

Executive summary

Climate change is reshaping the future for freshwater. It aggravates existing strains and complicates future planning, management and investment in water infrastructures. Reducing the adverse consequences and costs of climate change and tapping into any opportunities will require adjusting to new circumstances – that is, adaptation. Adaptation requires flexibility in a domain characterised by long-lived infrastructure with high sunk costs. It requires foresight where there is low confidence in climate projections for key water parameters at local scale. It also calls for adaptive water governance where inertia and poor water governance are more often the norm than the exception. In response to this challenge, OECD countries are making progress tackling this issue and a number of lessons learned can be drawn from experience to date.

Climate change is, to a large extent, water change. Water is the predominant means through which the impacts of climate change will be felt. More torrential rains, floods and droughts can be expected in many areas. Changing precipitation patterns are shifting rainy seasons and affecting the timing and quantity of melt water from snow pack and glaciers. In many cases, these impacts are making flood protection, water storage, urban drainage, water supply and treatment more costly. Shifts in extremes are likely to create a bigger challenge for adaptation than shifts in averages. They are also likely to be the key cost drivers for adapting water infrastructures. Freshwater ecosystems and the services they provide are especially vulnerable.

Despite abundant evidence of climate change impacts on freshwater, there are **significant gaps in the existing evidence base** that pose challenges for informing practical, site-specific adaptation. The level of confidence in climate change projections for key water parameters decreases as their potential utility for adaptation decision-making increases. However, one trend appears predictable: **the future for freshwater will not look like the past.**

A risk-based approach to adaptation

A **risk-based approach** can provide a flexible, dynamic, and future-oriented approach to adaptation in the absence of reliable climate predictions. A risk-based approach encourages policy makers to consider a whole range of possible future conditions, from the commonplace to the extremely unlikely and weigh the alternatives. Adaptation should not be undertaken in a way that focuses only on climate as a risk driver to the exclusion of other, often more dominant, drivers of water risks, such as social, economic and political systems. At the same time, adaptation should be seen as a prerequisite to improving water security over the long-term.

There is a need to “know”, “target” and “manage” water risks. “Knowing” the risk requires the incorporation of both scientific and technical inputs into risk assessments as well as risk

perceptions. Even under pervasive uncertainty, a range of decision-making approaches (e.g. sensitivity analysis, scenario-based approaches) can be used to help “know” the risk. “Targeting” the risk requires determining the *acceptability* of water risks, in light of potential consequences and costs of amelioration. This also requires weighing “risk-risk trade-offs” that can arise when efforts to reduce a given risk such as shortage may increase other risks, such as disrupting the resilience of freshwater systems. “Managing” the risk requires clarity in terms of risk sharing arrangements between public and private actors. It also means considering all risk management strategies (avoid, reduce, bear or transfer) and applying the full range of policy instruments available. **Policy guidelines** can help to prioritise action and improve the timeliness, efficiency and equity of responses.

Progress on adaptation for water in OECD countries

In order to gauge progress and gain insights from practical adaptation efforts for water systems, the OECD Secretariat undertook a **survey of policies across all 34 member countries and the European Commission**. The results reveal general trends and lessons learned. The survey documents that water is not just an important “sector” for adaptation, but that it is also **an essential resource, as well as a potential threat**, affecting a number of other policy domains – energy, agriculture, infrastructure, biodiversity, and health. Just as energy is a key for mitigation, water is the key for adaptation.

The survey reveals that **all 34 OECD countries have already observed changes in freshwater systems**. Nearly all countries **project increasing water risks** due to climate change. **Extreme events** (e.g. floods and/or droughts) are cited as a primary concern by 32 countries, along with the European Commission (EC). **Water shortage** is a key issue for 23 countries, as well as the EC. **Water quality** is a key concern for 15 countries, while impacts on **water supply and sanitation** were flagged by 16 countries. For 13 countries, **freshwater ecosystems** were among their primary concerns.

The majority of efforts to date in OECD countries have focussed on “**knowing the risk**” by building the scientific evidence base and disseminating information. Governments should ensure that this evidence is used to best effect and meets the needs of users in making practical, on-site adaptation decisions. In terms of **policy instruments**, information-based instruments (e.g. flood risk maps, decisions support tools for risk management, adaptation guidance for local governments) are by far the most widely used.

To “target” and “manage” the risk, some countries are revising **laws and regulations**, such as sustainable water abstraction limits, building codes and land-use planning. Other measures include adjusting **economic instruments** (e.g. water tariffs, water-related environmental taxes, flood insurance schemes) to reduce baseline stress on water systems, raise financing and address flood risks. Only a handful of countries have begun to explicitly address the issue of **financing**.

Laying the groundwork today to prepare for the future

Adaptive water governance and sound water policy will go a long way to enhancing resilience to climate change. However, most water policy instruments have not been

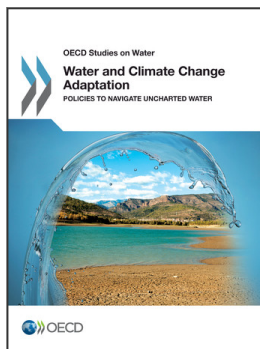
specifically designed with climate change adaptation in mind and may need to be adjusted in light of new evidence. At the same time, some existing policy settings may undermine effective and efficient adaptation by distorting market signals. Climate change strengthens the case for addressing these inefficiencies.

Scaling up the use of **economic instruments** and/or reforming perverse incentives (such as subsidising water supply for certain users, encouraging development in areas at high risk of flood) can provide flexibility and minimise the costs of adjusting to changing conditions. **Flood insurance** can provide incentives to reduce exposure and vulnerability to floods, efficiently spread residual risk and offset the economic impact of water-related disasters. However, greater uncertainty about future climatic conditions makes appropriately pricing flood insurance increasingly difficult. **Water trading** can improve the efficiency of water allocation in response to changing conditions. Temporary transfers can be effective for managing short-term supply variability, but, on their own, they are not sufficient to adjust to long-term declines in water availability. **Efficient water pricing** can boost adaptation by reducing inefficient water use, encouraging the diversification of sources of supply and raising financing for potentially higher investment needs. Incentives for **ecosystem-based adaptation** and **green infrastructure** can provide a cost-effective means to address uncertainty by avoiding or delaying lock-in to capital-intensive infrastructure and provide an additional option value, as compared to alternatives.

Climate change raises new issues for **financing** water and will likely add to the existing funding shortfall. In general, financing adaptation should build on sound approaches to financing water systems generally and avoid skewing financing to “speciality” projects that might be easily labelled as adaptation, but do not necessarily maximise net benefits. Countries should also focus on spending available financing wisely by using flexible investment approaches, such as **real options**, to deal with uncertainty.

Long-term climate change is a novel challenge that will test conventional approaches. The case for action is well-documented and compelling. Not all water risks can be avoided, but well-prepared, **resilient water systems will be better able to adjust to new conditions, at lower cost, and bounce back from disasters more quickly**. Yet, experience shows that mounting scientific evidence and a robust economic case do not necessarily spur action. History is full of examples from water crises and lessons for how they could have been avoided or better managed. Indeed, hindsight can provide valuable guidance for climate change adaptation and help to prepare for the future.

Reforming water systems takes time, stakeholder engagement, and political will, so action needs to start now. Countries that shore up their water governance today and put in place the policies needed to prepare for the future can avoid managing water crises in a reactive and more costly way.



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