Climate change impacts, vulnerability and adaptation in Europe

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EEA member and cooperating countries

The EEA is a specialised agency of the European Union.

The EEA aims to support sustainable development and to help achieve significant and measurable improvement in Europe’s environment through the provision of timely, targeted, relevant and reliable information to policy makers and the public.
The Adaptation Strategy package

- Communication
- Impact assessment
- **Green Paper** on the insurance of natural and man-made disasters
- Commission Staff Working Documents on:
  - Climate change adaptation, **coastal** and **marine** issues;
  - Adaptation to climate change impacts on human, animal and plant **health**;
  - Adapting **infrastructure** to climate change;
  - Climate change, environmental degradation and **migration**;
  - Technical guidance on integrating climate change adaptation in programmes and investments of **Cohesion Policy**;
  - Principles and recommendations for integrating climate change adaptation considerations under the 2014-2020 **rural development programmes**;
  - Guidelines on **developing adaptation strategies**.
Why an EU Strategy?

- **Cross-border** dimensions
- EU competence in **common policies** affected by CC
- **Economies of scale** in capacity-building, research, data-gathering and knowledge transfer
- Different capacities and vulnerabilities across regions and population call for **solidarity**
- EU Funding
Strategy objective and priorities

To contribute to a climate-resilient Europe

3 Priorities:

- 1. Promoting action by Member States
- 2. Better informed decision making
- 3. Promoting adaptation in key vulnerable sectors
• Action 1: Encourage all Member States to adopt comprehensive adaptation strategies

• Action 2: Provide LIFE funding to support capacity building and step up adaptation action in Europe. (2013-2020)


• Action 4: Bridge the knowledge gap (H2020, JPI, Copernicus)

• Action 5: Further develop Climate-ADAPT as the ‘one-stop shop’ for adaptation information in Europe.

• Action 6: Facilitate the climate-proofing of the Common Agricultural Policy (CAP), the Cohesion Policy and the Common Fisheries Policy (CFP).

• Action 7: Ensuring more resilient infrastructure

• Action 8: Promote insurance and other financial products for resilient investment and business decisions.

2014-2020 Multi-annual Financial Framework share of climate-related EU expenditure of 20% (35% for research)
EU forestry strategy (Commission, Sep. 2013)

- Responds to **new challenges** facing forests and the forest sector.

- **Sustainable** forest management and the **multifunctional** role of forests remain key.

- Forests are important for rural development, job creation, the environment - especially for biodiversity; for forest-based industries; bioenergy; and for reducing greenhouse gas emissions.

- Mentions the importance of actions to maintain and enhance **forest's resilience and adaptive capacity**.

- Calls for a Forest Information System to be set up and for Europe-wide harmonised information on forests to be collected.
EEA activities 2011-2013
Climate change, impacts and vulnerability in Europe (EEA indicator based report, Nov 2012)

Content:
- climate change and impacts
- sectors and regions most at risk
- main sources of uncertainty
- monitoring needs

Preparation:
- European Topic Centres, incl ETC climate change adaptation, WHO, ECDC, JRC (about 90 experts)
- Data from research projects and international databases
- External advisory group
- Expert and government review process

Next steps:
- Selected indicators on the EEA web site to be updated after publication of IPCC WGI/II reports in 2013/2014
Europe’s key past and projected impacts and risks/vulnerabilities

**Arctic**
- Temperature rise much larger than global average
- Decrease in Arctic sea ice coverage
- Decrease in Greenland ice sheet
- Decrease in permafrost areas
- Increasing risk of biodiversity loss
- Intensified shipping and exploitation of oil and gas resources

**Northern Europe**
- Temperature rise much larger than global average
- Decrease in snow, lake and river ice cover
- Increase in river flows
- Northward movement of species
- Increase in crop yields
- Decrease in energy demand for heating
- Increase in hydropower potential
- Increasing damage risk from winter storms
- Increase in summer tourism

**North-western Europe**
- Increase in winter precipitation
- Increase in river flow
- Northward movement of species
- Decrease in energy demand for heating
- Increasing risk of river and coastal flooding

**Coastal zones and regional seas**
- Sea-level rise
- Increase in sea surface temperatures
- Increase in ocean acidity
- Northward expansion of fish and plankton species
- Changes in phytoplankton communities
- Increasing risk for fish stocks

**Central and eastern Europe**
- Increase in warm temperature extremes
- Decrease in summer precipitation
- Increase in water temperature
- Increasing risk of forest fire
- Decrease in economic value of forests

**Mediterranean region**
- Temperature rise larger than European average
- Decrease in annual precipitation
- Decrease in annual river flow
- Increasing risk of biodiversity loss
- Increasing risk of desertification
- Increasing water demand for agriculture
- Decrease in crop yields
- Increasing risk of forest fire
- Increase in mortality from heat waves
- Expansion of habitats for southern disease vectors
- Decrease in hydropower potential
- Decrease in summer tourism and potential increase in other seasons
## Example: forests and forestry

<table>
<thead>
<tr>
<th>Climate effects</th>
<th>Impacts</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased CO(_2) concentrations, longer growing season</td>
<td>Increased productivity of some species, e.g. for biomass production</td>
<td>Increased timber supply</td>
</tr>
<tr>
<td>Reduced snowfall</td>
<td>Decrease in snow damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase in wet snow damages</td>
<td></td>
</tr>
<tr>
<td>Increase in average winter temperature</td>
<td>Winter chilling requirements for flowering and seed germination not met, incomplete winter hardening</td>
<td>Reduced natural regeneration</td>
</tr>
<tr>
<td></td>
<td>Reduction in winter cold damage</td>
<td>Serious winter tree damage</td>
</tr>
<tr>
<td></td>
<td>Reduction in cold-associated mortality of insect pest, deer populations</td>
<td>Increased tree damages</td>
</tr>
<tr>
<td></td>
<td>Potential for range of new species</td>
<td></td>
</tr>
<tr>
<td>Higher earlier spring temperatures</td>
<td>Earlier budburst and potentially increased damages by late frosts</td>
<td>Reduced high-quality timber supply</td>
</tr>
<tr>
<td>Decrease in spring and summer rainfall</td>
<td>Drought during tree growth period</td>
<td>Reduced tree growth, serious damage to trees</td>
</tr>
<tr>
<td></td>
<td>Threat to newly planted trees</td>
<td>Tree damage; increased tree vulnerability to insect attack; increased risk of soil erosion</td>
</tr>
<tr>
<td></td>
<td>Increase in forest fires</td>
<td>Changes in tree composition and thus in the range of goods and services</td>
</tr>
<tr>
<td></td>
<td>Limiting current tree species range</td>
<td></td>
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<tr>
<td>Increased winter rainfall</td>
<td>Waterlogging of soils, killing of tree roots</td>
<td>Reduction of rooting depths</td>
</tr>
<tr>
<td>Reduced soil moisture</td>
<td>Changes in species suitability</td>
<td>Increased vulnerability to droughts and storms</td>
</tr>
<tr>
<td>Increased frequency of high or extreme temperature episodes</td>
<td>Damaging effects of pests</td>
<td>Tree damage and mortality; loss of timber quality and quantity</td>
</tr>
<tr>
<td>Changes in temperature, rainfall and frequency of extreme weather events</td>
<td>Loss of biodiversity</td>
<td>Loss of biodiversity and habitats</td>
</tr>
<tr>
<td>Increase in storm events</td>
<td>Wind throws</td>
<td>Loss of quality timber supply, of recreational areas, gaps favouring regeneration</td>
</tr>
<tr>
<td>Droughts</td>
<td>Serious damages to trees and stands</td>
<td>Reduced timber volume and reduced high-quality timber supply; higher susceptibility to pests and pathogens; higher mortality; effects on nutrient cycling, habitats and fauna</td>
</tr>
<tr>
<td>Extreme weather events</td>
<td>Migration of tree species/loss of native tree species</td>
<td>Loss of biodiversity and habitats</td>
</tr>
<tr>
<td></td>
<td>Potential reduction of some of the damaging effects of pests</td>
<td>Reduced tree damage and yield losses (either quantity or quality)</td>
</tr>
</tbody>
</table>

Source: EEA Report 12/2012, adapted from Brown et al. (2012)
Example: forests and forestry key messages

• **Forests provide multiple goods and services**, including wood supply, carbon accumulation, ecosystems services, water purification, protection against natural hazards and recreational services.

• **Forests in Europe have been accumulating carbon (C)** at a rate of more than 100 million tonnes (Mt C) per year from 1990 to 2010. The area covered by forests and other wooded land in Europe (39 EEA countries) has increased for many decades.

• **Climate change is expected to have major impacts on forest ecosystems**. Rising atmospheric CO2 concentration, higher temperatures and changes in precipitation are likely to have significant effects on the vegetation period, growth, health and distribution of trees as well as on forest ecosystems, and thus on the goods and services provided by forests.

• Climate change may also enhance the **frequency of favourable conditions for forest fires** extending the fire season in both time and space.

• An increase in storms, droughts and heat waves can lead to **higher rates of tree mortality**, and make forests **more susceptible to secondary damages, such as insect and fungal infestations**.
Adaptation in Europe (EEA report, 29 April 2013)

- To inform and support policymakers who are/will be formulating or implementing adaptation policy and actions ((trans-)national, regional, local authorities, private stakeholders)

- To demonstrate that adaptation actions are already being taken across Europe

- To support the implementation of the 2013 EU Adaptation Strategy
Adaptation is already happening...

'Sand motor’ beach replenishment, Ter Heijde, Netherlands

Campaign to prevent insect-borne diseases, Emilia-Romagna, Italy

Restoration of the Danube, Kalimok marsh, Bulgaria

Peatland restoration, Lough Boora, Ireland

New grape variety research, Spain

Cantonal Insurance Monopolies, Switzerland

European Environment Agency
Examples of some adaptation in forest management

- Better resilience against heavy storm events — Germany
- Conversion of tree composition at local level — Poland
- Increasing drought resistance of species — Spain
- New silvicultural practices — France
- Strategies of forestry companies — Sweden
- Adaptive silvicultural practices — Austria

Forest regeneration with conversion to broadleaved species, Slovakia

Mediterranean forest with mixed domestic species, France
The EU funded FP7 project ‘MOTIVE’ (MOdels for AdapTIVE forest Management) investigated **adaptive management strategies** that address climate and land use change.

It also examined the **impacts** of these changes on a broad range of **forest goods and services**.

It focused on **regional case studies**, implemented in a participatory process with local stakeholders.

Source: MOTIVE project, Joanne Fitzgerald and Marcus Lindner (editors), http://motive-project.net/
Key messages

• **16 of the 33 EEA member countries have national adaptation strategies**, and some have started to prepare/implement action plans.

• Some **transnational regions** (e.g. the Danube, the Baltic, the Alps and the Pyrenees) and **cities** have developed or are developing adaptation strategies.

• Examples are available of actions taken, using different measures (‘**grey**’ **measures** using technological and engineering approaches, ‘**green**’ **ecosystem-based approaches** using nature, and ‘**soft**’ **measures** such as policies to change governance approaches)

• Challenges include the need for **coherent, flexible and participatory approaches**
European Climate Adaptation Platform Climate-ADAPT

- Supports governmental decision-makers developing/implementing climate change adaptation strategies, policies and actions
- Launched March 2012 (DG CLIMA, EEA)
- EEA maintains, with Commission, and supported by ETC CCA

http://climate-adapt.eea.europa.eu
Key tools:

- Adaptation support tool
- Overview of countries activities
- Case study search tool
- Database
- Share information
EU Adaptation Policy

In April 2013 the European Commission adopted the EU strategy on adaptation to climate change which sets out a framework and mechanisms for taking the EU’s preparedness for current and future climate impacts to a new level. The EU finances adaptation to climate change in Europe through a wide range of instruments.

Climate policy mainstreaming is the involvement of actors, whose main tasks are not directly concerned with climate change, working towards the goals of mitigation, or adaptation. Adaptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause. Early action will save damage costs later on, so adaptation strategies are needed at all levels of administration, from local to international.

Mainstreaming climate change adaptation in EU policies is one of the pillars of the European Commission’s 2009 White Paper “Adapting to climate change: Towards a European framework for action”. In the Europe 2020 strategy for smart, sustainable and inclusive growth, the following statement is made on combating climate change: ‘We must also strengthen our economies’ resilience to climate risks, and our capacity for disaster prevention and response’.

EU policies in which such mainstreaming is ongoing or explored are:

- **Agriculture and Forestry**
  - The European Commission’s EU strategy on adaptation to climate change...
  - Read more

- **Biodiversity**
  - Climate change is expected to have a substantial impact on biodiversity, the functioning of ecosystems...
  - Read more

- **Coastal areas**
  - Sea level rise can cause flooding, coastal erosion and the loss of low-lying...
  - Read more

- **Disaster risk reduction**
  - Over the last few years, Europe has experienced severe forest fires, floods, and droughts...
  - Read more

- **Financial**
  - Read more

- **Health**
  - Read more

- **Infrastructure**
  - Read more

- **Marine and fisheries**
  - Read more

- **Water management**
  - Read more
Responsibility for climate change adaptation is split between national, regional and local levels.

- The creation of a National Observatory for the Effects of Global Warming (ONERC) in 2001, tasked specifically with adaptation to climate change, followed by the adoption of the National Adaptation Strategy in 2006, marked the beginning of French government activity in the adaptation field;
- Programme law 2009-967 of 3 August 2009, relating to the implementation of the Grenelle Environment Forum, makes provision in Article 42 for "the preparation of a National Adaptation Plan for a variety of areas of activity by 2011". The first National Adaptation Plan was published on 20 July 2011 and aims to present concrete measures designed to prepare for and exploit new climatic conditions in France. The Plan covers a five-year period (2011-2015). 20 key fields are identified for action. More than 90% of actions have started and some like Dris les futur du climat are completed.
- Regional adaptation guidelines are defined in Regional Climate, Air and Energy Schemes (SRCAE) and local adaptation actions are designed within Territorial Climate-Energy Plans (PCET), under the provisions of Law 2010-788 of 12 July 2010.

Some French overseas communities have a specific competency regarding environmental policy (e.g. French Polynesia, New Caledonia). Thus adaptation policy falls under their local decision making process. French Polynesia is currently developing its strategic climate plan with specific provisions for adaptation issues.

In November 2009, France submitted its fifth national communication to the UNFCCC, with a significant part dedicated to adaptation issues and policies.
Database search

CLIMATE-ADAPT database
The database contains quality checked information and is annotated by climate adaptation experts with keywords.

Find data that has...
- Any of these words:
- All of these words:

Type of data
- All types
- A selection of types

Extended search
- Adaptation sectors
- Climate impacts
- Adaptation elements
- Countries

Search results: 1305
- Publications and reports (357)
- Information portals (135)
- Guidance (67)
- Tools (30)
- Maps, graphs and datasets (100)
- Indicators (42)
- Research and knowledge projects (367)
- Adaptation options (65)
- Case studies (66)
- Organisations (76)
Some statistics on Climate-ADAPT

- About 15 000 unique visitors per months on average
- 5th most visited EEA domain after HomePage, EUNIS (nature information), Glossary and Natura2000 (protected areas)
- Pages most visited are:  
  - Country profiles  
  - Adaptation support tool
- Visitors mostly from Denmark, Italy, Germany, UK, Netherlands, France, Belgium, US, Spain and Austria
- Visitors access through:  
  - Direct link (25%)  
  - Google (25%)  
  - EEA web site (20%)
Climate-ADAPT next steps

- Dissemination (Trainings, presentations, brochure, videos); Newsletter
- Update national and transnational information (e.g. Baltic Sea Region)
- Enhance city information
- Case studies improvement and enhancement
- Include outputs from key EU research, DG CLIMA, Interreg, LIFE+ projects on adaptation
- Include information on EU funding options
- Extend to include other countries (e.g. West Balkan)
- Links/interface to (future) Copernicus climate change service
Conclusions

- **Indicators** are available but further monitoring and national and EU research are needed. **Copernicus** projects and the planned EU climate change service and national services are essential.

- **Mainstreaming** of climate change adaptation in EU policies is taking place; the European Commission adopted an EU adaptation strategy in April 2013 with proposals for further action.

- Many EEA member **countries** have developed impacts, vulnerability and adaptation **assessments** and several countries and cities have **strategies** in place (and some also **action plans**); also many transnational actions have taken place or are planned (e.g. Baltic Sea Region).

- The European Climate Adaptation Platform and transnational, national and city level adaptation platforms will support climate change adaptation at various governance levels.
http://www.eea.europa.eu/themes/climate
http://climate-adapt.eea.europa.eu