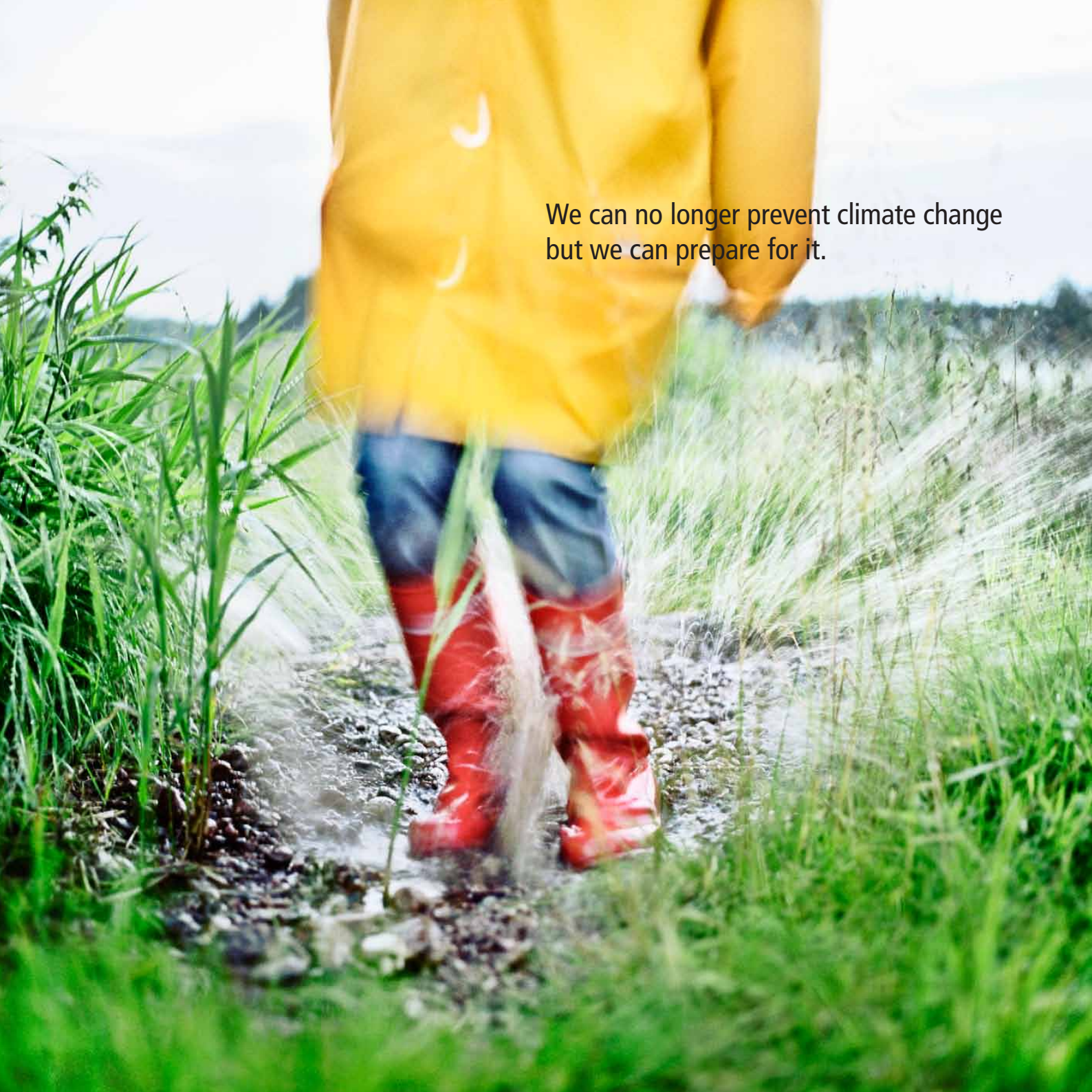
Adapting to climate change in Finland

Jukka Rapo / GORILLA


We can no longer prevent climate change
but we can prepare for it.

Finland is leading the way in adaptation policy

Climate change can no longer be fully prevented, since international agreements restricting greenhouse gas emissions will have no significant impact until the latter part of this century. This is why adaptation to the inevitable consequences of the ongoing climate change has become an integral element of climate policy, alongside climate change mitigation. Finland has been a pioneer in the implementation of adaptation policy. A National Strategy for Adaptation to Climate Change was prepared as an independent section of the National Energy and Climate Strategy already in 2005.

The objective of the Adaptation Strategy is to improve Finland's national adaptive capacity. The strategy describes the impacts of climate change and potential adaptation measures by sector up to 2080. The aim is to minimise the adverse impacts of climate change while taking advantage of the possible favourable ones. Measures have been outlined for 15 sectors: agriculture and food production, forestry, fisheries, reindeer husbandry, game management, water resources, biodiversity, industrial, energy, transport and communications, land use and communities, buildings and construction, health, tourism and the recreational use of nature, and insurance operations.

Key measures by 2015:

- Climate change adaptation will be incorporated into the regular planning, implementation and development processes in various sectors;
- Preparations will be made for extreme climatic events and the assessment of climate change impacts will be incorporated into the planning of long-term investments;
- Existing observation and warning systems will be improved and new ones developed;
- The Climate Change Adaptation Research Programme 2006–2010 will be implemented;
- Preparations will be made for changes in the international operational environment.

The Coordination Group for Adaptation to Climate Change follows and promotes the implementation of the Finnish Adaptation Strategy, steers the Climate Change Adaptation Research Programme ISTO, and supports the preparation of the adaptation policy in general.

Adaptation aspects are also included in the Long-term Climate and Energy Strategy drawn up in 2008. In the near future, measures on the EU level will be steered by the White Paper 'Adapting to climate change: towards a European framework for action', published in spring 2009. Adaptation will also be on the agenda in international negotiations, in particular, from the perspective of how developing countries can be supported in their own adaptation efforts.

ISTO produces information on adaptation

The Climate Change Adaptation Research Programme ISTO 2006–2010 produces information for the development of practical adaptation measures. Through this programme, funds were allocated to 28 research projects in 2006–2009. The main sources of funding were the Ministry of Agriculture and Forestry and the Finnish Environmental Cluster Research Programme of the Ministry of the Environment. In addition, the Finnish Funding Agency for Technology and Innovation Tekes, the Academy of Finland, certain foundations and EU research programmes also fund adaptation research in Finland.

Adaptation means preparation
Climate change adaptation refers to both human and natural adjustment to climatic change and the related preparations, whether already in place or to be expected, either by minimising the damages or by taking advantage of the benefits. Adaptation may be anticipatory, planned or reactive.

Karin Smeds / GORILLA

Climate change will have multiple impacts on Finland

At first, climate change may appear advantageous to Europe's northernmost reaches: the demand for heating energy will decrease and crop yields and forest growth may increase. Eventually, however, the disadvantages will outweigh the benefits, and changes taking place elsewhere in the world will be reflected in northern Europe, for example, through economic impacts.

Temperatures will rise more in winter than in summer

It is estimated that the temperature in Finland will rise faster than the global average. Finland's annual mean temperature is expected to rise by 2–6 °C by the end of the century. Temperatures will rise more in winter compared to the summer, and more in the northern than in the southern regions. Annual precipitation will rise by some 10% and, in this respect too, the change will be more pronounced in winter. With regard to rainfall, the occurrence of both extremes, long dry spells and heavy rains, will increase. However, in terms of winds and storms the changes will be less dramatic.

Climate variability will remain, meaning that cold spells will continue to occur but they will gradually become more infrequent, while periods of warm weather will become more common. Greenhouse gas emission trends will have an impact on the intensity of climate change, particularly towards the end of the century. If emissions are high, winter temperatures may rise by up to 6–9 °C from the present day.

Animal and plant species will change

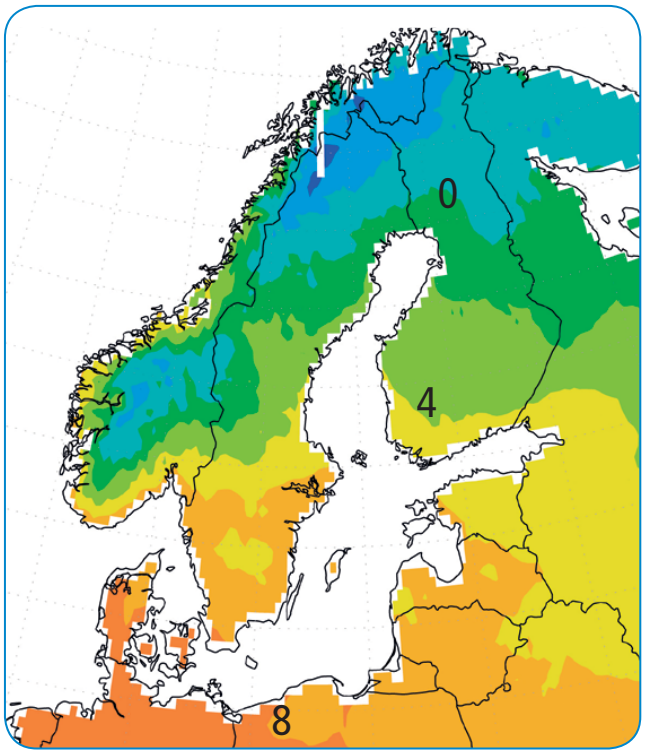
The impacts of climate change on Finnish nature are difficult to predict. Finland's animal and plant species have adapted to a cold climate. A longer growing season and a rise in the temperature may bring along rapid and significant changes in the occurrence and abundance of species. While Finnish animal and plant species are likely to become more abundant, many more northern species which depend on the cold climate are in danger of extinction.

In Finland's inland waters, floods and their timing and the volume of water resources will change. Higher temperatures are likely to increase eutrophication. In the Baltic Sea, climate change will reduce ice cover, increase water column stratification, dilute salinity and cause an increase in algal blooms. Such changes will have an impact on the marine species, such as economically significant fish stocks.

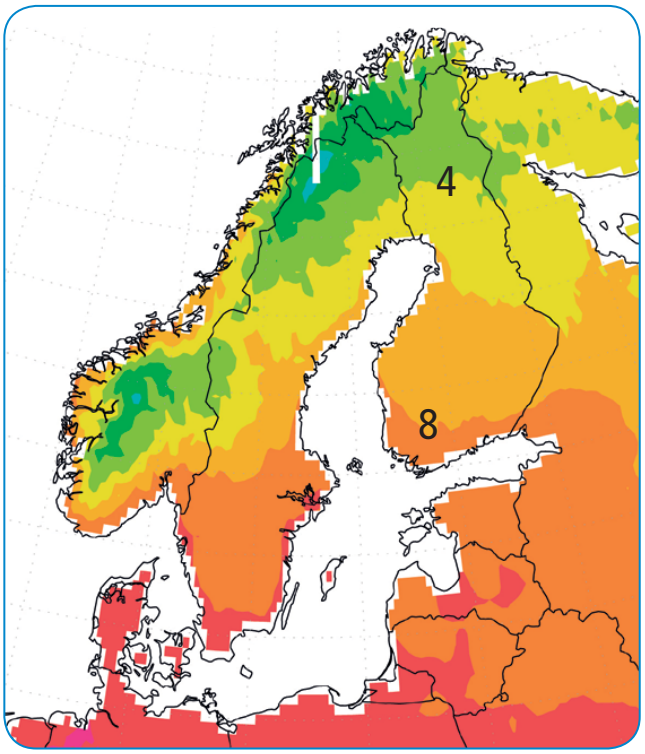
Further information on economic impacts is needed

Until now, little information has been available on the economic impacts of climate change. To form a comprehensive picture of this, much more research is required on topics such as the cost-benefit ratio and cost efficiency of adaptation.

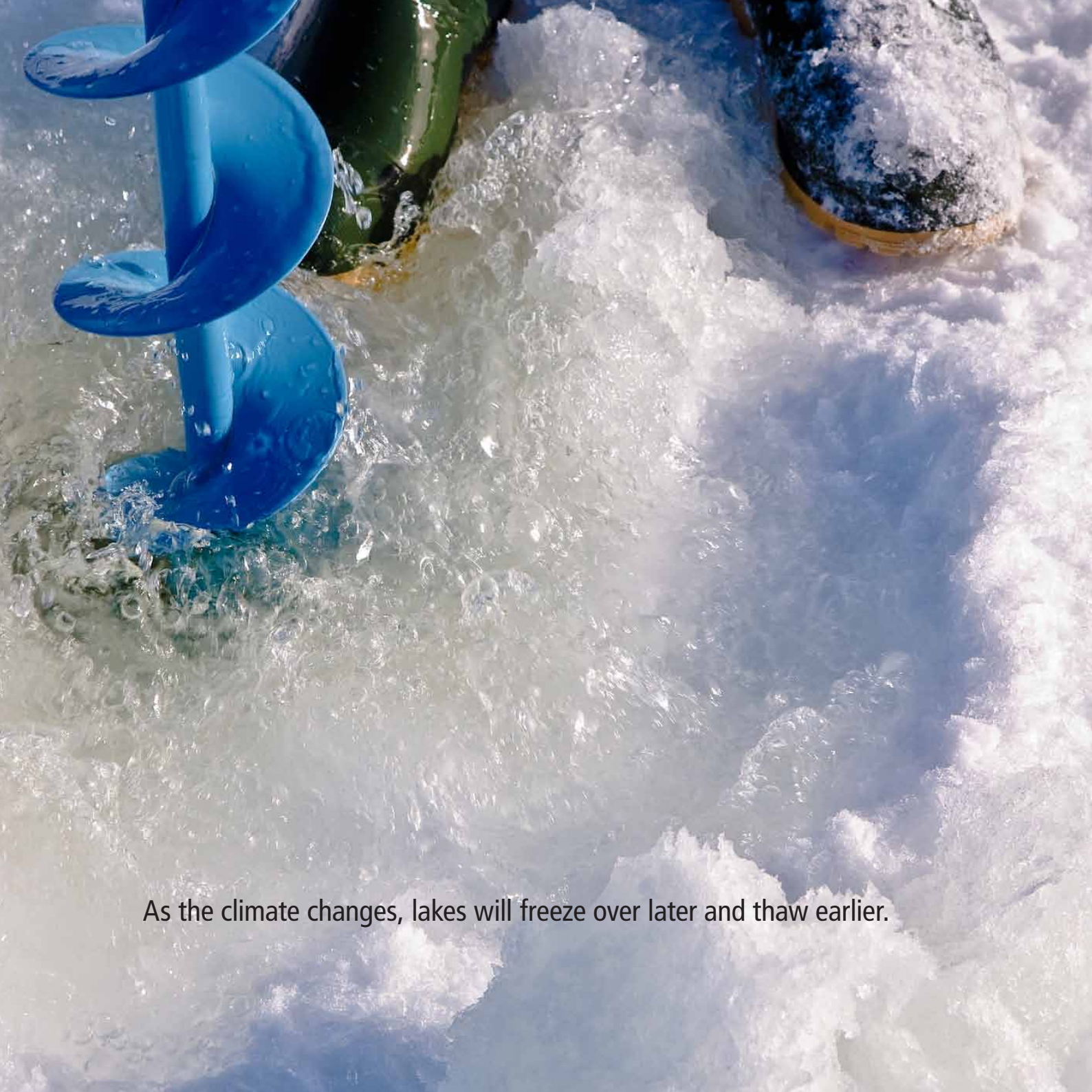
Annual mean temperature 1971–2000 (°C)



Projected annual mean temperature 2070–2099 (°C)



By the end of the century, the mean temperature in Lapland will rise to the level currently measured in southern Finland. This projection is based on a scenario where greenhouse gas emissions peak in mid-century. Source: ACCLIM II Project, K. Jylhä, Finnish Meteorological Institute.



As the climate changes, lakes will freeze over later and thaw earlier.

How can we adapt to climate change?

As changes in the environment and society become more apparent, the awareness of the necessity of adapting to climate change is increasing. The impacts are the most readily understood in weather-dependent sectors, such as transport and agriculture.

An evaluation of the implementation of the Adaptation Strategy was carried out in 2009 in order to map out the measures taken so far. There is a reasonable understanding of the impacts of climate change in Finland and, to a certain extent, decision-makers recognise the need for adaptation measures. Some practical adaptation measures have been identified and plans made or launched for their implementation. The most advanced sector in terms of implementation is water resources management, where adaptation is integrated into decision-making.

In addition, the transport sector is already well prepared for disturbances caused by the weather in the present climate conditions. So far, the industrial and energy sectors have focused more on climate change mitigation than adaptation.

In the urban environment, land use planning is faced with the challenge of reconciling the dense urban structure with the adaptation measures required by flood risk management, for instance, infiltration and flood retention areas and flood routes.

Nature-dependent industries

Many Finnish sources of livelihood are dependent on nature. As the climate changes, important goods and services provided by nature, such as biodiversity and good-quality water resources, will be at risk. The impacts will be seen in agriculture, forestry and fishing, as well as in nature tourism.

New conditions will result in the need to change forest management guidelines and measures. Tree growth, and also the risk of pests and diseases, will increase. As the ground frost period shortens, forests will be at greater risk of wind damage. New harvesting methods need to be developed, since ground frost in winter will no longer facilitate logging. This means that the maintenance of forest roads will become more important.

Milder winters with less snow cover threaten to decrease the number of tourists in the winter season, particularly in southern Finland, while the costs of making artificial snow and maintaining ski tracks in ski resorts will increase. As lakes freeze over later and thaw earlier, the season of ice roads and snowmobile routes will become shorter. Potential adaptation measures may include redirecting snowmobile and other routes overland, offering new tourist activities, extending summer programmes further into the autumn and the preparation of backup plans.

Action plan for adaptation of the environmental administration

The environmental administration has drawn up an Action Plan for adapting to climate change, which defines the necessary preparatory measures. Published in 2008, the action plan is based on the National Strategy for Adaptation to Climate Change.

The Action Plan includes a number of concrete measures to be taken by the environmental administration with regard to biodiversity, land use and construction, environmental protection and the use and maintenance of water resources.

The key issue is to prepare for extreme weather events, especially floods, storms and heavy rainfall. However, more information is required in several fields, including the ways in which species and habitats will react to changes.

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Three aspects of adaptation

New crop species for changing conditions

Climate change is projected to have a major impact on Finnish agriculture around 2025. In order to ensure successful adaptation, plant breeding must be accelerated, as a minimum of ten years is required for the development and introduction of new plant varieties.

According to the scientists, the present varieties of spring sown crops, such as spring wheat, oats, barley, turnip rape and oilseed rape, will not succeed in the warming climate of the north, since their growth rate will accelerate during the long daylight hours of early summer and productivity will decline. On the other hand, autumn sown cereals and pulses will benefit from climate change.

Over the next century, Finnish winters will become significantly milder, but the seasonal variability will remain. Even in the 2050s, Finnish plant varieties must maintain high winter tolerance. Adapting overwintering crops to cultivation remains one of the challenges posed by climate change. Nutrient leaching in agriculture can be reduced by giving priority to overwintering varieties.

Scientists' calculations show that the cultivation of oilseed plants and autumn sown cereals may become profitable further north, thus diversifying the use of arable land in certain regions. At the same time, there is a risk that the cultivation of some species becomes restricted and the biodiversity of arable land is reduced. An increase in plant pathogens caused by global warming poses another major risk to agriculture.

The impacts of climate change on agriculture have been studied in a research project 'Adaptation of the agrifood sector to climate change' (ILMASOPU), carried out by MTT Agrifood Research Finland. The project was funded by the Climate Change Adaptation Research Programme ISTO.

Projections in support of flood risk management

Global warming will increase rainfall and change the seasonal variation of river flow and lake levels in Finland. Autumn and winter floods will become more frequent, while spring floods caused by the melting of snow will become rarer, particularly in southern and central Finland. Traditionally, flood protection has mainly been carried out for the sake of agriculture, but the built environment is now more frequently at risk of flooding. Therefore, flood risk management constitutes a key adaptation measure.

In principle, flood risk prevention is quite simple: buildings must be placed high enough in relation to the shoreline so that water does not pose a threat to them. On the other hand, shoreline construction is tempting because lake and river views are valued, and this may cause conflicts.

New buildings and other urban development, in particular, should be redirected to safer areas through land use planning and building ordinances. These include compliance with the recommended lowest base floor of new houses. Flood mapping creates the basis for efficient flood risk management and is also required by the EU Flood Directive, which entered into force in 2007. The Finnish environmental administration has been carrying out flood mapping for several years.

In the planning of flood risk management, watercourses should be considered as connected entities. In the worst-case scenario, local flood protection measures, such as the construction of levees to protect a threatened area, may simply redirect the flood risk elsewhere. Changes to lake regulation permits and practices are important methods for adapting to climate change. The capability to retain flood waters in all parts of the catchment area is crucial. Property owners have a major role in decreasing flood damage by preparing for floods on their own initiative.

David Trood / GORILLA


New crop species are being developed
to ensure food production.

Invasive alien species change habitats and displace native species.

Preparing for the threat of invasive alien species

Invasive alien species refer to species which have spread outside their area of origin because of human activities. Globally, invasive alien species present the second largest threat to biodiversity after loss of habitats. Some 600 alien species, mainly plants, have been identified in Finland, while across Europe their number is more than 11,000.

Invasive alien species can be harmful to the environment, economy, human health and society. They may cause major changes in food networks and habitats, and they displace and prey on native species. Efforts to eradicate invasive alien species have proven difficult and expensive.

In Finland, invasive alien plants include the giant hogweed (*Heracleum mantegazzianum*), which is harmful to human health, and the rugosa rose (*Rosa rugosa*), which causes negative economic impacts. In southernmost Finland, the European rabbit (*Oryctolagus cuniculus*) is causing visible damage. American minks (*Mustela vison*) and raccoon dogs (*Nyctereutes procyonoides*) mainly prey on valuable waterfowl, while the raccoon dog also spreads rabies. Forest pests are a particularly problematic group of invasive alien species. These include the pine wood nematode (*Bursaphelenchus xylophilus*), which has caused widespread damage to forests in North America and Asia. To protect the Finnish forest sector, the spread of the pine wood nematode must be prevented.

Climate change will promote the spread of new invasive alien species into Finland and the establishment of permanent populations in the environment, and amplify their harmful effects. Invasive alien species may benefit from disruptions caused by humans, such as the eutrophication of habitats and disturbances associated with the increasingly frequent extreme climatic events, including stronger floods.

Preparations should be made in time to prevent the spread of invasive species because of the changing climate. Key methods include research and the identification of the most harmful alien species, early detection and minimisation of damages and, in particular, public information and education. A national strategy for invasive alien species is being prepared. The work is coordinated by the Ministry of Agriculture and Forestry, and the strategy should be completed by the end of 2010.

Sami Kero / Lehtikuva

Further information and useful links

Ministry of Agriculture and Forestry:
National Strategy for Adaptation to Climate Change
www.mmm.fi/adaptationstrategy

Ministry of Agriculture and Forestry:
Climate Change Adaptation Research Programme
ISTO 2006–2010
www.mmm.fi/ISTO/eng

Environmental administration:
Mitigation of and adaptation to climate change
www.environment.fi/climate

State of the environment: Climate change
www.environment.fi > State of the environment > Climate change

Environmental administration's research programmes
www.environment.fi > Research > Research programmes

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