



The European Alps adapt to changing water resources

The Alps play a crucial role in capturing and supplying water to Europe. Hosting the headwaters of the rivers Danube, Rhine, Po and Rhone, they deliver vital ecosystem services within and beyond the region, underpinning social and economic wellbeing in vast lowland areas. The Alpine climate has changed significantly in the past century, however, posing challenges for decision makers.

STÉPHANE ISOARD

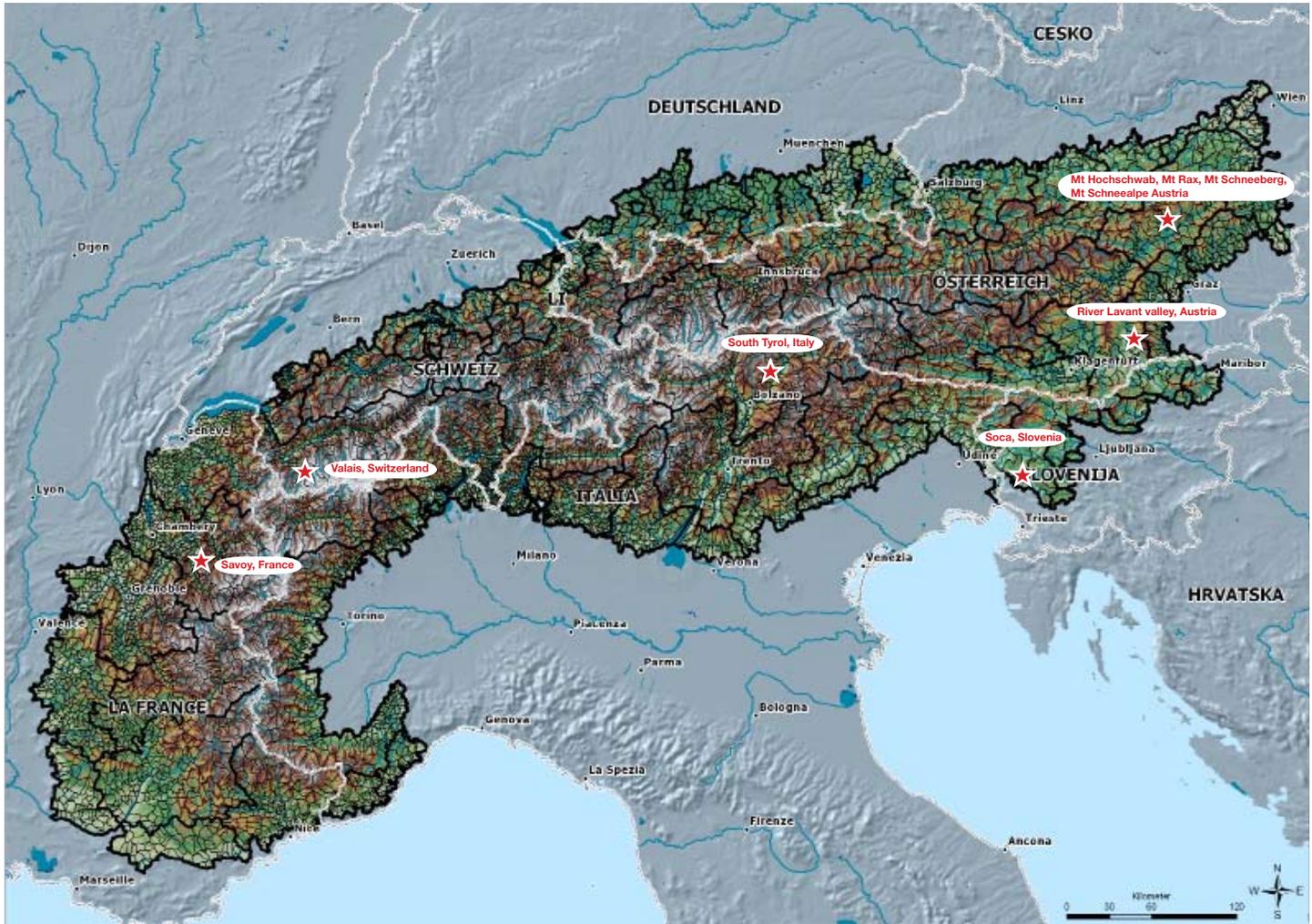
The Alpine climate has changed significantly during the past century. As a recent study by the European Environment Agency (EEA, 2008) notes, temperatures increased by more than twice the global average in that period and are projected to increase by 2.6–3.9 °C above the 1990 level by 2100. Projections show a decrease in summer precipitation and, in most regions, an increase in spring and winter. Precipitation in winter will increasingly fall as rain rather than snow, leading to fewer days with snow cover.

This warming and associated reductions in snow and glacier cover could have grave impacts. The hydrological cycle in the Alps will change, leading to more droughts in summer, floods and landslides in winter and higher inter-annual variability. Economic sectors, including households, agriculture, energy production, forestry, tourism and river navigation, are already vulnerable to water shortages that are projected to increase.

Soil cleans water

Dr Gerhard Kuschnig is working at the City of Vienna Waterworks. As a water expert he is concerned. He states: “The water serving Vienna travels at least 100 kilometres from the springs in the mountains. Our biggest threat at the moment from climate change is increased erosion as it threatens the forests. Without trees and proper foliage the soil will be washed away and it’s the soil that cleans the water. Managing climate change means managing uncertainty and we want to make sure we are asking the right questions.”

Projected water shortages and more frequent extreme events, combined with increasing water demand (for irrigating agriculture or meeting tourist influxes, for example), are likely to have severe adverse effects on ecosystem services, such as the provision of drinking water. Climate change also causes many European plant species to shift northward and uphill. Mountain ecosystems are changing and cold-adapted species are



Six regional case studies

Success factors and barriers to adaptation in the Alps

Regional case studies reviewed in the EEA's report illustrate adaptation to the water resource problems that have resulted from Alpine climate change. They provide valuable insights into the factors that promote or obstruct adaptation.

As the case studies make clear, political support is a key catalyst for initiating, driving and coordinating adaptation to climate change. Such policies are themselves generally responses to extreme events

or natural hazards that motivate public demand for action by authorities.

In addition to political backing, successful adaptation measures were found to exhibit one or more of the following characteristics:

- also promoting other goals, including economic gains;
- a sound legal framework to complement the political support;
- technological adaptation measures, such as improved irrigation techniques, new reservoirs, rainwater harvesting,

wastewater and greywater re-use;

- complementary 'soft' actions on demand management, for example reducing water consumption by households through behavioural change;
- market-based economic incentives and financial support to encourage proactive and innovative adaptation measures;
- stakeholder awareness about the need for anticipatory adaptation actions, especially in sectors with long lead times (e.g. forestry and

power generation);

- making use of local practices and social networks.
- The case studies also identified barriers to adaptation. These included a lack of scientific knowledge and uncertainty about future water availability, quality and demand, the absence of long-term planning strategies, and a failure to use appropriate management tools. Failing to consider climate change explicitly in water supply or demand management plans also created problems.



Because of the fast rate of projected climate change many mountain species will not be able to migrate

Natural alpine grasslands in the Stelvio National Park

being driven out of their ranges. European plant species may shift hundreds of kilometres to the north by the late 21st century and many mountain plant species may face extinction by 2100 if unable to adapt.

High-mountain species are extremely vulnerable to climate change

Dr Franz Essl is working at the Environment Agency Austria, Biodiversity & Nature Conservation Department:

“A recent study has estimated that almost 50% of the unique mountain plant species of the European Alps are at risk of extinction due to projected climate change. This would be a major loss of biodiversity. The risk is even much higher for range restricted species for which total loss of suitable habitats is expected. Because of the fast rate of projected climate change many mountain species will not be able to migrate.”

Observed and projected reductions in permafrost are also expected to increase natural hazards and dam-

age high altitude infrastructure. In addition, climate change can adversely affect winter tourism by reducing skiing areas. To lessen vulnerability to climate change, adaptation will be needed in virtually all economic sectors. For example, the skiing industry will need to plan alternative activities for when there is little or no snow (e.g. economic diversification), and the seasonal workers will need additional training and skills to be able to continue working and provide these new services.

Sebastian Montaz lives in a village in the Chamonix region of France. A mountain guide and ski instructor, he grew up in the French Alps but guides climbers and skiers across the Alpine region. He reports: “Mountains normally change slowly. But here in the Alps we see the changes almost as each season changes. It has changed dramatically since I was a boy and who knows what the Alps will be when my daughter is grown up. For the past five years, from June to July, it has not

been possible to carry out mixed climbing where you climb on snow and ice. Now it's not safe from June until the end of September. Last winter we had the best snow in 9 years but winters like that are now the exception."

Marco Onida is Secretary General of the Alpine Convention. He states: "Within the Alpine Convention, an Action Plan on Climate Change was adopted in March 2009. It aims to make the Alps an exemplary region in preventing and adapting to climate change. Regula Imhoff, Vice Secretary General of the Alpine Convention, reports that "Within this context, for example guidance on sustainable use of hydropower will be given, ensuring good ecological status of water bodies and including measures so dams do not form impassable barriers for migratory fish, while taking into account changing precipitation and river flows due to climate change."

About the author

Stéphane Isoard is project manager at the European Environment Agency for climate change impacts, vulnerability and adaptation issues, and takes part in international climate change negotiations. Since joining the EEA in 2002, Isoard has been responsible for developing outlooks across sectoral and environmental themes, and integrated assessments on climate change impacts and adaptation. He wrote this article at the request of Change Magazine



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Adaptation research & results: the CIRCLE Mountain Call € 2.1 million for transnational mountain research

There is a widespread need among European member states for more specific climate research that incorporates the needs and questions of stakeholders. Within the ERA-Net CIRCLE, a call for applied transnational and interdisciplinary research projects has been launched. An update on CIRCLE MOUNTAIN.

In several European mountainous regions, research centres will be closely looking at 'Climate change impacts (natural

and anthropogenic factors) and response options in mountainous areas'. Project proposals will focus on the effects on water resources, infrastructure, slope stability, agriculture, tourism, public health and biodiversity. The aim of this call is to increase knowledge of options, premises and barriers for climate change impacts and adaptation, including the relationship between adaptation and mitigation in mountainous areas. Special emphasis will be laid on the involvement of deci-

sion makers, developers and relevant stakeholders. This Mountain call is funded by Austrian, French, Greek, Hungarian, Spanish, Swedish and Turkish funding organizations. They have made funding pledges of up to € 2.12 Million. Proposed projects should not exceed € 300,000. Closing date for the Mountain call is 29 January 2010. For more information see: www.circle-era.net

for more information on CIRCLE see p. 14

EU policy options

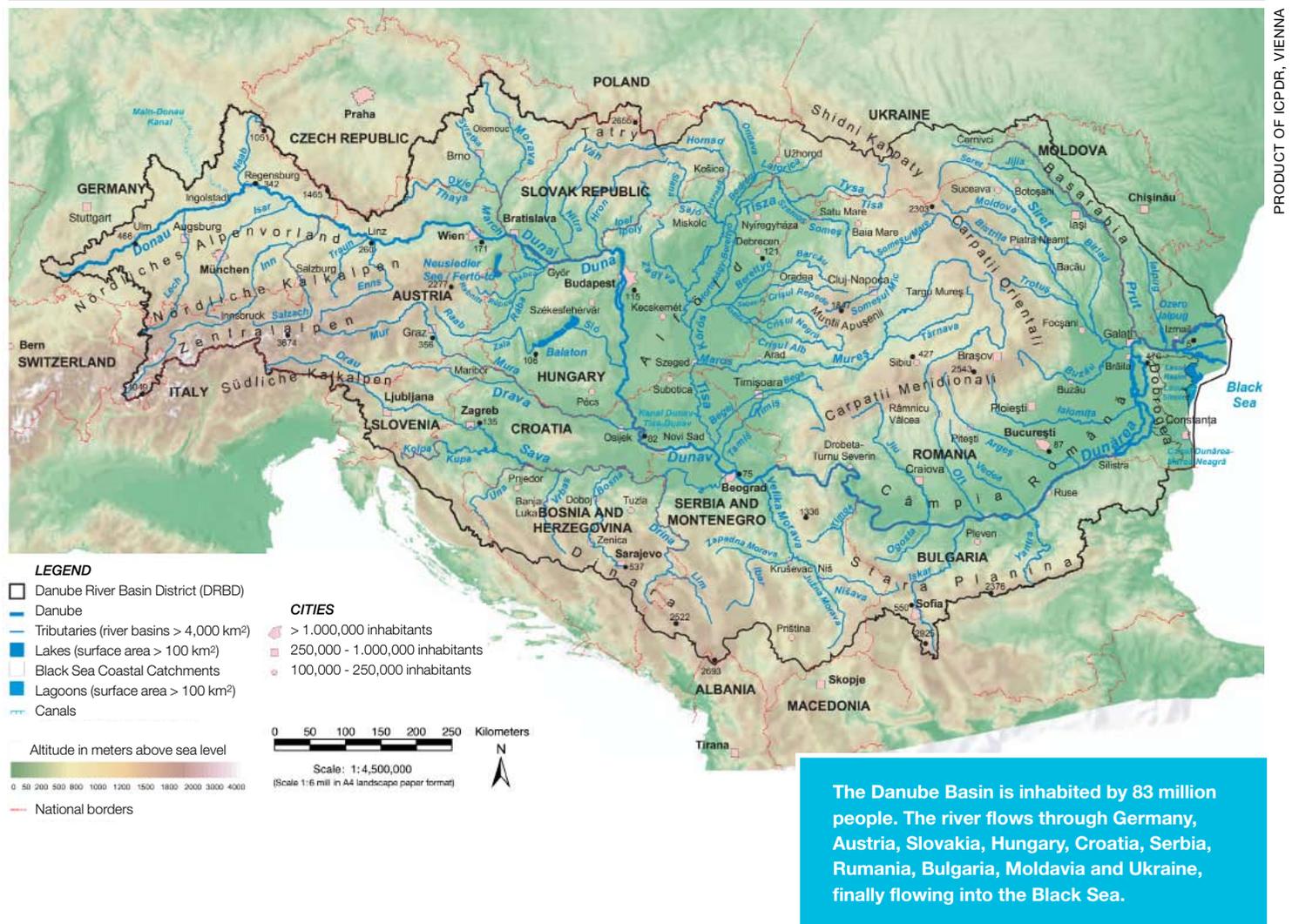
The role of the European Union is important in providing the overall policy framework on adaptation, particularly through the European Commission's Adaptation White Paper (adopted in April 2009) and the Water Framework Directive (WFD).

The Adaptation White Paper sets out a two-phase strategy that complements actions taken by Member States through an integrated and coordinated approach. The first phase will focus on improving the knowledge base on climate change and adaptation measures and means of embedding adaptation in existing EU policies, then a comprehensive EU adaptation strategy will be prepared from 2013 onwards. To support this, an EU clearinghouse on climate change impacts, vulnerability and adaptation is proposed for 2011.

The EU can facilitate the implementation of the first phase by:

- Supporting monitoring and data collection networks to expand time series of key data. More accurate data would better inform policy-makers.
- Developing analytical tools and assessments of adaptive capacity and the vulnerability of natural and human systems. This will help to enhance connectivity between protected areas.
- Developing information platforms on climate change impacts, risks and adaptation options to facilitate information sharing.
- Encouraging countries and regions that have not yet prepared adaptation strategies to do so, and improving transboundary cooperation in managing water shortages along river basins.
- Fostering stakeholder participation in research projects to bridge the gap between scientists, policymakers, civil society and others.

Danube River Basin District: Relief and Topography



PRODUCT OF ICPDR, VIENNA

2010: Total plan for the Danube

The River Danube traces a route of over 1800 miles as it winds through ten European countries. Climate change became bitter reality in the Danube Basin during the dramatic floods of August 2002, August 2005 and Spring 2006.

The Danube is a major shipping artery, agriculture draws irrigation water from the river, and hydropower stations generate electricity. According to the Austrian Danube expert, Helmut Habersack of the University of Vienna, the diverse interests of all the interested parties and nations have hindered the river's sustainable development for decades. At the same time,

the space the river needs is being squeezed as living and working on the waterfront is regarded as increasingly attractive. Perhaps the best-known example of this is 'Donaucity', the business district on the river's banks in Vienna.

Experts from 14 nations are collaborating in the International Commission for Protection of the Danube River (ICPDR) to draft a management plan for the entire Danube Basin, with a planned timetable extending to 2015. The scientists are looking at every aspect: pollution, biodiversity, infrastructure and flood hazard. The plan is due to be discussed by the national mi-

nisters involved in February 2010. ICPDR Chair, the Slovakian Olga Srsnova, says: "It's one thing to draw up a plan. Now we have to ensure that funds are made available. Given the importance Europeans attach to clean, safe surface water, it seems to me nothing other than logical that taxpayers' money should be spent on a clean, healthy Danube." A recent EU Water Barometer found that 68 % of the respondents were worried about the availability and quality of the water in their own country.

MAARTJE SMEETS