdateringen genomfördes och samordnades av ett nät av sakkunniga som behandlar anpassningen till klimatförändringen inom miljöförvaltningen.</p> <p>Vid uppdateringen följde man den indelning enligt tema som användes i det tidigare åtgärdsprogrammet. Kommunikationen och forskningen innehar en större roll än förr. Det är viktigt att anpassningen till klimatförändringen utgör en del av den gängse planeringen, verkställandet och utvecklingen inom ansvarsområdena. Det blir allt viktigare att man behärskar olika frågor horisontellt, över förvaltningsområdenas gränser. När man diskuterar anpassningen är det viktigt att man tar i beaktande inte bara de ekologiska och teknisk-ekonomiska utmaningarna utan även de sociala verkningarna.</p> <p>Det uppdaterade åtgärdsprogrammet gäller för åren 2011 och 2012. Det uppdaterade åtgärdsprogrammet för miljöförvaltningen utgör en god utgångspunkt för uppdateringen av den nationella anpassningsstrategin i slutet av år 2011.</p>	
Nyckelord	Anpassning till klimatförändringen, miljöförvaltningen, biologisk mångfald, områdesanvändning, byggbeståndet, byggande, miljöskydd, nyttjande och vård av vattenresurser	
Finansiär/ uppdragsgivare	Miljöministeriet	
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Tryckeri/tryckningsort- år	Helsingfors 2011	

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