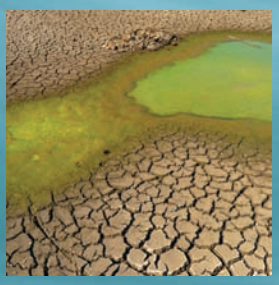
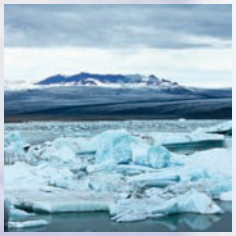
Water and climate change adaptation

AN OECD PERSPECTIVE



"Climate change represents a major challenge for the management of freshwater resources, one that requires a long-term vision and urgent concerted action."

Angel Gurría, OECD Secretary-General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About OECD

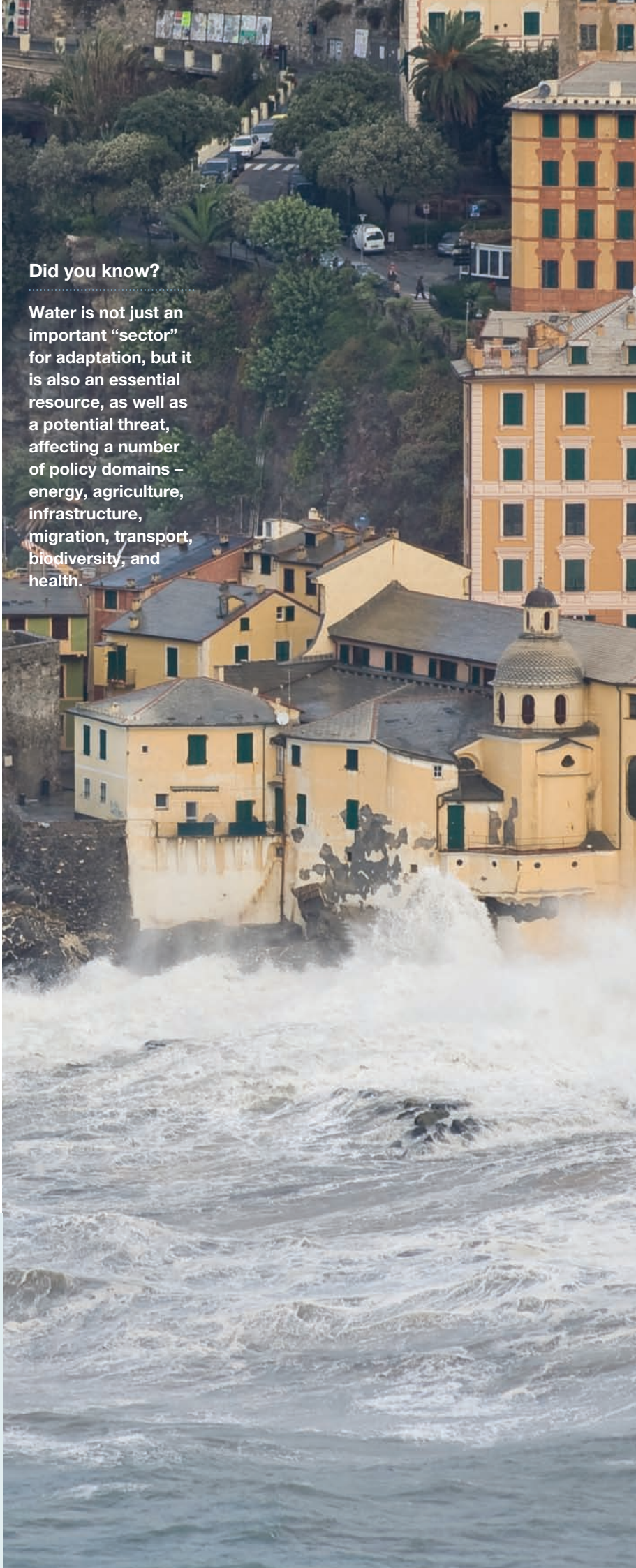
The Organisation for Economic Co-operation and Development (OECD) is a multi-disciplinary inter governmental organisation, tracing its roots back to the post-World War II Marshall Plan. Today, it comprises 34 member countries that are committed to democratic government and the market economy and the European Commission, with the major emerging economies increasingly engaged directly in the work. The OECD provides a unique forum and the analytical capacity to assist governments to compare and exchange policy experiences, and to identify and promote good practices through policy decisions and recommendations.

1 Climate change as water change

Climate change is affecting all aspects of the water cycle. Water is the main way through which the impacts of climate change will be felt. Projections suggest that 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. Impacts on **water quality** can be expected. **Freshwater ecosystems** and the services they provide are especially vulnerable.

Reducing the adverse consequences and costs of climate change and tapping into any opportunities will require **adaptation**. Adaptation is **not about maintaining the status quo at all costs**. It is about adjusting to new circumstances in order to reduce adverse effects and minimise costs and seize any potential opportunities.

The new OECD report *Water and Climate Change Adaptation: Policies to Navigate Uncharted Waters* provides guidance to policy makers on how they can prioritise actions and improve the efficiency, timeliness and equity of adaptation decisions. It sets out a risk-based approach to improve water security in a changing climate. It also documents key trends and highlights best practices from the OECD *Survey of Policies on Water and Climate Change Adaptation*, which covers all 34 OECD countries and the European Commission. Finally the report examines options to improve the flexibility of water governance, policy and financing approaches.



Did you know?

Water is not just an important "sector" for adaptation, but it is also an essential resource, as well as a potential threat, affecting a number of policy domains – energy, agriculture, infrastructure, migration, transport, biodiversity, and health.

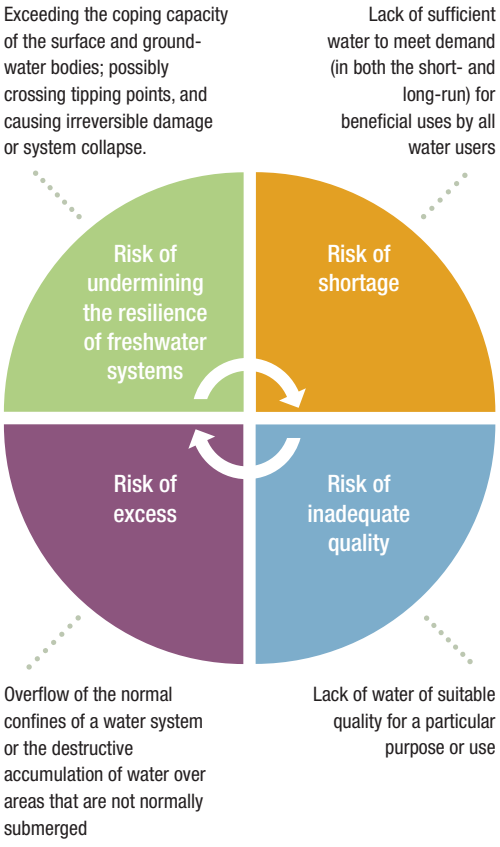
Key challenges for adaptation decision making

In general, the level of confidence in climate change projections decreases as their potential utility for making decisions on how to adapt increases. Adaptation decisions need to accommodate considerable uncertainty. One trend appears predictable: **the future for freshwater will not look like the past**.

2 Thinking risk

A **risk-based approach** to water encourages policy makers to consider a whole range of possible future conditions, from the commonplace to the unlikely, and to weigh the alternatives. Adaptation should not be undertaken in an isolated way that focuses only on climate as a risk driver to the exclusion of other, often more dominant, drivers of water risks. It should also be seen as a prerequisite to improving water security over the long-term. A risk-based approach can improve the **cost-efficiency** of adaptation and ensure that measures are **proportional** to the risks faced.

Water security requires maintaining acceptable levels of **four water risks**. These water risks are interrelated and should be assessed and managed coherently.



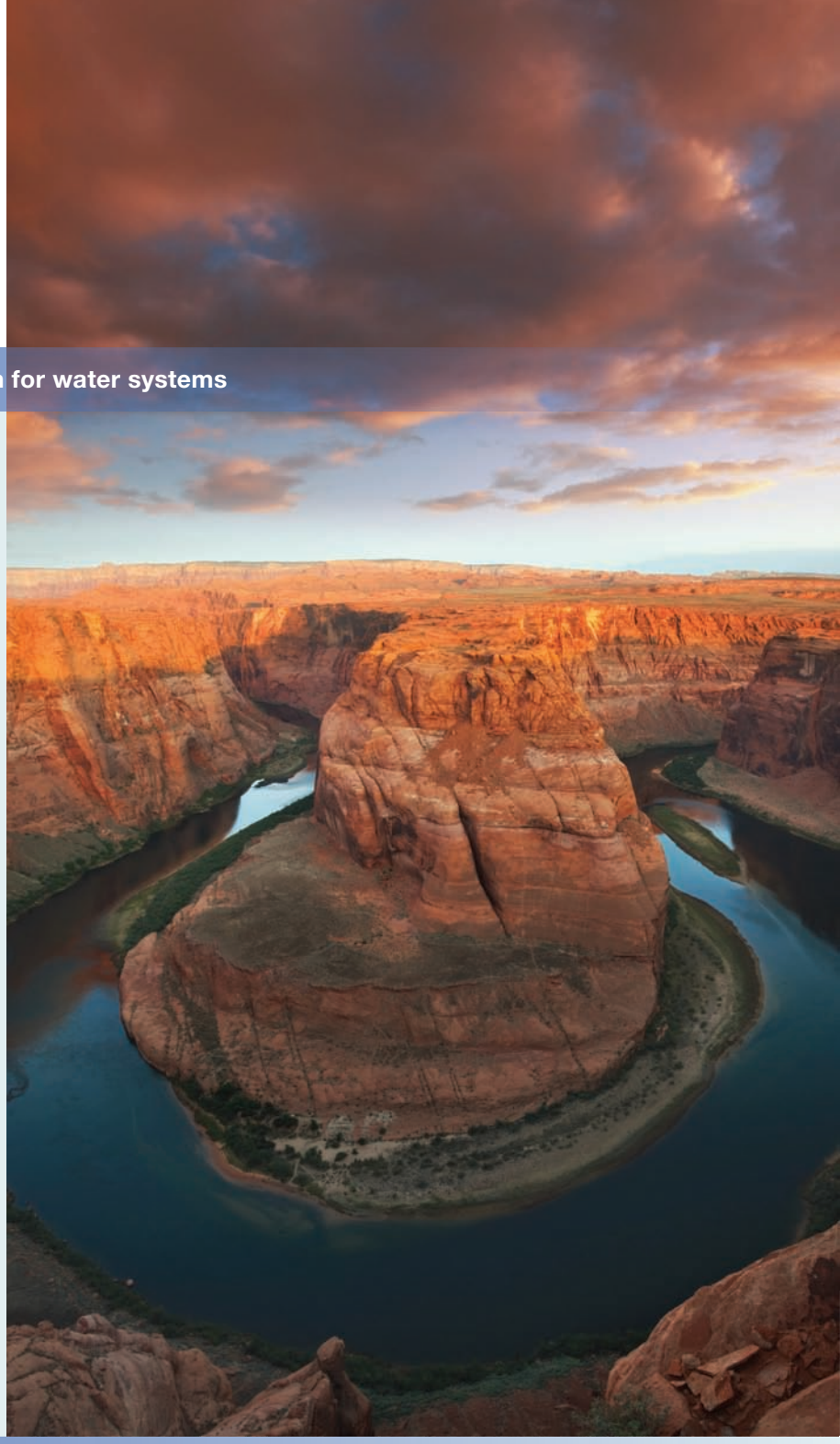
Key steps to applying a risk-based framework

1. **To "know" the risk** requires providing information to reduce information asymmetries as the basis for making effective and informed risk management decisions. This requires scientific and technical risk assessments, as well as gaining an understanding of risk perceptions of stakeholders.

2. **To "target" the risk** requires facilitating stakeholders' agreement on the acceptability and tolerability of a given risk, relying on both evidence- and values-based judgements. The acceptable level of risk should balance the economic, social and environmental consequences and the cost of amelioration.

3. **To "manage" the risk** requires clarity in terms of risk sharing arrangements between public and private actors to ensure that the risk is managed by actors able to do so most efficiently. The full range of risk management strategies should be considered: to avoid, to reduce, to transfer, or to bear risks. Governments can tap a broad range of policy instruments to facilitate timely and efficient adaptation.

Thinking risk



Policy guidelines to facilitate adaptation for water systems

- Explicitly address the **risk implications of water policies**, including assigning the risk to the actor able to manage it most efficiently.
- Consider the **full range of strategies to manage water risks**, including to avoid, to reduce, to transfer or to bear the risk by putting in place policies to alter risk drivers, limiting exposure or making populations, ecosystems and physical assets less vulnerable.
- Consider climate change adaptation **early in the planning and project cycle** to identify low cost approaches, rather than facing costly retro-fitting later.
- Use **appropriate decision-making approaches** to deal with pervasive uncertainty, such as sensitivity or scenario-based approaches.
- Consider ***expected* costs and benefits** of adaptive actions, which may require appropriate discount rates for long timeframes.
- Account for the **option value** of approaches that allow for scalability and flexibility to favour investments that can be adjusted as new information is gained.
- Prioritise **"no regrets"** and **"low regrets"** options.
- **Minimise timing errors** by adopting a flexible approach to planning and investments under uncertainty.

A risk-based approach to water security

Conventional wisdom typically equates water security with sufficient access to water. However, improving water security requires a much broader vision than just ensuring water access; water security requires managing risks!

Water management, at its core, is about *reducing or avoiding water risks* and about the distribution of residual water risks (e.g. asking *"who bears the risk?"*). Responses to water risks may transfer risks to others or defer them into the future. They may also increase other water risks (e.g. reducing the risk of water shortage may increase the risk of undermining the resilience of freshwater systems). Current policies often fail to recognise these unintended effects and to address trade-offs between water risks.

The new OECD report *Water Security for Better Lives* proposes a **fundamental shift in our approach to tackling water security**. It argues that a risk-based approach has many advantages over current policies to manage water security and could be applied more systematically to improve water security cost-effectively. It provides practical guidance on how such an approach can be implemented.

3 Climate ready?

In order to gauge progress and gain insights from practical adaptation efforts for water systems, the OECD undertook a **survey of policies across all 34 member countries and the European Commission**. The results reveal general trends and lessons learned. Country profiles can be accessed at: *www.oecd.org/env/resources/waterandclimatechange.htm*

The survey reveals that **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.

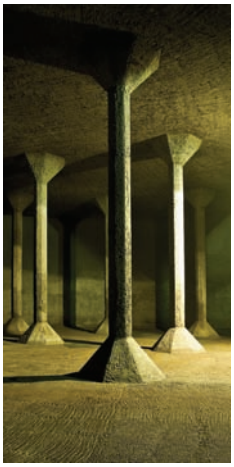
Progress on water and adaptation has advanced rapidly in recent years and a significant number of efforts are currently on-going. **Impacts on freshwater** nearly always feature as a key priority.

The majority of efforts to date have focused on "knowing" the risk by **building the scientific evidence base** and disseminating information. Much more can be done to better "target" and "manage" water risks in a changing climate.

In terms of policy responses, **information-based instruments** such as flood risk maps, decisions support tools for risk management, and adaptation guidance for local governments are by far the most widely used.

Some countries are also revising **laws and regulations** such as sustainable water abstraction limits, building codes, land-use planning – and adjusting economic instruments such as water tariffs, water-related environmental taxes, flood insurance schemes to reduce baseline stress on water systems, raise financing and address increasing flood risks.

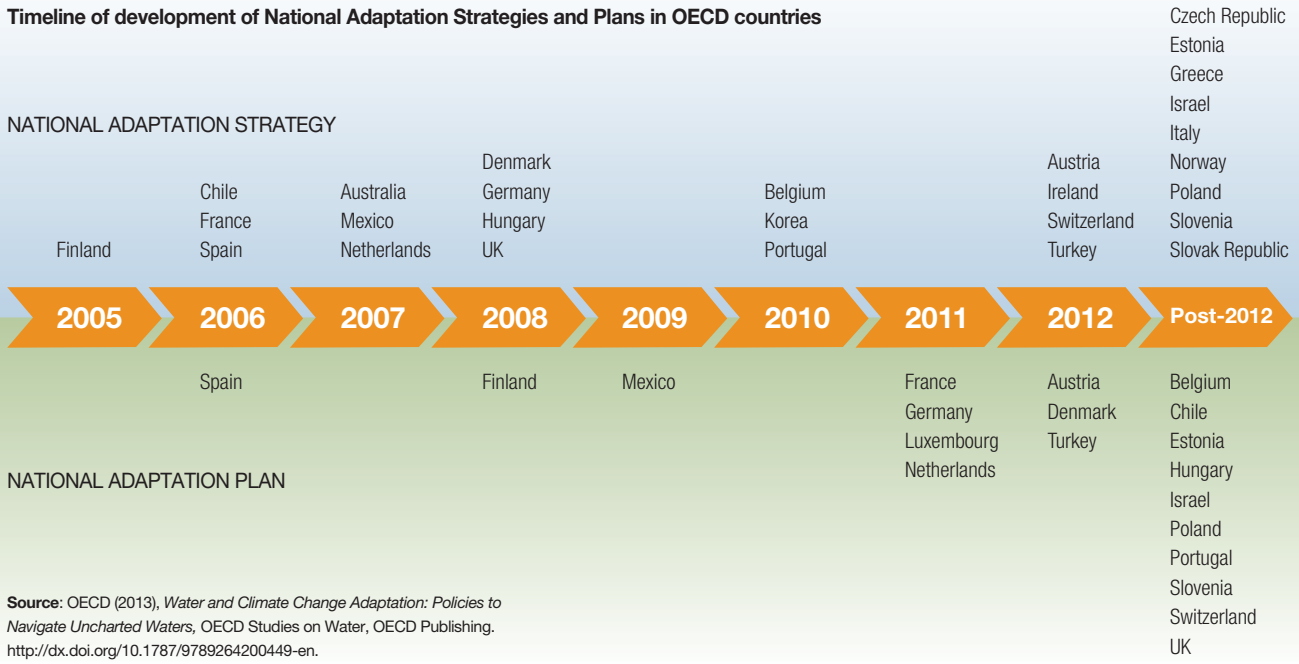
Only a handful of countries have begun to address the issue of **financing** adaptation for water systems. Some countries are mainstreaming adaptation into existing budgetary mechanisms, while others are addressing adaptation via specific water programmes or projects. Some countries are tapping international financing mechanisms. A few countries have allocated dedicated funding to climate change adaptation in general, which typically includes measures for water.



Did you know?

Nearly *all* OECD countries project increasing water risks due to climate change.

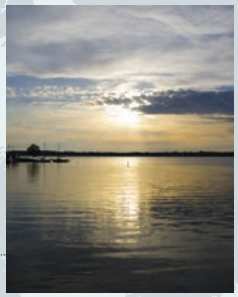
Timeline of development of National Adaptation Strategies and Plans in OECD countries



Source: OECD (2013), *Water and Climate Change Adaptation: Policies to Navigate Uncharted Waters*, OECD Studies on Water, OECD Publishing. http://dx.doi.org/10.1787/9789264200449-en.

4 Adaptation in action across the OECD

In the **United Kingdom**, a real options approach has been applied to flood risk management for the Thames Estuary to incorporate the uncertainty of climate change and the value of flexibility into decision making.



All of **Canada**'s 10 provinces and 3 territories have developed a climate change adaptation strategy or plan which take into account water resources or, they have main-streamed climate change adaptation in their water strategies and plans.

Since the implementation of the Lerma Chapala Surface Water Allocation Agreement in **Mexico**, the lake levels have shown remarkable recovery, reducing water stress and countering the adverse effects of climate change.

Spain was the first country to develop both a National Adaptation Strategy and Plan. Water resources are considered both a key sector and a cross-cutting theme.

In **Chile**, glaciers act as strategic water resources and provide the single most important source of replenishment for rivers, lakes, and groundwater in arid regions during periods of drought.

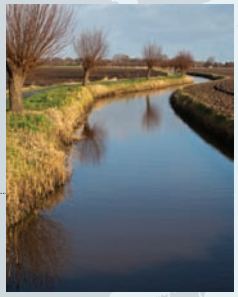
In 2008, a Glaciology and Snow Unit was established to inventory, study and monitor glaciers, and to identify adaptation strategies for different climate scenarios.

France's "Rain Tax" was introduced to provide incentives for the improved management of urban rainwater in order to help municipalities meet the challenge of coping with increasing storm water runoff that strains the capacity of current water treatment systems.

In **Germany**, there are awareness raising campaigns underway at the Länder level with the goal to increase the percentage of people and businesses with voluntary insurance against natural hazards.

All 98 municipalities in **Denmark** are required to develop a climate change adaptation plan before the end of 2013, including a risk-mapping of the entire surface in each municipality for flood events from all water sources (e.g. rain events, sewer systems, creeks, sea and groundwater). Denmark is also tapping ecosystem-based approaches by restoring wetlands to provide flood protection for low-lying, densely populated areas.

Recent legislation in **Korea** aims to reduce dependency on existing freshwater resources and to reuse rainwater, wastewater and treated water, thus helping to address water shortages driven, in part, by climate change.



The Netherlands has developed "adaptive delta management" to promote flexible strategies for water management and reduce the risk of over- or underinvestment in future flood risk management and freshwater supplies.

In **Australia**, water trading allows access to water resources to be reallocated over time in response to changing conditions and allows scarce water resources to be transferred to their most productive uses.

5 Adaptive governance, policy and financing

Regulatory, economic and information-based instruments all have a role to play in effective adaptation. Well-designed economic instruments can improve the efficiency and timeliness of adaptation responses by reducing baseline stress on water resources and hence, vulnerability. They can also provide flexibility to deal with increased variability, risks, and uncertainty and lower the cost of adjusting to changing conditions.

Did you know?

A study by Australia's Productivity Commission indicated that applying a real options approach could reduce the cost of water supply for Melbourne and Perth by over AUD 1 billion over a 10 year period, compared with traditional approaches to planning and investment.

Source: Government of Australia Productivity Commission (2011), "Australia's Urban Water Sector", Productivity Commission Inquiry Report, Vol. 2/55.

Flood insurance schemes

- Can provide incentives to reduce exposure and vulnerability to floods, efficiently spread residual risk, and offset the economic impact of floods.
- Greater uncertainty about the likelihood and severity of floods makes appropriately pricing flood insurance increasingly difficult.
- A key challenge is striking a balance between efficiently pricing flood risk, while maintaining affordability and broad coverage.

Water trading

- Allows for efficient reallocation of water resources in response to changing conditions, including increasing variability and more frequent episodes of shortage.
- Allows scarce water resources to be transferred to their most productive uses.
- While temporary transfers can be effective for managing drought-induced supply variability, they are insufficient on their own to adjust to long-term changes in total water availability.

Efficient water pricing

- Can reduce inefficient water use, encourage the diversification of sources of supply and raise financing for potentially higher investment needs.
- Prices could also be used to signal scarcity and hence the optimal timing for expanding supply.
- Climate change strengthens the economic case for efficient water pricing, however, in practice, water has long been inefficiently priced in most cases and scarcity pricing has met with resistance.

Incentives for ecosystems-based adaptation and green infrastructure

- Can provide a cost-effective means to address uncertainty by avoiding or delaying lock-in to capital-intensive infrastructure, hence providing an additional "option" value.
- Gaining attention, especially in urban settings, yet experience to date remains limited.

Financing adaptation and water

- Adapting to climate change will likely add to the already substantial financing gap for water systems in OECD countries.
- Financing adaptation should build on sound approaches and avoid skewing financing to "speciality" projects that might be easily labelled as adaptation, but do not necessarily maximise net benefits.
- A real options approach can be employed to explicitly incorporate the value of flexibility into decision-making, in particular for investments in water infrastructure, which are often capital-intensive, long-lived, with high sensitivity to climate.

Ecosystem-based approaches

Ecosystem-based approaches and green infrastructures leverage the services provided by nature to promote adaptation. Examples include restoring wetlands to reduce vulnerability to floods or improving catchment management to improve water quality. In a changing climate, they can provide a cost-effective means to address uncertainty by avoiding or delaying lock-in to capital-intensive infrastructure, hence providing an additional **"option" value**.

In **New York City** green infrastructure has been used to offset the adverse impacts of urban flooding expected to become more frequent due to greater storm intensity and sea level rise due to climate change. Since 2007, USD 1.5 billion has been committed for green infrastructure to clean New York City waterways by making the city greener and more permeable. The City expects that this investment, combined with targeted cost-effected grey infrastructure, will reduce combined sewer overflows by 40%. Compared with an "all-grey" approach, the plan is expected to **save ratepayers** more than **USD 2 billion**.

Real options analysis

Real options analysis explicitly incorporates the value of flexibility into decision-making. A "real option" is an alternative that can be put into place, modified or abandoned as new information is gained. It is particularly useful in cases where projects are scalable, have high sunk costs and long lead times and there is an expectation of improved information over time. This is the case for many investments in water infrastructures. Real options analysis can be used to adjust investments to respond to higher or lower magnitude impacts, sooner or later than anticipated, as knowledge about future climatic conditions improves. Interest is growing in a number of OECD countries in the context of climate change adaptation.

Examples include:

- In the **UK**, a real options approach has been applied to flood risk management for the Thames Estuary.
- A real options approach has been employed to assess water-related projects under climate change in the **Netherlands**.
- The **Australian** Productivity Commission has proposed wider use of real options approaches for water supply augmentation decisions.

"Nature never deceives us; it is always we who deceive ourselves."

Jean Jacques Rousseau (1762)

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For more information:
www.oecd.org/env/resources/waterandclimatechange.htm