



**Helsingin seudun ympäristöpalvelut -kuntayhtymä**  
Samkommunen Helsingforsregionens miljötjänster  
Helsinki Region Environmental Services Authority

## Helsinki Metropolitan Area Climate Change Adaptation Strategy



**Partially funded by the European Union (the Life+ Financial Instrument for the Environment)  
Helsinki Region Environmental Services Authority**

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# Foreword

Climate change can no longer be completely prevented. The mean temperature in Finland is expected to rise by more than the global average. The speed of such change is a major challenge to society and to nature.

It is vitally important to mitigate the progress of climate change and to reduce greenhouse gas emissions. In spite of such work, the temperature is rising on account of the greenhouse gases already released and yet to be released into the atmosphere. For this reason, we must adapt to the consequences of climate change. Through well-planned adaptation work, the Helsinki metropolitan area and wider Finland both have good prerequisites to cope with such change.

A new special report (IPCC 2012) by the Intergovernmental Panel on Climate Change (IPCC) deals with adaptation and managing the risks of extreme events and disasters. The main message is that our body of knowledge about climate change is already sufficient. We can make good decisions on managing the risks of weather phenomena and climate change and on preparing for them.

Many impacts of climate change and, on the other hand, measures required to prepare for them are regional, transcending administrative, industrial and municipal boundaries. It is sensible and justifiable to plan and carry out regional measures together.

The Helsinki metropolitan area adaptation strategy is a strategy prepared jointly by the region's cities, municipal federations and other organisations. It focuses on the urban environment and the built environment. HSY coordinated the three-year strategy preparation process (2009-2012), in which many experts and planners from the cities and other parties participated at different stages.

The regional strategy is a compilation of policy guidelines, and shorter-term policies (2012-2020). Through these, the Helsinki metropolitan area can adapt to the impacts of climate change and extreme weather events, and reduce the region's vulnerability to them. In the future, HSY will monitor the progress of adaptation in the region. HSY is also conveying the increasing climate-related information to actors and decision-makers, so that the region can better prepare for climate change.

HSY's vision is of an environmentally-friendly metropolis, in which the mitigation of climate change and adaptation to it are key elements. HSY will act as an environmentally responsible pioneer in co-operation with the region's municipalities, not only in waste and water management, air quality and geographic information services, but also in climate-related work. HSY will monitor the implementation of the climate change mitigation strategy in the Helsinki metropolitan area, and calculate the region's greenhouse gas emissions annually. HSY will also participate in different climate projects and monitor and try to reduce the energy consumption and greenhouse gas emissions caused by its own activities. HSY will prepare for climate change in waste and water management, and take part in different joint projects with local authorities and research institutes aimed at, among other things, developing planning tools for adapting to climate change in an urban environment.



Raimo Inkinen  
Executive Director



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Director of Regional and Environmental Information

# Abstract

The Helsinki Metropolitan Area Climate Change Adaptation Strategy has been prepared in close cooperation with the four cities of the metropolitan area (Helsinki, Espoo, Vantaa and Kauniainen), the Helsinki Region Environmental Services Authority HSY and other municipal, regional and state level organisations. In the strategy, strategic starting points and policies with which the metropolitan area prepares for the consequences of climate change, are compiled.

The Helsinki Metropolitan Area adaptation strategy concentrates on the adaptation of the built and urban environment to the changing climate. The vision of the strategy is climate proof city – the future is built now. The strategy aims to 1) assess the impacts of climate change in the area, 2) prepare for the impacts of climate change and to extreme weather events and 3) to reduce the vulnerabilities of the area to climate variability and change. The target is to secure the well-being of the citizens and the functioning of the cities also in the changing climate conditions.

The preparation of the adaptation strategy started in 2009 by producing the background studies. They include the regional climate and sea level scenarios, modelling of river floods in climate change conditions and a survey of climate change impacts in the region. Also, existing programmes, legislation, research and studies concerning adaptation were collected. The background studies are published in a report titled “The Helsinki metropolitan area climate is changing - Adaptation strategy background studies” (in Finnish) (HSY 2010).

HSY coordinated the strategy preparation. The work was carried out in close cooperation with the experts of the metropolitan area cities, regional emergency services, Ministry of the Environment, Helsinki Region Transport

Authority and other regional organisations. The strategy work has had a steering group that consists of representatives of the cities and other central cooperation partners. The steering group has guided and steered the work and disseminated the results in their own organisations. In the strategy, the adaptation policies are divided into two groups: 1) regional and joint strategic starting points in adaptation and 2) short term (2012 - 2020) adaptation policies. The policies are defined for the following sectors and cross-sectoral issues: 1) Land use, 2) Transport and technical networks, 3) Building and climate proof local environment, 4) Water and waste management, 5) Rescue services and safety, 6) Social and health services, and 7) Cooperation in producing and disseminating information.

The environmental impacts of the strategy proposal were assessed by Ramboll Finland Oy. In the study, the impacts of the measures to vegetation, fauna, biodiversity, greenhouse gas emissions, air quality and noise, human health, social impacts and economic impacts were assessed. In addition, a case study of flood protection costs was carried out.

It is important to monitor the implementation of regional adaptation measures, and to follow the changes in the working environment and newest research information in order to prepare for the impacts of climate change effectively and to assess the efficiency of the policies in reducing vulnerability. It is also necessary to assess practices and policies from time to time if for example new climate research information or changes in legislation call for re-assessment.

The preparation of the strategy was part of the Julia 2030 project that was part-financed by the European Union Life+ Programme.

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# Tiivistelmä

Pääkaupunkiseudun ilmastomuutokseen sopeutumisen strategia on valmisteltu seudun kaupunkien Helsingin, Espoon, Vantaan ja Kauniaisten ja Helsingin seudun ympäristöpalvelut -kuntayhtymän (HSY) sekä muiden toimijoiden yhteistyönä. Strategiaan on koottu linjauksia ja toimenpiteitä, joilla pääkaupunkiseutu varautuu ilmastomuutoksen vaikutuksiin.

Pääkaupunkiseudun ilmastomuutokseen sopeutumisen strategia keskittyy rakennetun ja kaupunkiympäristön sopeutumiseen muuttuvaan ilmastoon. Strategian visio on ilmastokestävä kaupunki - tulevaisuus rakennetaan nyt. Tavoitteena on ollut arvioida ilmastomuutoksen seurauksia seudulle sekä varautua ilmastomuutoksen vaikutuksiin ja sään ääri-ilmiöihin ja vähentää seudun haavoittuvuutta ilmaston vaihtelulle ja sen muutokselle, jotta seudun asukkaiden hyvinvointi ja kaupunkien toiminta voidaan turvata myös muuttuvissa olosuhteissa.

Pääkaupunkiseudun ilmastomuutokseen sopeutumisen strategian valmistelu käynnistyi vuoden 2009 alussa taustaselvitysten tekemisellä. Taustaselvityksinä tehtiin pääkaupunkiseudun alueelliset ilmasto- ja merenpinnan nousun skenaariot, mallinnettiin jokitulvien riskejä ilmastomuutoksen oloissa Espoonjoella ja Vantaanjoella sekä koottiin katsaus ilmastomuutoksen vaikutuksista alueella. Taustaselvitykset on koottu raporttiin ”Pääkaupunkiseudun ilmasto muuttuu – Sopeutumisstrategian taustaselvityksiä” (HSY 2010).

Sopeutumisstrategian valmistelua koordinoi HSY. Työ tehtiin tiiviissä yhteistyössä pääkaupunkiseudun kaupunkien, alueellisten pelastuslaitosten, ympäristöministeriön, HSL:n ja Kuntaliiton asiantuntijoiden kanssa, jotka ovat osallistuneet strategiatyöhön mm. työpajoissa. Sopeutumisstrategian valmistelua on ohjannut johtoryhmä, joka

koostuu kaupunkien eri hallintokuntien sekä muiden keskeisten yhteistyötahojen edustajista.

Strategian toimenpiteet ja linjaukset ilmastomuutokseen sopeutumiseksi pääkaupunkiseudulla on jaoteltu kahteen ryhmään: seudulliset ja yhteiset strategiset lähtökohdat ilmastomuutokseen sopeutumisessa sekä lyhyen aikavälin (2012 - 2020) toimenpidelinjaukset. Toimenpidelinjaukset on määritelty seuraaville sektoreille sekä sektorirajat ylittävälle aiheille: 1) Maankäyttö, 2) Liikenne ja tekniset verkostot, 3) Rakentaminen ja lähiympäristön ilmastokestävyys, 4) Vesi- ja jätehuolto, 5) Pelastustoimi ja turvallisuus, 6) Sosiaali- ja terveystoimi ja 7) Yhteistyö tiedon tuottamisessa ja levittämisessä.

Ilmastomuutokseen sopeutumisen strategian vaikutusten arvioinnin teki Ramboll Finland Oy. Työssä arvioitiin vaikutukset kasvillisuuteen, eläimistöön ja luonnon monimuotoisuuteen, kasvihuonekaasupäästöihin, ilmanlaatuun sekä meluvaikutukset, sosiaaliset vaikutukset ja vaikutukset ihmisten terveyteen sekä taloudelliset vaikutukset. Lisäksi arvioitiin tulvasuojauksen kustannuksia kahden tapauksen perusteella.

Seudullisten sopeutumisen toimien toteutumisen, toimintaympäristön muutosten ja uusimman ilmastotiedon seuraaminen on tärkeätä, jotta ilmastomuutoksen vaikutuksiin pysytään varautumaan ennakolta ja mahdollisimman tehokkaasti ja arvioimaan toimien vaikuttavuutta haavoittuvuuden vähenemisen kautta. Toimintatapoja on myös syytä tarkastella aika ajoin, mikäli lisääntyvä ilmastotieto tai esimerkiksi muuttuvat säädökset niin edellyttävät.

Sopeutumisstrategian valmistelu oli osa Julia 2030 -hanketta, joka oli Euroopan Unionin osittain rahoittama (ympäristöalan rahoitusväline Life+).

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# Sammandrag

Strategin för anpassning till klimatförändringen i huvudstadsregionen har utarbetats i samarbete mellan regionens städer Helsingfors, Esbo, Vanda och Grankulla och samkommunen Helsingforsregionens miljö tjänster (HRM) samt övriga aktörer. Linjedragningar och åtgärder med hjälp av vilka huvudstadsregionen förbereder sig för verkningarna av klimatförändringen har sammanställts i strategin.

Strategin för anpassning till klimatförändringen i huvudstadsregionen koncentreras kring frågorna hur den byggda miljön och stadsmiljön ska anpassas till klimatförändringarna. Strategins vision är en klimattålig stad - framtiden byggs nu. Målet har varit att bedöma klimatförändringarnas följder för regionen, att förbereda sig för klimatförändringens verkningar och extrema väderförhållanden samt att minska regionens sårbarhet vid klimatvariationer och -förändringar, för att invånarnas välfärd i regionen samt städernas verksamhet ska kunna tryggas också under förändrade omständigheter

Beredningen av Strategin för anpassning till klimatförändringen i huvudstadsregionen inleddes med bakgrundsutredningar i början av år 2009. Bakgrundsutredningarna utgjordes av regionella klimatscenarier som beskrev klimatet områdesvis samt den stigande havsytan, modellering för översvämningsskyddet under ändrade klimatförhållanden utarbetades för Esbo och Vanda år och en översikt över konsekvenserna av klimatförändringen sammanställdes. Bakgrundsutredningarna har sammanställts i rapporten "Huvudstadsregionens klimat förändras. - Bakgrundsutredningar till anpassningsstrategin" (HRM 2010).

Utarbetandet av anpassningsstrategin har koordinerats av HRM. Arbetet utfördes i samråd med städerna i huvudstadsregionen, de lokala räddningsverken, miljöministeriet och sakkunniga från HST och kommunförbundet som har deltagit i bl.a. arbetsverkstäder för strategiarbetet. Arbetet med anpassningsstrategin har styrts av en ledningsgrupp som be-

står av representanter för städernas olika förvaltningsenheter och andra centrala samarbetsorgan.

Åtgärderna och linjedragningarna i strategin för anpassning till klimatförändringen i huvudstadsregionen har indelats i två grupper: regionala och gemensamma strategiska utgångspunkter för anpassning till klimatförändringen och linjedragningar för åtgärder på kort sikt (2012-2020). Linjedragningarna för åtgärder har definierats för följande sektorer samt för teman som överskrider sektorgränserna: 1) Markanvändningen 2) Trafiken och de tekniska nätverken, 3) Byggandet och närmiljöns klimattålighet, 4) Vatten- och avfallsförsörjningen, 5) Räddningsverken och säkerheten, 6) Social- och hälsovårdsverken och 7) Samarbetet inom informationsproduktionen och -spridningen.

Konsekvensbedömningen av strategin för anpassning till klimatförändringen har gjorts av Ramboll Finland Oy. I detta arbete bedömdes konsekvenserna för floran, faunan och naturens mångfald, växthusgasutsläppen, luftkvaliteten samt bullereffekterna, de sociala konsekvenserna och konsekvenserna för människornas hälsa samt de ekonomiska konsekvenserna. Ytterligare gjordes en bedömning av kostnaderna för översvämningsskyddet utgående från två fall.

Förverkligandet av regionala åtgärder för anpassning, förändringen av verksamhetsmiljöerna och uppföljningen av de nyaste uppgifterna om klimatet är viktiga för att man så effektivt som möjligt ska kunna förutspå verkningarna av klimatförändringarna samt bedöma effekten av åtgärderna för att minska sårbarheten. Det är också skäl att då och då syna verksamhetssätten ifall ökad kunskap om klimatet eller ändringar i lagstiftningen förutsätter detta. Utarbetandet av anpassningsstrategin utgjorde en del av projektet Julia 2030 som delvis finansierades av Europeiska Unionen (finansieringsredskapet för miljöbranschen Life+).

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# 1 Introduction

The Helsinki metropolitan area climate change adaptation strategy has been prepared in close co-operation with the region's cities of Helsinki, Espoo, Vantaa and Kauniainen, the Helsinki Region Environmental Services Authority (HSY) and other organisations in the region. The strategy is a compilation of policy guidelines and policies by which the Helsinki metropolitan area can adapt to the impacts of climate change.

The strategy's vision is "a 'climate-proof' city - the future is being built now". The aim has been to assess the consequences of climate change on the region, to prepare for the impacts of climate change and extreme weather events and to reduce the vulnerability of the region to climate variation and change, in order to safeguard the well-being of inhabitants and the functioning of the cities even in changing conditions.

The thunderstorms of summer 2010 and the winter storm of December 2011 showed the vulnerability of Finnish society to climate change and extreme weather events, as well as the importance of preparing for climate variability and weather events. The activities of society are very dependent on uninterrupted electrical supply and on efficient and reliable communications and transport. Our infrastructure is highly developed and any damage to it causes major costs. Preparing in advance for natural hazards can significantly reduce the damages and costs that arise from them. Preparation by the authorities and other actors and co-operation between them is key to the prevention of accidents and the repair of damage<sup>1</sup>.

A new special report published in March 2012 by the Intergovernmental Panel on Climate Change (IPCC) deals with adaptation and managing the risks of extreme events and disasters (IPCC 2012)<sup>2</sup>. The main message of the report is that

our body of knowledge about climate change and extreme weather phenomena is already sufficient for us to be able to make good decisions on managing the risks of weather events and climate change. A future challenge will be, on the one hand, strengthening that body of knowledge and, on the other hand, making good decisions, even in situations about which there remains a great deal of uncertainty.

The aim of the Helsinki metropolitan area adaptation strategy is the adaptation of the built and urban environment to climate variability and change. The strategy focuses on those consequences of climate change and policies to prepare for it which transcend municipal, sectoral or administrative boundaries, and which may have an inter-municipal impact and/or whose planning or implementation is cheaper or more beneficial to do in co-operation. Policies have been chosen for the strategy, the implementation of which is under the jurisdiction of the cities, HSY and other involved parties.

In December 2011, the Ministry of Agriculture and Forestry designated the coastal area of Helsinki and Espoo and the River Vantaa as being significant areas for flood risk. Flood-risk working groups were assembled for the areas, and flood-risk maps and plans are being drawn up for them for the control of flood risks<sup>3</sup>. Measures outlined in the strategy of the Helsinki metropolitan area are being integrated with flood risk management planning work that is starting up this year.

Espoo's climate strategy action programme 2012-2014 also contains measures aimed at adapting to climate change<sup>4</sup>. In the BaltCICA project, the City of Helsinki has produced a report on ways to adapt to climate change in the city (2012)<sup>5</sup>. The adaptation-related programmes, legislation, plans and research of other municipal and region-

al organisations at both national and EU level are presented in background material 3 of the strategy document<sup>6</sup>.

The consequences of climate change taking place elsewhere in Finland, Europe or around the world, and its impacts on the Helsinki metropolitan area such as possible environmental refugees, are excluded from the adaptation strategy of the Helsinki metropolitan area. Neither does the strategy deal with the impacts of climate change mitigation policies on the region and adapting to them.

Experts from the cities in the Helsinki metropolitan area, regional rescue services, the Ministry of the Environment, Helsinki Region Transport (HSL) and the Association of Finnish Local and Regional Authorities have participated in the strategic work at many stages. Preparation of the adaptation strategy has been overseen by a steering group, consisting of representatives from key administrative branches of cities and other key parties involved. The members of the steering group and people participating in the different stages of the strategic work are presented in Appendix 1. The timetable for drawing up the strategy, the participants and the operating environment are presented in Figure 1.

1 Safety Investigation Authority 2011

2 <http://ipcc-wg2.gov/SREX/report/>

3 [http://www.mmm.fi/fi/index/etusivu/vesivarat/tulvien\\_torjunta.html](http://www.mmm.fi/fi/index/etusivu/vesivarat/tulvien_torjunta.html)

4 Espoo's climate strategy action programme, proposal 29 Sep 2011

5 Yrjölä, T., and Viinanen, J. 2012. Keinoja ilmastonmuutokseen sopeutumiseksi Helsingin kaupungissa. City of Helsinki Environment Centre publications 2/2012. City of Helsinki Environment Centre

6 The background material is available on the HSY website (in Finnish): <http://www.hsy.fi/seututieto/ilmasto/sopeutuminen/Sivut/default.aspx>

### Processes and products

- 2009
  - Expert interviews
  - Background reports
  - Start of steering group work
- 2010
  - Report of adaptation strategy background studies
  - Workshops: impacts of climate change and preliminary policies
  - 1st draft strategy
- 2011
  - Commenting of draft strategy
  - Basic content of strategy
  - Specification of strategy guidelines
- 2012
  - 2nd draft strategy
  - Public hearing
  - Completion of strategy
  - Decision by HSY Board
- Monitoring of strategy implementation and updating of background information

### Actors and interestgroups

- Executive group:  
Cities of Helsinki, Espoo, Vantaa and Kauniainen, HSY, HSL, Ministry of the Environment, Ministry of the Interior, Rescue services, Association of Finnish Local and Regional Authorities
- Other interest groups:  
Ministry of Agriculture and Forestry, Ministry of Transport and Communications, Uusimaa ELY Centre
- Research institutes
- Projects: Julia 2030, BaltCICA

### Other operating environment

- Research and body of knowledge of the IPCC, Finnish Meteorological Institute, Finnish Environment Institute and other research institutes
- EU White Paper on climate change adaptation
- Finnish National climate change adaptation strategy and ISTO research programme
- ELY Centres: planning of flood risk management
- Action programme for adaptation for the environmental administration
- Preparedness planning by rescue services
- Ministry of the Interior:  
Internal security programme
- Preparation for natural disasters

Figure 1. Timetable for drawing up the strategy, participants and operating environment



Strategy work was started by carrying out background studies, which have been published in the report “Pääkaupunkiseudun ilmasto muuttuu - sopeutumisstrategian taustaselvityksiä” (the Metropolitan Area’s climate is changing - background studies for the adaptation strategy) (HSY 2010). In addition, experts from the cities and other involved parties were interviewed about their current practices and preparations for weather and extreme weather events. Joint workshops in 2009 and 2010 attended by experts from cities and other involved parties defined the key impacts of climate change in the region and different sectors, and key policies from a point of view of the region’s adaptation. Policies were specified by sector in discussions in autumn and winter 2011. The background material and reports are being published as appendices and background information on the HSY website<sup>1</sup> and will be updated if necessary.

The preparatory work for the strategy was coordinated by HSY and was supported by two projects partially funded by the EU: Julia 2030 (Climate change in the Helsinki region - mitigation and adaptation) and BaltCICA (Climate Change: Impacts, Costs and Adaptation in the Baltic Sea Region).<sup>2</sup> The cities of the Helsinki metropolitan area were partners in the Julia 2030 project, which HSY coordinated. The City of Helsinki Environment Centre and HSY were partners in the BaltCICA project, which was coordinated by the Geological Survey of Finland (GTK).

In the preparatory stage of the strategy, aspects of climate change that will have an impact on the Helsinki metropolitan area were identified as temperature, precipitation, windiness and sea level rise. Based on expert assessment and literature, sectors were chosen that were considered to be most vulnerable to climate change and/or that climate change will affect the most, and which it

would be advisable to prepare for the impacts of climate change. The workshops of experts identified the possible impacts of climate change on different sectors (background material 2) and assessed their significance.

A draft of the strategy was completed in December 2010. The Board of HSY decided to send the draft to the cities of the metropolitan area and other interest groups for commenting. The period during which comments could be given was from February to the end of May 2011. Comments about the draft were received from all of the metropolitan area cities and 28 other parties. Comments were given by, among others, the Ministry of Agriculture and Forestry, the Ministry of Education, the Ministry of the Interior, the Ministry of the Environment, the Regional State Administrative Agency of Southern Finland, the Uusimaa Centre for Economic Development, Transport and the Environment, the Uusimaa Regional Council, Helsinki Region Transport HSL, the National Board of Antiquities, the Association of Finnish Local and Regional Authorities, the Federation of Finnish Financial Services, the Helsinki Region Chamber of Commerce, the University of Helsinki, the Finnish Meteorological Institute, the Government Institute for Economic Research, the VTT Technical Research Centre of Finland, the National Institute of Health and Welfare, the Helsinki Neighbourhoods Association, the Finnish Association for Nature Conservation, the Finnish Red Cross, the Finnish Air Pollution Prevention Society and the Water Protection Association of the River Vantaa and Helsinki Region.

1 <http://www.hsy.fi/seututieto/ilmasto/sopeutuminen/Sivut/default.aspx>

2 The Life+ Financial Instrument for the Environment, and the European Regional Development Fund

The strategy's policies were modified based on comments received. In autumn 2011, policies were revised with specialists in meetings sector-by-sector, and were modified into project form, if it was possible to do so. A hearing for the revamped draft strategy was organised for the cities' different sectors and other interested parties on 16 February 2012. Representatives of 22 different organisations attended (the Cities of Helsinki, Espoo and Vantaa, Helsingin Energia, the Helsinki City Rescue Department, the Ministry of the Environment, the Regional State Administrative Agency of Southern Finland, HSL, the Central Uusimaa Environment Centre, the Association of Finnish Local and Regional Authorities, Aalto University, the National Institute of Health and Welfare, the Helsinki Nature Conservation Society, the Helsinki Region Chamber of Commerce, the Water Protection Association of the River Vantaa and Helsinki Region). In addition to verbal comments received at the event, written comments were also received from six organisations (the City of Espoo, the

Helsinki City Planning Department, the City of Helsinki Real Estate Department, the Helsinki City Rescue Department, the Regional State Administrative Agency of Southern Finland, the Finnish Transport Agency, the Uusimaa District of the Finnish Association for Nature Conservation and the Helsinki Nature Conservation Society).

An impact assessment of the adaptation strategy was done by Ramboll Finland Oy (Rantanen et al. 2012). The work was done by experts and identified the possible impacts on vegetation, animals, biodiversity, greenhouse gas emissions and air quality, as well as the impact of noise, the social impact, the impacts on human health and economic impacts. The direction of the impacts was assessed (positive or negative), as well as their scope (e.g., local, regional, national) and significance (e.g., significant, slightly significant, insignificant). The costs of flood protection were also assessed based on case studies. The report on the impact assessment is Appendix 2 of the

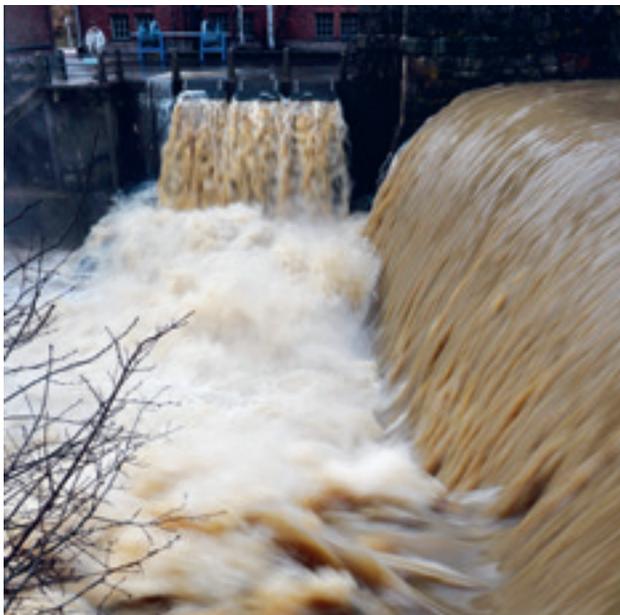
strategy and is also available online (<http://www.hsy.fi/seututieto/ilmasto/sopeutuminen/Sivut/default.aspx>).

According to the latest research, climate change is progressing more quickly than previously estimated, and some of its impacts may be more serious than was projected in the IPCC's report in 2007. The concentration of greenhouse gases in the atmosphere is still increasing as global emissions continue to grow. As a result of the strengthening of the greenhouse effect, the climate will inevitably change and Finnish climate will warm quite considerably in the decades to come. The natural climate variation will sometimes accelerate and sometimes slow down the rate of change.

The impact of climate change is not distributed evenly over the different parts of the globe. There are also great differences between different countries in how resilient they are to the impacts of climate change, and how well



Photo: Lehtikuva / Vesa Moilanen



they can cope with the damages caused by natural disasters, for example (IPCC 2007, 2012). The impacts of climate change in other parts of the world are probably reflected in Finland and the Helsinki metropolitan area, and their significance may be even greater than of the direct impacts of climate change in the region.

Climate change can be mitigated by reducing greenhouse gas emissions. This is of primary importance if dangerous climate change and its most harmful impacts are to be prevented. Adapting to the impacts of climate change is, however, necessary. Through adaptation, it is possible to reduce and prevent harmful impacts and to take advantage of the opportunities presented by climate change.

The simultaneous planning and coordination of climate change mitigation and adaptation measures are important. For example, the metropolitan area is focusing on energy saving and improving energy efficiency in the building stock, which reduces greenhouse gas emissions.

In some cases, mitigation and adaptation measures may be contradictory. For example, the increasing density of the urban structure may be challenging from a perspective of adaptation, if it increases the size of water-im-

permeable areas, reduces the size of greenbelt areas or construction takes place in the way of flood water relief routes. It is also possible that adaptation measures in one area may weaken the possibilities for adaptation in another. 'Maladaptation' may, for example, be the construction of flood protection to prevent sea flooding resulting in the protective embankment hindering the discharge of storm waters into the sea.

By following the implementation of adaptation policies, it is possible to gather valuable information about the effectiveness of the policies and actions, and also to assess their impact from a perspective of climate change mitigation and adaptation actions taking place elsewhere. In addition to this, it is also important to monitor changes in the operating environment and the latest climate research information, so that it is possible to prepare for the impacts of climate change in advance and as effectively as possible. Operating methods should also be examined from time to time, if the increasing amount of climate research information or changing regulations so require. For example, so far there is only a little information about good adaptation practices. Defining good adaptation practices for urban regions is one important area for continued investigation.

# 2 Strategic starting points and policy guidelines

## 2.1 Background

Policies and guidelines for adapting to climate change in the metropolitan area are divided into two groups: regional and joint strategic starting points in adapting to climate change and short-term (2012-2020) policies.

From a national perspective, the Helsinki metropolitan area and the Helsinki region are significant centres of population, jobs, public and private investment, infrastructure construction, administration and research. The measures in the region's climate policy also require that its special features be taken into account. The region's extensive markets also enable the distribution of promising operating models and their scaling. The region has the natural prerequisites to become a forerunner in climate change adaptation and mitigation in Finland.

The strategic starting points and policy guidelines are presented in Section 2.2.

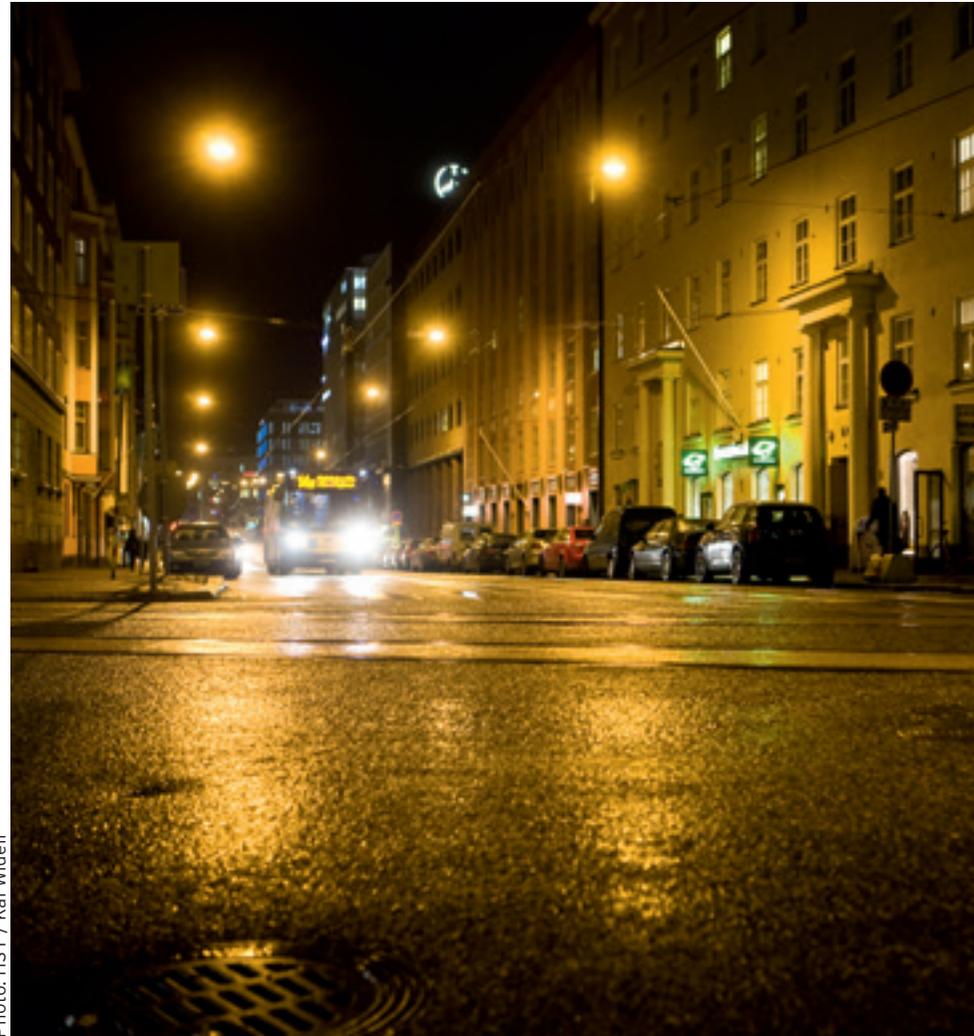


Photo: HSY / Kai Widell

## 2.2 Starting points and policy guidelines

Strategic starting points and policy guidelines for climate change adaptation

<p>Climate change mitigation is of primary importance in the region. Adapting to the impacts of climate change is also necessary. Mitigation and adaptation measures must be coordinated.</p>	<p>The public sector takes the initiative in building co-operation with interest groups and strengthening the sharing of climate-related expertise between organisations.</p>
<p>Climate change adaptation is taken as a key starting point in municipal planning, building regulation and guidance and the development of technical networks.</p>	<p>The cities and municipal federations share information about good practices in adapting to climate change.</p>
<p>The metropolitan area is a forerunner in climate change adaptation.</p>	<p>Functional risks caused by climate change are taken into account in the preparedness strategies of the cities.</p>
	<p>The public sector promotes research into adaptation to supplement the body of knowledge.</p>

The increase in global greenhouse gas emissions has been at record levels in recent years<sup>1</sup> and the concentration of greenhouse gases in the atmosphere is now higher than ever before in the history of mankind. Climate change mitigation by reducing emissions is of primary importance in the prevention of dangerous climate change, but adaptation is also vitally important. Our past and present greenhouse gas emissions will in any case cause climate change to a certain extent. Mitigation and adaptation measures must be coordinated, so that synergies can be benefited from and contradictory or harmful impacts can be avoided.

According to policy guidelines, structures and buildings must be built to last, and buildings and infrastructure now being planned must still be in place in a hundred years' time. It is projected that climate will change considerably during this time, so it must be ensured that we now plan and build towns and cities that will withstand variations in the weather and a changing climate.

The Helsinki metropolitan area adaptation strategy of is one of the first attempts in adaptation in an urban region. The metropolitan area has a special position in Finland in making possible the distribution of new and promising operating models, for example.

The role of the public sector is important in creating and maintaining contacts and co-operation between different actors, promoting common benefits between different organisations and levels, and in building an overall picture of the changing operating environment. The role of the public sector is also important in the promotion of research and the expansion of the body of knowledge about climate change and adapting to it.

In addition to economic risks and risks of damage, it is also important to prepare for the functional risks that climate change may cause. Preparing in advance is usually a cheaper solution than reacting to sudden situations and repairing the damages that they can cause.

<sup>1</sup> World Meteorological Organisation WMO 2011, International Energy Agency IEA 2011, Global Carbon Project GCP 2011

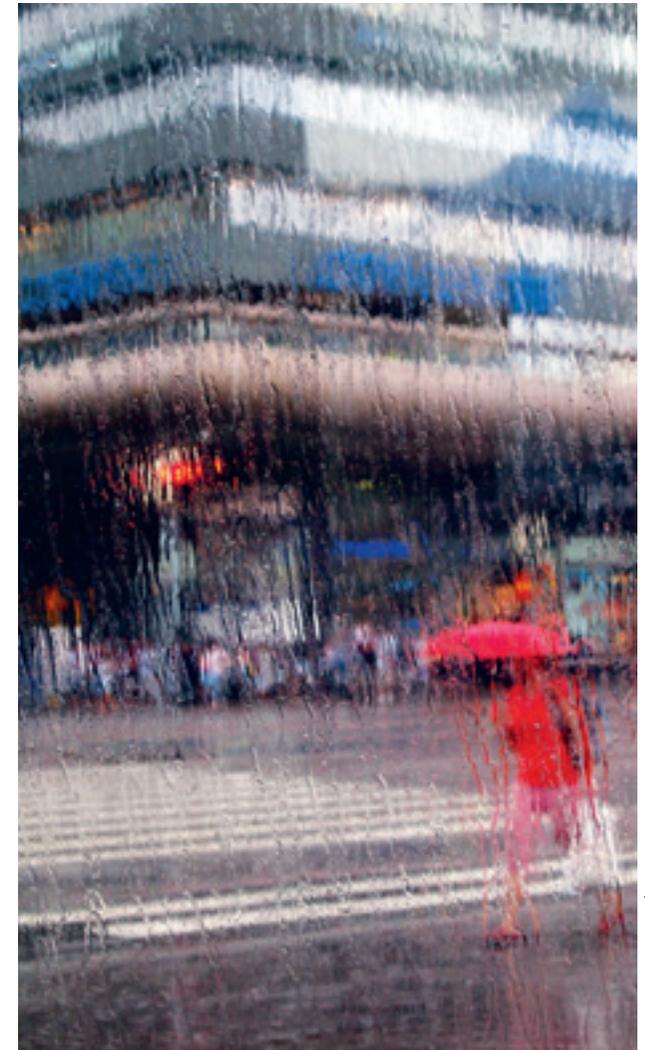


Photo: Vastavalo / Tuula Roos

# 3 Policies 2012-2020

## 3.1 Background

The policies of the Helsinki metropolitan area, by which sectors and departments prepare for the impacts of climate change, have been defined for the near future (2012-2020). The definition of the policies takes into account the comments received on the draft adaptation strategies.

The policies are intended to be as concrete as possible, and actors and timetables for them have been defined through discussions with experts in each sector. The policies have been defined for the following sectors and cross-sectoral issues:

- Land use
- Traffic and technical networks
- Building and the climate proof local environment
- Water and waste management
- Rescue services and safety
- Health care and Social services
- Co-operation in the production and distribution of information



Photo: HSY / Kai Widell

## 3.2 Land use

Adaptation policies	Indicator and timetable	Actors
Take the impacts of climate variation, extreme weather events and climate change into account in the land use planning work of municipalities in the Helsinki metropolitan area.	2012 => Land use plans	Cities (city planning)
Take care of the efficiency of ecosystem services and the preservation of biodiversity by developing ecological contacts and a greenbelt network*.	2012 => Area and share of forests and greenbelt areas	Cities (city planning, technical services, environment centre) Forestry Development Centre Tapio Uudenmaan liitto

\* Integrated greenbelt areas enable the conservation of more diverse living environments and the transfer of species to new areas, among other things. Sufficiently large and diverse forest areas are more able to resist such events as storm and pest damage. They also offer more protection for animals and plants (less edge effect). Greenbelt areas are also important for water management.

## 3.3 Traffic and technical networks

Adaptation policies	Indicator and timetable	Actors
In the planning of public transport in the Helsinki metropolitan area, take account of the major risks posed by extreme weather events, sea level rise and climate change. In preparedness planning for public transport, prepare for traffic management in cases of disruption and emergency.	2012 => Public transport management plan	HSL Cities (responsible for public transport) Partners in co-operation: Cities (city planning, technical services) The Finnish Transport Agency The Centre for Economic Development, Transport and the Environment
In the planning of the municipal transport network and other technical networks, take account of the risks of extreme weather events and climate change.	2013 => Traffic system plan	Cities HSL Partners in co-operation: The Finnish Transport Agency The Centre for Economic Development, Transport and the Environment Companies
Develop public transport on-call services and customer communication at the Transport Information Centre to real-time via different channels.	2013 => Customer feedback, experiences of users	HSL Partners in co-operation: The Finnish Transport Agency The Centre for Economic Development, Transport and the Environment Different authorities

### 3.4 Building and climate proof local environment

Adaptation policies	Indicator and timetable	Actors
Participate in a project studying the scenarios of sea level rise and their probabilities.	2012-2013	Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Transport and Communications, Finnish Meteorological Institute, Finnish Environment Institute, Centre for Economic Development, Transport and the Environment, STUK, City of Pori, City of Helsinki, HSY
Check the minimum heights for construction based on updated sea level scenarios and guidelines.	2013=> Building codes, RT-cards	Cities (city planning, building inspection)  Partners in co-operation: Finnish Meteorological Institute Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Transport and Communications The Finnish Transport Agency The Centre for Economic Development, Transport and the Environment
Study the proportion of sealed areas in the metropolitan area, and assess their significance from a perspective of storm water management	2012-2014  Study of sealed areas	HSY  Cities (city planning, building control) Finnish Environment Institute

### 3.5 Water and waste management

Adaptation policies	Indicator and timetable	Actors
In the planning of water and waste management in the Helsinki metropolitan area, take account of the risks posed by extreme weather events, sea level rise and impacts of climate change. In preparedness planning for water and waste management, prepare for the problems caused by extreme weather events	2012 =>  Preparedness plan	HSY  Partners in co-operation: Cities (preparedness planning)
Study the dimensioning principles of the water management system and their adequacy, taking into account impacts of climate change, increasing extreme weather events and sea level rise	2013 =>  Report	HSY  Partners in co-operation: Cities (city planning, technical services)
In the further development of the action programme concerning the reduction of waste water overflows in the catchment area of the River Vantaa, also take account of impacts of climate change and potential increasing risks	2013 =>  Action programme	HSY  Partners in co-operation: Water Protection Association of the River Vantaa and Helsinki Region Water treatment plants in the area of the River Vantaa
Work to reduce overflows from mixed water sewers in the area of central Helsinki. In the planning of projects, take account of the risks posed by extreme weather events and sea level rise	2012 =>  Project plans	HSY  Partners in co-operation: The City of Helsinki, Public Works Department
Check the dimensioning principles for water management at the Ämmässuo waste treatment plant, taking into account the risks of impacts of extreme weather events and climate change	2013 =>  Report	HSY

### 3.6 Rescue services and safety

Adaptation policies	Indicator and timetable	Actors
<p>In preparedness planning by the cities, take account of extreme weather events and the risks caused by weather and climate and preparations for such risks</p> <p>Introduce preparatory measures into the municipal risk management action plan</p>	<p>2012 =&gt;</p> <p>Preparedness plans</p>	<p>Cities (administration and management, preparedness planning)</p> <p>Partners in co-operation: Rescue departments, network of preparatory operations</p>
<p>Rescue services keep up-to-date information about collaborating organisations and resources, which may be needed in disruptions caused by weather events</p>	<p>2012 =&gt;</p>	<p>Rescue departments</p> <p>Partners in co-operation: Cities, HSL, companies (such as maintenance companies), relevant organisations</p>
<p>In the cities' own and regional preparedness exercises, also practise command and action procedures for accidents and disruptions resulting from extreme weather events</p>	<p>2012 =&gt;</p> <p>Evaluations of preparedness drills</p>	<p>Cities (management, preparedness planning), Emergency Services College</p> <p>Partners in co-operation: Rescue departments HSY, HSL</p>
<p>In connection with the renewal of rescue planning guidelines, guide independent adaptation for the risks caused by extreme weather events</p>	<p>2013 =&gt;</p> <p>Guidelines</p>	<p>Rescue departments, cities (health care and social services) Ministry of Social Affairs and Health</p> <p>Partners in co-operation: Relevant organisations (including real estate) Ilmasto-info</p>

### 3.7 Health care and social services

Adaptation policies	Indicator and timetable	Actors
<p>In the organisation and readiness planning of health care and social services, take account of the risks posed by extreme weather events, sea level rise and impacts of climate change</p>	<p>2013 =&gt;  Action plans and preparedness plans</p>	<p>Cities (health care and social services) Ministry of Social Affairs and Health  Partners in co-operation: Regional State Administrative Agencies Hospital District of Helsinki and Uusimaa</p>
<p>As case studies, study the groups vulnerable to climate change and extreme weather events, and identify their needs during disruptions</p>	<p>2013 =&gt;  Report</p>	<p>Cities (health care and social services, education), Ministry of Social Affairs and Health</p>
<p>Start the Urban survival project, the aim of which is to prepare citizens for climate change and extreme weather events</p> <p>Tools for this are the urban survival guide, an annual event and communication through social media. The guide gives advice on survival in emergency situations, such as cuts in electrical or water supply, heat waves or extreme weather phenomena in summer or winter</p>	<p>2013 =&gt;  Event, guide</p>	<p>Cities (all sectors), police, rescue services, defence forces, HSY Ilmasto-info  Partners in co-operation: Organisations (patient and customer organisations, neighbourhood associations), housing associations (people responsible for rescue) Regional State Administrative Agency Hospital District of Helsinki and Uusimaa National Institute for Health and Welfare, Finnish Meteorological Institute</p>

### 3.8 Co-operation in the production and distribution of information

Adaptation policies	Indicator and timetable	Actors
Create a network for climate change researchers and users of information (such as the experts and planners in local authorities and HSY, companies, organisations) in order to communicate and disseminate the latest climate research information and to direct research. Organise joint workshops, seminars and meetings	2012 => Establishing a network	HSY  Partners in co-operation: Cities (different sectors), HSL, Research institutes (Finnish Meteorological Institute, Finnish Environment Institute, Aalto University, National Institute for Health and Welfare, University of Helsinki, Government Institute for Economic Research), Climateguide.fi, rescue services, organisations
Study international best practices and experiences of adaptation of urban regions, and distribute information about them to cities and other interest groups	2012 => Reports, websites	HSY  Partners in co-operation: Hamburg, Stockholm, Copenhagen
Take part in co-operative networks on national and regional levels in order to distribute experiences and information  Publish climate-related pages on HSY's website and use them to obtain expert and user feedback, and to convey and gather information	2012 =>  Co-operative networks	Cities, HSY, Ilmasto-info  Partners in co-operation: A national group to coordinate adaptation, Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Transport and Communications, The Finnish Transport Agency, The Centre for Economic Development, Transport and the Environment, Uusimaa Regional Council, Other urban regions (Tampere, Turku, Lahti), The Association of Finnish Local and Regional Authorities, Climateguide.fi
Develop tools for adapting to climate change for the use of city planning, and study the costs of adaptation (climate change tools in planning - project application). Funding applied for from the European Regional Development Fund (ERDF)	2012-2014 Report	Helsinki, Espoo, Vantaa, HSY, Turku, Lahti, Finnish Meteorological Institute, University of Turku
Participate in projects that assess the impacts of climate change on diseases and evaluate its economic impacts, and study the significance of climate change on the prevalence of diseases of plants and animals and infectious diseases between humans and animals	2013 => Projects	Cities (health care and social services)  Partners in co-operation: Research institutes (National Institute of Health and Welfare, Finnish Meteorological Institute), Ministry of Social Affairs and Health
Participate in projects that study the impacts of climate change on air quality and health, including forest fires and particulate emissions	2012 => Projects such as KASTU-2	National Institute of Health and Welfare HSY Cities  Partners in co-operation: Research institutes
Produce information from different perspectives concerning sustainable development and the capacity of society to tolerate risk and recover, and to promote research into the subject	2013=> Reports, projects	Cities HSY  Research institutes

# 4 Impact assessment

The impact assessment of the climate change adaptation strategy was done by Ramboll Finland Oy (Rantanen et al. 2012). The report on the impact assessment is Appendix 2 of the strategy and is also available online (<http://www.hsy.fi/seututieto/ilmastosopeutuminen/Sivut/default.aspx>). The work was done by experts and examined the impact of the policies presented in the strategy proposal (15 December 2011) on natural conditions, greenhouse gas emissions, air quality, people's living conditions and health, as well as the economic impacts of the policies.

The policies to be assessed were mostly quite general, so all of the impacts could not be identified for all policies. The direction of trend or significance of the impact may also be affected by how the policies are ultimately carried out. For example, most of the actions can be carried out either in a way that exerts a positive influence from a perspective of nature values, or in a way that is detrimental to nature values. There may also be contradictions between adaptation actions and mitigation actions aimed at reducing greenhouse gas emissions. The increasing density of the urban structure may be challenging from a perspective of adaptation if, for example, it increases the size of water-impermeable areas or construction takes place in the way of possible flood water relief routes.

Overall, the economic benefits of the policies can, in the long term, exceed the costs arising from them. The assessment of economic impact is, however, hindered by the fact that the costs of measures have to be paid in the short or medium term, whilst the benefits accumulate over time or can be enjoyed only in the long term. Adaptation actions can, however, reduce or even prevent the future potentially very harmful and large-scale impacts of extreme weather events or climate change, in which case the benefits then constitute saved costs.

In addition, a case study was done into the costs of flood protection, which examined floods caused by a sudden rise in sea levels due to storm. The costs of flood protection were examined using cost-benefit analysis. A cost-benefit analysis framework was developed for cases of floods, and it would be worth further developing this in future. Data used in calculations could be made more specific, and the estimation of benefits and costs and the examination of their allocation could be improved. It would be important to develop an integrated and open operating model and data bank for the cost-benefit analysis of cases of flooding and broader climate change adaptation measures. The intention is to continue the assessment of costs of climate change impacts and adaptation for the Helsinki metropolitan area in 2012 in a different project, for which funding has been sought from the European Regional Development Fund (ERDF).

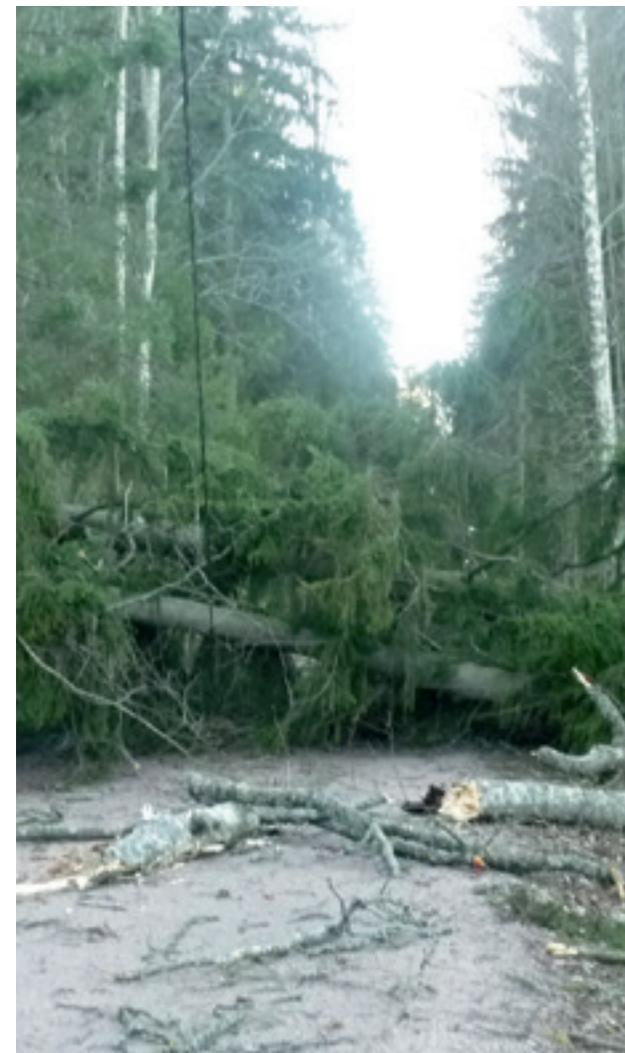


Photo: HSY / Antti Viren

# 5 Monitoring and updating

Scientific knowledge about climate change is constantly increasing and becoming more exact. New information about climatic phenomena might change or modify previous estimates about the progress of climate change. Measures set forth in the strategy may need to be checked or modified as information increases and changes.

The operating environment concerning adaptation is also changing: new legislation and guidelines are coming from both the EU and national level, which local actors too must take into account in their activities. New reports and experiences about ways of adapting to the impacts of climate change are being received and, based on them, there is a need to review existing practices.

Through monitoring, it is also possible to create an overall picture of how the region is adapting to the impacts of climate change, to identify and avoid possible overlapping activities and to benefit from synergies.

Create an adaptation monitoring system:

Monitoring actions	Actors
Monitor the implementation of agreed policies, and changes to the operating environment. If necessary, update measures in co-operation with different actors	HSY Partners in co-operation: Cities, HSL, Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of the Interior, Ministry of Social Affairs and Health, The Centre for Economic Development, Transport and the Environment, Uusimaa Regional Council, Regional State Administrative Agency, The Finnish Transport Agency, other actors
Select and compile monitoring indicators	HSY Partners in co-operation: Cities, Research institutes, The Centre for Economic Development, Transport and the Environment, other actors
Report on the implementation of adaptation actions in the region, and on changes to the operating environment (such as legislation, guidelines, actions of other parties)	HSY Partners in co-operation: Cities, HSL, Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of the Interior, Ministry of Social Affairs and Health, The Centre for Economic Development, Transport and the Environment, Uusimaa Regional Council, Regional State Administrative Agency, The Finnish Transport Agency, other actors
Follow new and updated climate research information with the aid of the co-operative network of researchers and other actors	HSY Partners in co-operation: Research institutes (Finnish Meteorological Institute, Finnish Environment Institute, the Geological Survey of Finland, Aalto University, University of Helsinki, University of Kuopio)
Distribute and convey information through different channels	HSY Partners in co-operation: Cities, other actors

# 6 Summary

The Helsinki metropolitan area climate change adaptation strategy has been prepared in close co-operation with the region's cities of Helsinki, Espoo, Vantaa and Kauniainen, the Helsinki Region Environmental Services Authority (HSY) and other organisations in the region. In the strategy, policy guidelines and policies by which the Helsinki metropolitan area can adapt to the impacts of climate change, are compiled.

The Helsinki metropolitan area climate change adaptation strategy focuses on the adaptation of the built and urban environment to a changing climate. The strategy's vision is "a climate proof city – the future is being built now". The aim has been to assess the consequences of climate change on the region, to prepare for the impacts of climate change and extreme weather events and to reduce the vulnerability of the region to climate variation and change, in order to safeguard the well-being of the region's inhabitants and the functioning of the cities even in changing conditions. The consequences of climate change taking place elsewhere in Finland, Europe or around the world, and its impacts on the Helsinki metropolitan area such as possible environmental refugees, are excluded from the strategy. Neither does the strategy deal with the impacts of climate change mitigation policies on the region and adaptation to them.

The preparation of the Helsinki metropolitan area climate change adaptation strategy was started at the beginning of 2009 by producing background studies. The background studies contained regional climate and sea level scenarios for the metropolitan area (Venäläinen et al.,

2009), modelling of the risks of river floods on the River Espoo and River Vantaa in conditions of climate change (Veijalainen et al., 2009), and an overview of the impacts of climate change on the region. These background studies have been published in the report "Pääkaupunkiseudun ilmasto muuttuu – sopeutumisstrategian taustaselvityksiä" (the metropolitan area's climate is changing – background reports for the adaptation strategy) (HSY 2010).

Preparation of the adaptation strategy was coordinated by HSY. The preparation work was done in close co-operation with experts in the metropolitan area's cities, regional rescue services, the Ministry of the Environment, HSL and the Association of Finnish Local and Regional Authorities, which took part in the preparation work through such means as workshops. Preparation of the adaptation strategy was steered by a steering group consisting of representatives of the different administrative branches of cities and other key parties involved.

Policy guidelines and policies for adapting to climate change in the metropolitan area are divided into two groups: regional and joint strategic starting points and policy guidelines in adapting to climate change and short-term (2012–2020) policies. The policies have been defined for the following sectors and cross-sectoral issues: 1) Land use, 2) Traffic and technical networks, 3) Building and climate-proof local environment, 4) Water and waste management, 5) Rescue services and safety, 6) Health care and social services, and 7) Co-operation in the production and distribution of information.

Impact assessment the climate change adaptation strategy was done by Ramboll Finland Oy. The work assessed the possible impacts on vegetation, animals, biodiversity, greenhouse gas emissions and air quality, as well as the impact of noise, social impacts, impacts on human health and economic impacts. The costs of flood protection were also assessed based on a case study.

The storms of recent years have demonstrated the vulnerability of the Finnish society to natural hazards and the importance of preparing for them. Our society is very dependent on electricity, and long-lasting power cuts can have a significant impact on such things as communications, heating, water supply and traffic. The significance of co-operation between authorities and other actors in the prevention of natural disasters and in the recovery of them is now being highlighted. Preparing in advance for disasters and their consequences is worth doing, as it reduces the damages and costs that arise from them.

The monitoring of implementation of regional adaptation measures, changes to the operating environment and following the latest climate research information is important, so that the region can prepare for the impact of climate change in advance and as effectively as possible, and the effectiveness of measures can be assessed through a reduction in vulnerability. Operating methods should also be examined from time to time, if such things as an increasing amount of climate information or changing regulations so require.

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# Glossary

**Sensitivity** is the degree to which a system is affected, either adversely or beneficially, by climate variability and change (IPCC 2007).

**Vulnerability** is the degree by which the system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. 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 (IPCC 2007).

**Risk** = the probability of change x the magnitude of the impact x the magnitude of the consequence.

**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. Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation (IPCC 2007).

**Adaptive capacity** (in relation to climate change impacts) The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC 2007).

**Consequence** The consequences of (the impact of) climate change for society and its different sectors.

**Scenario** A plausible and often simplified description of how the future may develop, based on a coherent and internally consistent set of assumptions about driving forces and key relationships (IPCC 2007).

**Impact** The impact of climate change on human and natural systems. Impact may be positive or negative, direct or indirect.

**Special situation** is a surprising or sudden threat or event that may endanger the safety of society or the living conditions of the population, and the control of which may require extraordinary management models and communitarian.

**Disruption** An abnormal condition, a disturbance that endangers some part of the activities and service production process of a city or region. Authorities and public utilities generally cope using normal resources and management models.

**Serious disruption** A disturbance, the management of which may require more resources, more effective cooperation and extraordinary management arrangements and advance preparation, but which does not, however, require the enforcement of powers prescribed in the Emergency Powers Act.

**Emergency conditions** A serious disruption requiring the enforcement of powers and regulations prescribed in the Emergency Powers Act. The Emergency Powers Act defines an emergency as follows: 1) an armed attack against Finland, as well as war and the aftermath of war; 2) a serious violation of the territorial integrity of Finland and a threat of war against the country; 3) war or a threat of war between foreign countries and a serious international crisis implying the threat of war and requiring immediate action for the increase of the defensive readiness of Finland, as well as other specific conditions outside Finland

having a comparable effect, if they may pose a grave danger to the foundations of national existence and well-being; 4) a serious threat to the livelihood of the population or the foundations of the national economy brought about by hampered or interrupted import of indispensable fuels and other energy, raw materials and goods or by a comparable serious disruption of international trade; and 5) a catastrophe provided the authorities cannot control the situation with regular powers.

**Preparation** is an activity which ensures the performance of tasks in as trouble-free a way as possible in all situations. Preparatory measures include preparedness planning, the management of risks to continuity, forward preparation, training and preparedness exercises.

**Preparedness planning** is a description, drawn up and maintained during normal times, of measures that safeguard operations in cases of disruption and emergency. According to the Emergency Powers Act, it is the statutory obligation of the State authorities, public utilities and municipalities to ensure the trouble-free performance of their functions in all situations. This means that, under normal conditions, preparedness planning prepares for disruptions, emergencies and major disasters.

# Abbreviations

**BaltCICA** (Research project) Climate Change: Impacts, Costs and Adaptation in the Baltic Sea Region (2009-2011)

**ELY Centre** Centre for Economic Development, Transport and the Environment

**ERDF** European Regional Development Fund

**GCP** Global Carbon Project

**HSL** Helsinki Region Transport

**HSY** Helsinki Region Environmental Services Authority

**IAE** International Energy Agency

**IPCC** Intergovernmental Panel on Climate Change

**SREX** Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation

**WMO** World Meteorological Organization

**YTV** Helsinki Metropolitan Area Council

# Appendices and background material

## Appendix 1. Participants in preparation

### **Steering group for the Helsinki metropolitan area climate change adaptation strategy:**

**Chairman:** City Engineer Matti-Pekka Rasilainen, Helsinki up to 1 Sep 2010

City Engineer Raimo K. Saarinen, Helsinki

#### **Members:**

*The City of Espoo:*

Lars Hagman, City Architect

Tuula Hämäläinen-Tyynilä, Head of the Environment Centre

Ossi Keränen, City Planning Manager

Solja Mäkelä, Construction Manager

*The City of Helsinki:*

Lauri Jääskeläinen, Director of Building Control Department

Päivi Kippo-Edlund, Environmental Research Manager

Matti Latvala, Preparedness Manager (up to 31 Jan 2011)

Anssi Lehtinen, Acting Preparedness Manager (from 1 Feb 2011)

Aaro Toivonen, Safety Manager

Olavi Veltheim, Director of Town Planning Division

*The City of Kauniainen:*

Marianna Harju, Director of Technical and Planning Services

*The City of Vantaa:*

Maritta Pesonen, Director of Family Services

Reijo Sandberg, Project Director

Jouko Sillanpää, Preparedness Manager

Stefan Skog, Director of the Environment Centre

*The City of Helsinki Rescue Department:*

Simo Wecksten, Head of Risk Management

*West Uusimaa Rescue Department:*

Tuomas Päiviä, Preparedness Manager

*Central Uusimaa Rescue Department:*

Hannu Kuhanen, Preparedness Manager

*The Association of Finnish Local and Regional Authorities:*

Ulla Hurmeranta, Lawyer

*Ministry of the Interior:*

Tarja Mankkinen, Director of the Internal Security Secretariat

*The Ministry of the Environment:*

Antti Irjala, Senior Environmental Adviser

*HSL Helsinki Region Transport:*

Suoma Sihto, Head of Department

*HSY Helsinki Region Environmental Services Authority*

Tommi Fred, Director Water Services

Irma Karjalainen, Director Regional and Environmental Information (up to 1 Jun 2011)

Peter Fredriksson, Director Regional and Environmental Information (from 1 Jun 2011)

#### **Deputy members:**

*The City of Helsinki Rescue Department:* Matti Koskinen, Civic Defence Planner

*West Uusimaa Rescue Department:* Karl-Henrik Widbom, Special Planner

*HSL:* Anna Planting, project manager

Johanna Vilkuna, project manager

**Secretary:** Susanna Kankaanpää, HSY

A **project group** took part in the preparation of the adaptation strategy, the members of which were: Sari Soini from the City of Espoo Environment Centre and Hannu Vepsäläinen of the Espoo City Planning Centre (up to 14 Apr 2010), Pauliina Jalonen (up to 1 Dec 2010), Jari Viinanan and Tiia Yrjölä (from 1 Feb 2011) of the City of Helsinki Environment Centre, Anna-Lena Granlund-Blomfeldt of the City of Kauniainen, Krister Höglund and Leena Maidell-Münster of the City of Vantaa Environment Centre and Susanna Kankaanpää of HSY.

In August 2010, HSY appointed an internal working group to prepare the adaptation strategy. This group comprises Tommi Fred, Päivi Kopra and Jukka Saarijärvi of HSY Water Services, Maria Valtari of HSY Waste Management and Susanna Kankaanpää of HSY Regional and Environmental Information.

**Participants in the workshops and meetings** concerning the preparation of the strategy:

Sami Aherva, HSL, Markku Antinoja, City of Espoo, Achim Drebs, Finnish Meteorological Institute, Tommi Fred, HSY, Peter Fredriksson, HSY, Anna-Lena Granlund-Blomfeldt, City of Kauniainen, Simo Haanpää, YTK, Aalto University, Riitta-Liisa Hahtala, HSY, Mari Heinonen, HSY, Karri Hel-

len, HSL, Heidi Huvila, City of Helsinki, Tuula Hämäläinen-Tyynilä, City of Espoo, Krister Höglund, City of Vantaa, Antti Irjala, Ministry of the Environment, Lauri Jääskeläinen, City of Helsinki, Riikka Jääskeläinen, City of Helsinki, Pauliina Jalonen, City of Helsinki, Sirkku Juhola, Aalto University, Suvi Järvinen, HSY, Susanna Kankaanpää, HSY, Irma Karjalainen, HSY, Nea Kielessä, City of Helsinki, Päivi Kopra, HSY, Jukka Koskikallio, City of Espoo, Matti Koskinen, City of Helsinki Rescue Department, Hannu Kuhanen, Central Uusimaa Rescue Department, Marika Kämppe, Association of Finnish Local and Regional Authorities, Tapio Kytö, Finnish Meteorological Institute, Tarja Laine, Uusimaa ELY Centre, Matti Latvala, City of Helsinki, Marko Lehtonen, City of Helsinki, Jorma Lilja, City of Helsinki Rescue Department, Johannes Lounasheimo, HSY, Janne Markkula, HSL, Ari Melakari, HSY, Asta Mellais, City of Vantaa, Leena Mikkonen-Young, HSY, Solja Mäkelä, City of Espoo, Jaakko Pekki, West Uusimaa Rescue Department, Lasse Peltonen, Aalto University, Anna Planting, HSL, Jussi Rahikainen, Central Uusimaa

Rescue Department, Kari Ranta-Kokko, Uusimaa ELY Centre, Piia Rantamäki, City of Vantaa, Matti-Pekka Rasilainen, City of Helsinki, Teija Rautiala, City of Vantaa, Timo Rekunen, West Uusimaa Rescue Department, Ulla-Maija Rimpiläinen, City of Vantaa, Kimmo Ruosteenoja, Finnish Meteorological Institute, Anna Ruskovaara, HSL, Reija Ruuhela, Finnish Meteorological Institute, Jukka Saarijärvi, HSY, Reijo Sandberg, City of Vantaa, Elina Savola, City of Espoo, Jouko Sillanpää, City of Vantaa, Pirjo Siren, City of Vantaa, Sari Soini, City of Espoo, Tuula Säämänen, Finnish Transport Agency, Erkki Tammisto, City of Vantaa, Tuula Tampio, City of Vantaa, Aaro Toivonen, City of Helsinki, Tiina Turkia, City of Vantaa, Maria Valtari, HSY, Noora Veijalainen, Finnish Environment Institute, Ari Venäläinen, Finnish Meteorological Institute, Hannu Vepsäläinen, City of Espoo, Karl-Henrik Widbom, West Uusimaa Rescue Department, Marko Vihervuori, HSL, Jari Viinanen, City of Helsinki, Marika Visakova, HSY, Kirsi Viikka, City of Espoo

## List of online appendices and background materials

The following appendices and background materials are only published online. The background materials will be updated if necessary. The appendices and materials are available at:

<http://www.hsy.fi/seututieto/ilmasto/sopeutuminen/Sivut/default.aspx>

- Appendix 2. Strategian vaikutusten arviointi (Impact assessment of the strategy) (Rantanen, A. et al. 2012).
- Appendix 3. Tulvariskit - kaavoitusta ja rakentamista koskeva lainsäädäntö (Flood risks - legislation concerning planning and construction) (Ekroos, A., and Hurmeranta, U. 2011)
- Appendix 4. Pääkaupunkiseudun toimintaympäristö (Helsinki metropolitan area operating environment) (Salmi, A. 2010)
- Appendix 5. Maanpinnan korkeuden kartat Espoon ja Helsingin rannikkoalueelta (Topographical maps of the Espoo and Helsinki coastal areas) (HSY 2010)
- Background material 1. Ilmasto muuttuu (the climate is changing) (Kankaanpää, S. (ed.) 2010)
- Background material 2. Ilmastonmuutoksen arvioidut vaikutukset pääkaupunkiseudulla (The projected impacts of climate change on the Helsinki metropolitan area) (Kankaanpää, S. 2011)
- Background material 3. Toimintaympäristö, Ilmastonmuutokseen sopeutuminen eri tasoilla, olemassa olevat strategiat, ohjelmat, suunnitelmat ja tutkimus (Operating environment, adapting to climate change on different levels, existing strategies, programmes, plans and research)





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