

Climate change and water adaptation issues

The impact of climate change on Europe's water resources is a critical issue for people's lives and the economy. Even if emissions of greenhouse gases were stabilised today, increases in temperature and the associated impacts, including water availability and flooding, will continue for many decades to come. Countries are aware of these impacts and have started to adapt to them but there is still much to do.

Too much water and too little: In recent decades more intense rainfall events have occurred and parts of Europe have experienced extreme weather events in the form of severe floods, droughts and heat waves. Analyses from climate change models project an exacerbation in the frequency and intensity of these events. Changes in precipitation, combined with rising temperatures and reduced snow cover, will have impacts on water quality and quantity, requiring water managers to incorporate climate change in their planning and investment decisions. While uncertainties remain about the level and extent of changes in precipitation in specific locations, enough is known for action.

Sectoral and regional aspects: Water is a critical core sector so that impacts

here have a cascading effect. Economic sectors which are projected to be most affected are agriculture (increased demand for irrigation), energy (reduced hydropower potential and cooling water availability), health (worsened water quality), recreation (water-linked tourism), fisheries and navigation. Serious impacts on biodiversity loom. The dominant impacts are flooding in central Europe, hydropower, health and ecosystem concerns in the northern countries, and water scarcity in the southern countries.

Embedding adaptation: Climate change is an important driver but there are other factors that affect European water management. Climate change concerns need to be integrated with other issues. For example increased water demand for agriculture, and tourism,

and land-use development in flood-prone areas, can increase vulnerability to climate change. Strategies for adaptation need to be embedded within existing national policy and institutional frameworks. Overall adaptation seems to be facilitated if it coincides with other objectives, and if win-win solutions can be implemented that also have other benefits. A range of strategies and actions are possible, including 'no regrets' measures, so there are often difficult policy choices to be made, for example, between additional capital investments or campaigns to promote behavioural change. The aim should thus be to achieve cost-effective and flexible frameworks which can be modified as scientific understanding improves.

Sustainability aspects: From the sustainable development perspective, the top priority for adaptation in the water

sector should be to reduce the vulnerabilities of people and societies to shifts in hydro-meteorological trends, increased climate variability, and extreme events. A second priority should be to protect and restore ecosystems that provide critical land and water resources and services. A third should be to close the gap between water supply and demand by enhancing actions which reduce demand. A wide range of strategies are available to address these priorities, including sharing the losses, preventing the effects, research and education. Climate change impacts can also be limited by structural and technological change, and/or regulatory and institutional change.

Time and multi-stakeholder dynamics:

Implementation of any of these strategies takes considerable time, particularly if substantial step changes are needed. Successful adaptation will also require interactions between multiple levels of government: European, national, sub-national, and local, as adaptation at one level can strengthen, or weaken, adaptive capacity and action at other levels. A range of civil society and business sector organisations should also be involved. These governance and engagement issues enhance the need for action now.

National practices:

European countries expect significant changes in water resources and hydrology as a consequence of climate change, and policy-makers are generally well-informed

about the results of up-to-date scientific research. In many countries adaptation research is taking place and adaptation policies are being planned and developed, but much remains to be done. So far only a few countries have overall national policy frameworks in place on climate change adaptation. In the water sector, initiatives include long-term planning and policy-oriented research, institutional development, technical investments, spatial planning and regulatory measures, flood defence and management in response to observed trends, coastal defence, and management of water scarcity. Many adaptation activities currently seem to be focused on flood management and defence, while measures related to the management of water scarcity and drought, although recognised in the vulnerability assessment as also damaging, do not yet seem to be widespread. Uncertainties with respect to future climate change impacts are a major obstacle to the development of adaptation actions.

Many countries highlight the subsidiarity principle and the need for Member States to react flexibly to the specific challenges in their countries. However, many see a role for the EU in the coordination of trans-boundary issues, sectoral policies — including funding, supporting monitoring and information exchange, research funding, awareness-raising and education.

European policies: There are several tools and emerging frameworks at the European

level which can provide the necessary coherent European leadership and vehicles for coordination, guidance and awareness-raising. The Green Paper on Climate Change Adaptation, to be published in 2007, is expected to create an EU-wide legal framework, such as support for adaptation within the EU's direct funding programmes, in particular the Structural, Cohesion and Solidarity funds, the Agriculture and Rural Development funds, and the LIFE+ instrument. These funds are already being accessed for activities relevant to climate change adaptation which will create new challenges on resource allocation. The funds should increasingly be used to support EU climate change policy objectives. There are also existing and new directives and initiatives which can be mobilised.

While the main text of the Water Framework Directive (WFD) does not explicitly address climate change, it is well-suited to handle the long-term implications of climate change with its step-wise and cyclical approach. Its effectiveness to deliver climate change adaptation will depend on the extent to which the long-term perspective is included in river basin management plans. Implementing the Directive requires assessment of the impacts of climate change on the reference conditions of water bodies and on the cost-effectiveness of water management strategies. Adaptation could be explicitly incorporated

into the implementation of the WFD in various ways, for example through a climate change impact assessment for each river basin district and inclusion of associated catchment-wide actions in the programmes of measures. Inclusion of climate change

impacts and adaptation indicators in WFD monitoring activities could also be considered.

There are other relevant EU policy instruments. The proposed Directive on the Assessment and Management

of Floods complements the WFD by specifically addressing flood risks which are affected by climate change. Similarly, the proposed Marine Strategy Directive also provides an overall framework for developing marine strategies that could take into account

Country	Selected current initiatives
Austria	FloodRisk — integrated flood management StartClim (flexible focus — heat waves and droughts, health, tourism)
Belgium	Veilige Kust (Flanders): coastal management Sigma Flood Protection Plan: Regional initiative, focus flood protection and control
Cyprus	New and improved irrigation systems and desalination units
Finland	National Adaptation Strategy, improved dam safety, restriction of development in flood risk zones
France	Flood risk management measures through new legislation Sustainable water management measures, drought plan of action and financial instruments Study on adaptation recently launched (Meuse, Loire; Gironde and Rhône river basins)
Germany	Improvement in landscape water balance guideline (Brandenburg) Adaptation to climate trends and extreme weather conditions and sustainable groundwater management strategy (Hesse) Master Plan Integrated Coastal Defence Management KLIWA and ESPACE projects (Bavaria)
Hungary	VAHAVA project (coordination, publication/dissemination, expert debates on climate change issues) The New Vásárhelyi Plan (emergency reservoirs along Upstream- and Middle Tisza sections to enhance flood safety, covering conservation ecotourism, agro-ecological farming, rural development)
Malta	Water conservation and water-saving measures (e.g. reducing leakage from distribution network; water metering in households and establishments)
Netherlands	Space for the river — long term spatial planning Agreement between authorities on incorporating climate change into planning for 2015 Increase capacity (pumping, discharge capacity of sluices) Strengthening coastal defence to incorporate sea level rise and extension of beach nourishment programme
Romania	Adaptation under different water legislation; National Action Plan on Climate Change (2005) highlights the need for an Action Plan on Adaptation by 2007
Slovenia	Strategies for flood and drought mitigation under National Environmental Programme (determination of risk areas; regulation of land use)
Spain	National Adaptation Strategy, water scarcity and flood protection measures
Sweden	Ongoing survey on vulnerability of society Permit system for water users
United Kingdom	Incorporating climate change in long term coastal planning — iterative changes Climate change allowances and flood risk management associated with spatial planning and new investments New building standards and guidance for developers UK Climate Impacts Programme — supporting organisations to adapt — since 1997 Changing Our Ways — impacts and adaptation strategy (Scotland)

Source: EEA and German Ministry (BMU) survey, 2006 .

and enable adaptation to the impacts of climate change. The Maritime Policy Green Paper recognises climate change as a major threat, and discusses adaptation to changing coastal risks in Europe. The common fisheries policy has a key role in managing fish populations and, to the extent that climate change affects fish stocks, it could take climate change into account. There is also an EU initiative on drought and water scarcity underway with a communication due in 2007.

Mitigation of greenhouse gas emissions and adaptation:

Providing additional supplies of water to alleviate droughts can often involve more investment in energy, for example desalination plants and pumped water transfer schemes. Improvements in water quality, which may be needed to combat existing pollution, also often require increased use of energy. Land management schemes for river basin protection, for example the use of land for water storage to

alleviate flooding, may have implications for emissions of greenhouse gases. This report does not cover greenhouse gas mitigation but it is evident that efforts should be made to link the two areas of climate change policy which currently operate in separately at all governance levels.

Research and policy support:

There is general agreement within countries about the need for enhanced regional and local climate change scenarios. The greatest demand is for climate information for the next 20–50 years, and even the next 5–10 years. Uncertainties need to be reduced and more knowledge is needed to distinguish the consequences of climate change and of natural climate variability. Countries want regional and local data to be merged with hydrological models, and for improvements in the accuracy of hydrological and hydraulic models, including groundwater. There is also a need to improve the coupling of climate and hydrological models.

Countries see the need to maintain observation networks to identify climate change trends, and suggested including remote-sensing techniques in hydrological monitoring.

Basic gaps still exist: The need for research on the vulnerability of society and ecosystems to climate change impacts is felt by many of countries, particularly for the water sector. Better databases on frequency, intensity and effects of extreme events and on national adaptation practises, including responses to these extremes, would facilitate the development of effective adaptation strategies.

References

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