



Adapting to a changing climate in Europe Strategies for reducing risk and building resilience

SUMMARY *Global temperatures on land have risen by 0.9°C since the 1950s, and are expected to continue rising by 2°C and more, compared to pre-industrial temperatures.*

The changing climate affects many sectors of business and society. Different kinds of adaptation measures are needed for each situation – there is no one-size fits all approach.

Adaptation to a changing climate can be undertaken at all levels: individuals, companies, international organisations, cities, regions and countries. Insurance, as a traditional risk management tool, can play a meaningful role in managing climate risk.

In the EU, adaptation is primarily the responsibility of Member States and local actors. The European Commission (EC) supports coordination, research and knowledge-sharing. The EU adaptation strategy, adopted by the EC in April 2013, sets out EU actions and promotes actions by Member States.

Some economists argue that adaptation measures are best carried out by private actors, with only a limited role for states or international organisations. Experts note that adaptation measures should provide the most cost-effective way to achieve an acceptable level of risk and should not be delayed because of uncertainties about future impacts.



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The Thames Barrier aims to protect London from floods.

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Glossary

Adaptation: adjustment of behaviour to limit harm, or exploit beneficial opportunities, arising from actual or expected climate change.

Adaptive capacity: the ability or potential of a system to respond successfully to climate variability and change.

Resilience: the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change.

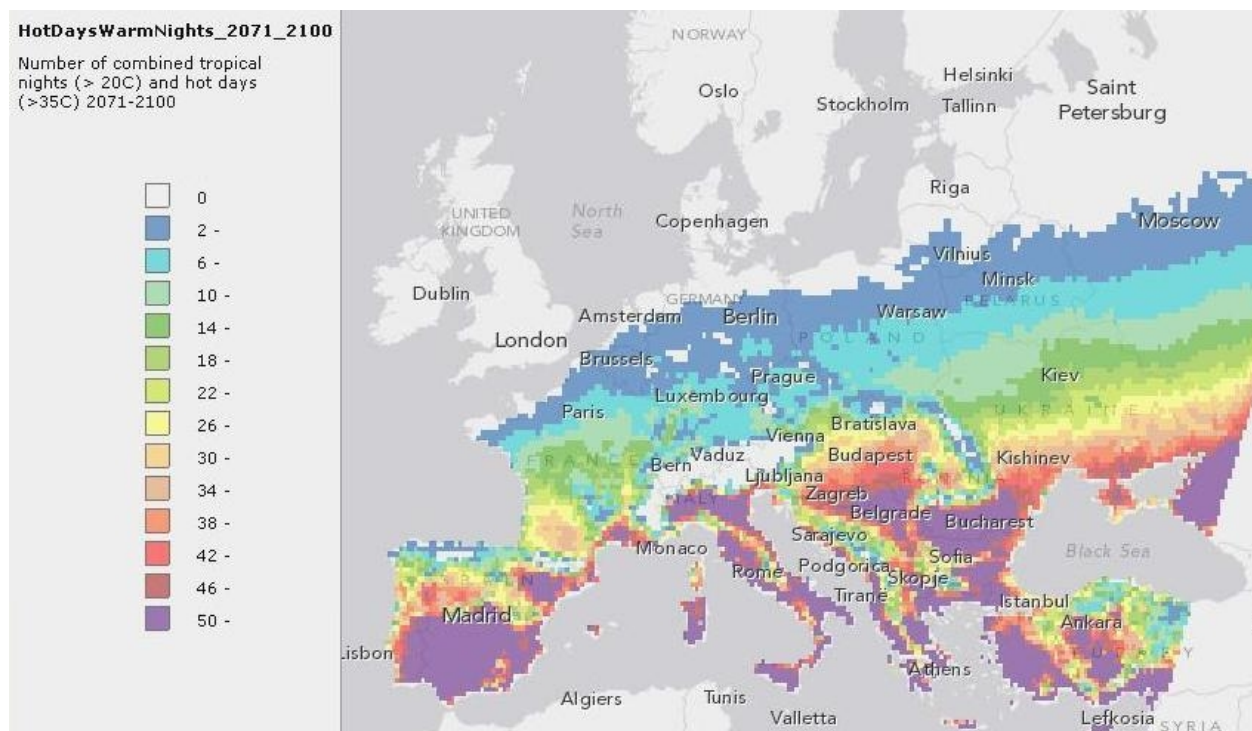
Expected climate impacts

Greenhouse gases and climate change

Most climate scientists [agree](#) that it is very likely that human activities, notably the emission of greenhouse gases (GHG), cause climate change. In May 2013, the atmospheric concentration of CO₂ – the most important GHG – [reached 400 parts per million](#) (ppm), [up from 280 ppm](#) in pre-industrial times.

While GHG emissions in the EU27 fell by 12% from 1990 to 2011, [global GHG emissions](#) have grown by almost 50% in the same period. China's GHG emissions in 2011 were larger than those of the EU and US combined.

Global temperatures on land have risen by 0.9°C since the 1950s. In Europe, the past decade was the warmest on record, with temperature on land 1.3°C above the pre-industrial level. Due to the inertia of the

Figure 1 - Heat-wave risk of European cities for the period 2071-2100

Number of combined tropical nights and hot days (2071-2100). Source: [EEA](#)

climate system, temperatures would continue to rise even if GHG emissions were stopped immediately.

However, a significant decline in global GHG emissions in the near future is unlikely. Economic growth in Asia (based mostly on coal power) will lead to increased emissions. [Carbon prices](#) in the [ETS](#) and other carbon trading systems are too low to incentivise investments in low-carbon technologies. A global agreement to reduce GHG emissions is being negotiated, but will not come into force before 2020. The widely agreed [target](#) of limiting global warming to 2°C above pre-industrial levels is [likely to be missed](#).

Impacts

Climate change has already had wide-ranging impacts in Europe, according to a comprehensive [report on climate change, impacts and vulnerability](#) published by the European Environment Agency (EEA).

The current and expected impacts include:

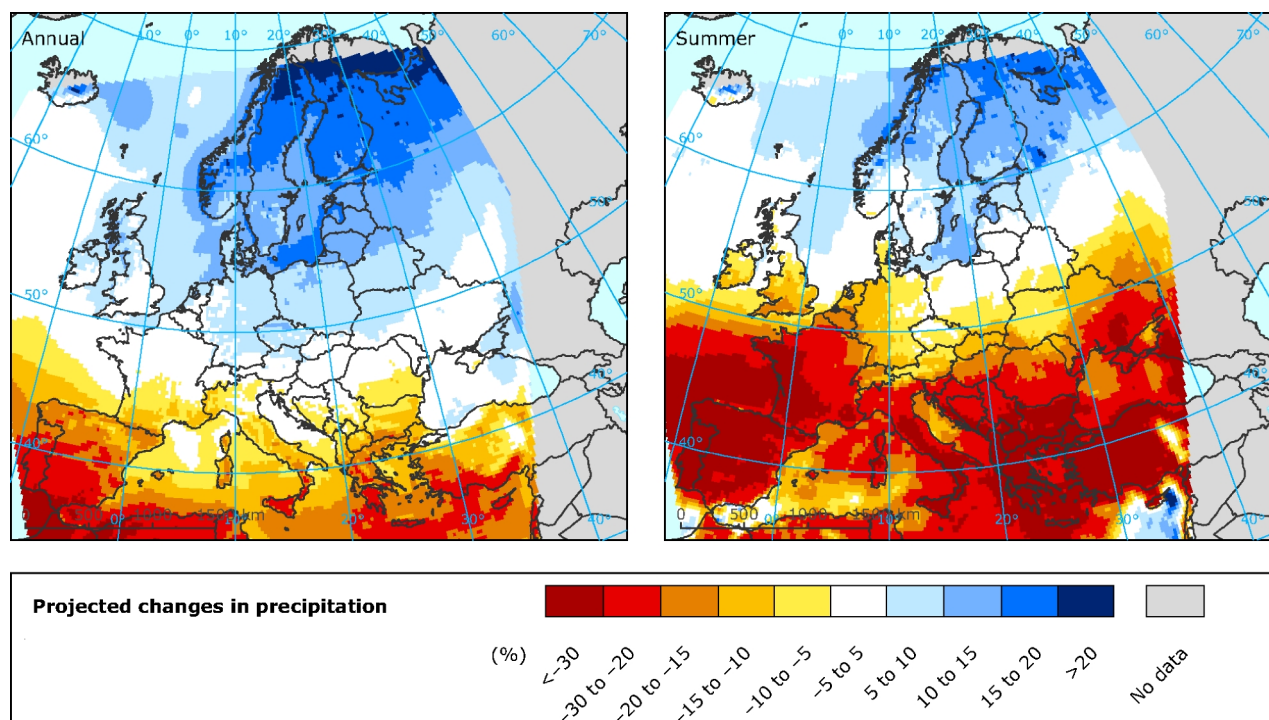
- heat waves (figure 1), causing drought, forest fires, and affecting the health of vulnerable persons,
- rising sea levels (3 mm a year in the last

two decades), leading to coastal erosion, storm floods and flooding of coastal areas (figure 2),

- changing rainfall patterns (figure 3), leading to reduced recharge of groundwater reservoirs, floods, droughts and desertification, reduction of snow pack and glaciers,
- [increased ocean acidity](#),

Figure 2 – Areas vulnerable to sea level rise

EU coastal lowlands (areas less than 5 metres above present sea levels are shown in red). Source: [EEA](#)

Figure 3 - Projected changes in precipitation for 2071–2100 vs. 1961–1990 (%)

Changes in annual and summer precipitation for 2071–2100 vs. 1961–1990 (%). Source: [EEA](#)

- more [extreme weather-related events](#) such as storms, [floods](#), avalanches and mudslides,
- species may become extinct or migrate to other areas, where they may have impacts on biodiversity,
- pests, [deadly fungi](#) and diseases may expand their range, with impacts on human health and agriculture.

Although individual events like the European heat wave of 2003 or the [floods of 2013](#) cannot be directly attributed to climate change, such events are more likely to occur in a warming climate.

Climate change has impacts on a number of sectors, for example agriculture (heat waves, floods, pests and diseases, changes in rainfall and water availability), [electricity generation](#) (water availability for hydropower and cooling of power plants), transport (floods, storms, sea-level rise), health (heat waves, new diseases), tourism (less snow, more rain, heat waves), insurance (claims from weather-related disasters).

Urban areas are particularly affected by [heat waves](#) and water shortages. Natural habitats

of plants and animals are likely to be [reduced](#) in size.

Impacts are not evenly distributed. While some regions are expected to suffer losses, others stand to benefit from higher temperatures through increased agricultural productivity (e.g. longer growing seasons in northern areas) and lower heating costs.

Climate impacts can [cause people to migrate](#) ("climate refugees"), and may provoke [international conflicts](#) (e.g. in South Asia).

The impacts are expected to increase with rising temperatures. However, there is uncertainty about the magnitude of the impacts and their geographical distribution.

Adaptation measures and strategies

Adaptation measures

Some examples of adaptation measures are:

- crops resistant to heat and drought,
- air conditioning,
- improved flood defences,
- heat-tolerant road surfaces,
- flood insurance,

- water management,
- green infrastructure.

Adaptation measures can be classified as grey, green or soft. Examples of **grey actions** (technological and engineering actions) are flood defences and dykes. **Green actions** are ecosystem-based approaches that use natural systems to reduce the risk of impacts, e.g. by protecting moors, which store water and reduce the risk of floods and water shortages. **Soft actions** alter human behaviour or governance, e.g. spatial planning or information campaigns.

Adaptation also aims to reduce the risk of damages from extreme climate events, which result from exposure and vulnerability. Exposure is the presence of people or assets in places that could be affected, and vulnerability is a predisposition to suffer adverse effects.

Regularly checking the well-being of elderly people during a heat wave is a measure to address vulnerability. Exposure can be addressed, for example, by [resetting](#) people whose houses are at risk of river floods. The vacated areas can then be used to expand the floodplain of the river in order to reduce flood risk for cities downstream.

Adaptation actors

Most adaptation measures need to be carried out at a local level by individuals, companies, cities and regional authorities. National governments and the EU can play a role in providing information, coordinating actions, and adapting major infrastructures.

Adaptation strategies

The report [Adaptation in Europe](#), published by the European Environment Agency in

Adaptation vs. mitigation

In contrast to adaptation, mitigation aims to prevent or limit climate change, typically by reducing GHG emissions. Mitigation can reduce the impacts of climate change, and thereby also the costs of adaptation.

A [recent study](#) concludes that strong mitigation can reduce the impacts expected for the year 2100 by up to 65%. The EC's Joint Research Centre ([PESETA](#) project, 2009) estimates that EU welfare would be reduced by 0.2% in case of a 2.5°C temperature rise, and by up to 1% for 5.4°C. The [Stern Review](#) concludes that losses will amount to 5% to 20% of global GDP if GHG emissions are not reduced.

While adaptation actions have a local effect and are often motivated by self-interest (for instance farmers switching to more drought-resistant crops), mitigation actions address climate change on a global scale. A country that opts for unilateral mitigation actions may be at an economic disadvantage.

Mitigation agreements are therefore subject to intense [international negotiations](#).

May 2013, advocates a coherent approach to adaptation, which starts with a comprehensive risk assessment and takes societal changes into account.

Decisions about adaptation must be taken in the face of uncertainty about future climate change and its impacts at the local level. This calls for flexible adaptation plans that help increase the resilience of natural and social systems. 'Low-regret' adaptation actions, which make sense for a wide range of possible future climate conditions, are more attractive than 'high-regret' actions which make sense only for a few of the possible future conditions.

The costs of impacts depend on the magnitude of climate change and on the preparedness of societies. The former is addressed through mitigation, and the latter through adaptation. According to a [World Bank report](#), a temperature rise of 4°C could exceed the adaptive capacity of many societies.

Evaluation and assessment are undertaken to determine whether adaptation measures have been cost-effective, i.e., the benefits exceed the costs.

The role of insurance

Insurance can play a dual role in adaptation. On the one hand, insurance payouts reduce the financial impact of events like flooding or storm damage. On the other hand, the cost of insurance premiums for properties with high exposure to climate risks can provide an incentive for adaptations which reduce the risk.

EU policy

Since 2009, the EU has taken a number of actions to support adaptation efforts. The publication in 2013 of a Communication on an EU adaptation Strategy marks the beginning of a second phase of EU action.

Adaptation actions (2009-2012)

Following a [green paper](#) in 2007, the EC adopted a [white paper](#) outlining an EU adaptation framework in 2009. The actions comprise strengthening the knowledge base, mainstreaming adaptation into EU policies, financing, and cooperation within the EU and beyond.

Building a stronger knowledge base

The [European Climate Adaptation Platform \(CLIMATE-ADAPT\)](#) offers an information database with case studies, publications, tools, and interactive maps.

Research into climate impacts and adaptation was supported through the Seventh Research Framework Programme. The [ClimateCost](#) project estimated the costs of climate impacts under different emissions scenarios and evaluated the benefits and costs of adaptation measures. The EC's Joint Research Centre carried out the [PESETA II](#) project, which studied the biophysical and economic impacts of climate change on different sectors of the EU.

Mainstreaming

Climate adaptation is taken into account in sectoral EU policies, for example agriculture, transport, energy or public health.

EU Strategy on Adaptation

On 16 April 2013, the European Commission adopted a Communication on an EU Strategy on adaptation to climate change

([COM\(2013\)216](#)), which promotes action by Member States and sets out EU actions. It was preceded by a [public consultation](#) in 2012.

The strategy is accompanied by a number of sector-specific documents concerning [coastal and marine issues](#), [health](#), [infrastructure](#) and [migration](#). A [green paper on insurance for natural and man-made disasters](#) raises questions about the role which disaster insurance should play in supporting adaptation.

Wine industry

Wine production is very dependent on climate: specific grape varieties need the right temperatures and predictable rainfall to produce top quality wines.

With rising temperatures, wine regions shift north (for example to Britain and Sweden), and different grape varieties thrive (red instead of white).

The Bordeaux wine region in south-western France is at risk from higher temperatures and summer droughts. Wine growers are already taking adaptation measures, such as using grape varieties that are more resistant to heat.

Objectives

The strategy aims to help make Europe more resilient to climate impacts through a coherent approach and improved coordination.

It encourages all MS to adopt comprehensive adaptation strategies and supports adaptation by cities. So far, [15 MS](#) have adopted such strategies. The EC will set up indicators to evaluate vulnerabilities and adaptation efforts.

The strategy aims at closing knowledge gaps and further developing the CLIMATE-ADAPT platform.

Financing

In the [multi-annual financial framework](#) for 2014-2020, at least 20% of spending is foreseen for climate-related actions (mitigation and adaptation) across all policy areas (mainstreaming).

Adaptation to climate change plays a major role in the [Seventh Environment Action Programme](#) proposed by the EC. The EP [supports the proposal](#), and also called on the EC to put forward proposals for combating invasive species and pests which proliferate as a result of climate change.

European Parliament

The [EP resolution of 6 May 2010](#) on the white paper calls for a “cross-sectoral approach based on ecosystem resilience, habitat and biodiversity protection” and emphasises the importance of research, water management, and sharing knowledge with developing nations.

The [proposed EU adaptation strategy](#) was referred to the Environment Committee.

Reactions

Council, in its [conclusions](#) of 18 June 2013, calls on the Commission to consult with MS on the approach and criteria for carrying out its assessment of MS' progress.

Expert and stakeholder positions

[Jim Hall](#) (University of Oxford) warns that uncertainty about future climate change is not a reason to delay adaptation. Societies should identify the most cost-effective ways of maintaining a tolerable level of risk.

The [European Policy Centre](#) (EPC) favours EU action in knowledge provision and coordination, and calls for analysis of the costs and impacts of adaptation policies and measures for different regions and economic sectors.

The [EPC-King-Baudouin-Foundation task force](#) considers adaptation as an opportunity to innovate, encourages a multi-stakeholder approach and insists that adaptation policies and measures cannot wait.

[Economists](#) see adaptation primarily as the responsibility of companies and individuals. They consider that the role of the state should be limited to the provision of information, local public goods (such as dykes or green infrastructure), and regulation of insurance markets. Matthew Kahn [predicts](#) that cities will thrive in a warmer climate, as capitalism will help the world adapt to climate change.

Thomas Schelling noted in 1992 that richer, highly developed societies are less

vulnerable to impacts of climate change. Therefore, sacrifices in economic growth, which are made to slow down climate change, increase vulnerability.

Submissions to the EC's [public consultation](#):

Eurelectric, representing the electricity industry, is concerned that adaptation-driven environmental regulations and planning processes may complicate the approval of new energy projects.

Climate Alliance, a network including more than 1 600 European municipalities, points out that EU-wide networks of local authorities can help connect the EU strategy with local needs.

The UK, the UN Environment Programme and the World Food Programme highlight the international dimension of adaptation. They propose to cooperate with countries facing similar challenges and to take adaptation into account in development policy.

Main references

[Climate change, impacts and vulnerability in Europe 2012](#) / EEA, 2012

[Adaptation in Europe - Addressing risks and opportunities from climate change in the context of socio-economic developments](#) / EEA, 2013

[Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation \(SREX\)](#) / IPCC, 2012

[Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments](#) / OECD, 2008

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