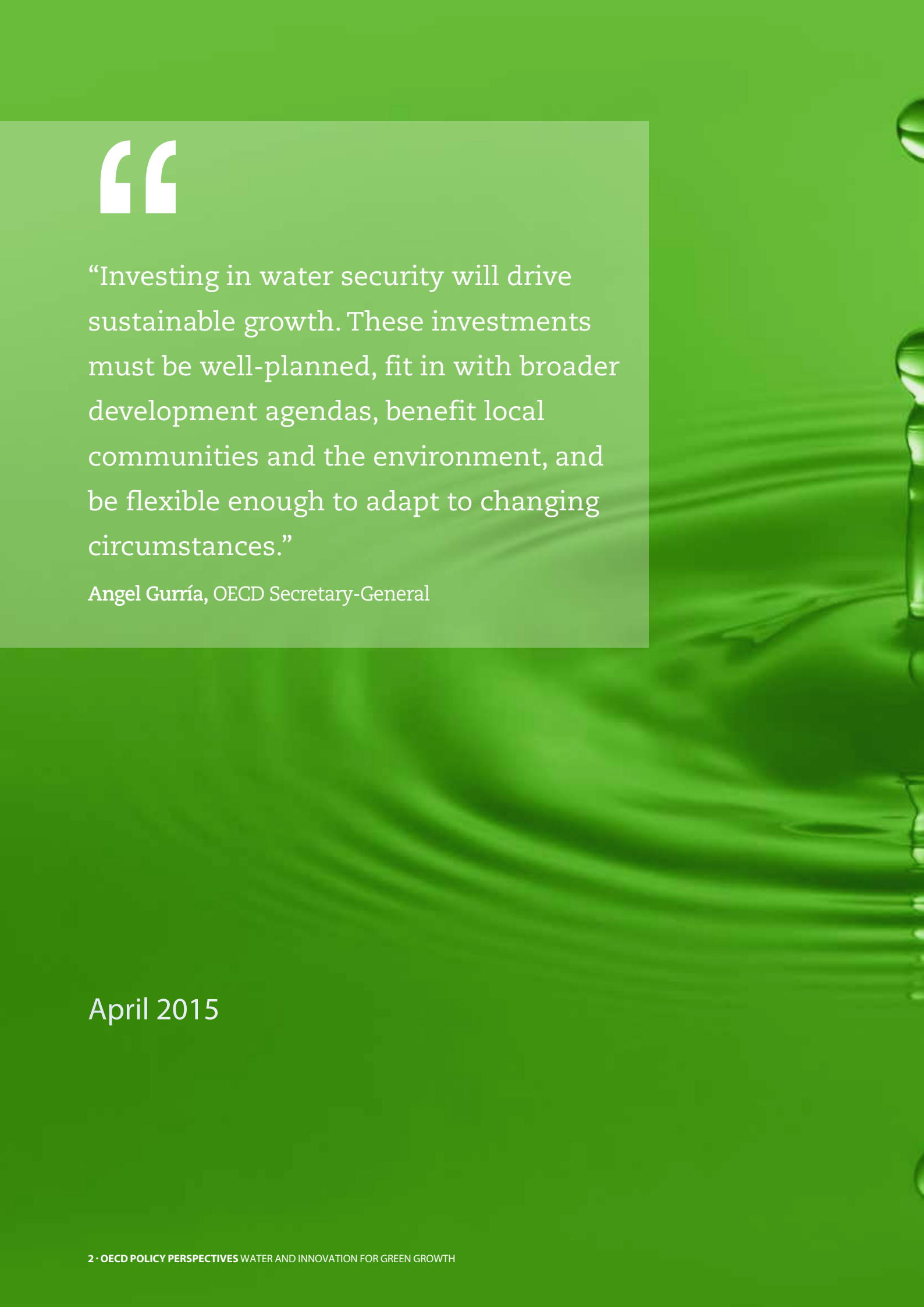
# Water and Innovation for Green Growth

POLICY PERSPECTIVES

OECD

BETTER POLICIES FOR BETTER LIVES



“Investing in water security will drive sustainable growth. These investments must be well-planned, fit in with broader development agendas, benefit local communities and the environment, and be flexible enough to adapt to changing circumstances.”

**Angel Gurría,** OECD Secretary-General

April 2015

# WATER

## Innovation for Green Growth

Green growth means fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which human well-being relies.

We need green growth because risks to development are rising as growth continues to erode natural capital – our water, soil, minerals, living organisms, the atmosphere, and all formations of the Earth's biosphere. If left unchecked, this results in increased water scarcity, worsening resource bottlenecks, greater pollution, climate change, and unrecoverable biodiversity loss. These tensions may undermine future growth prospects for at least two reasons:

- It is becoming increasingly costly to substitute physical capital for natural capital. For instance, if water becomes more polluted or scarcer, more infrastructures are required to purify and transport it over greater distances.
- Change does not necessarily follow a smooth, foreseeable trajectory. For example, the cumulative impacts of point and diffuse source nutrient pollution (nitrogen and phosphorus) can lead to eutrophication of water bodies, resulting in abrupt (non-linear) excessive growth of algae, collapse of freshwater ecosystems, and release of toxins that can make water unsuitable for consumption or recreation.

Green growth policies can unlock opportunities for economic growth and better welfare for all. The *OECD Green Growth Strategy* (2011) shows that moving towards a greener model of growth can help to ensure that future growth is "shielded" from costly resource bottlenecks and systemic risks arising from pressures on the environment.

Effective water management is a crucial ingredient for green growth. It is becoming increasingly clear that astute investment in, and management of, water can help to drive green growth. To do this, governments must catalyse water-related investment and innovation that underpin sustained growth and give rise to new economic opportunities.

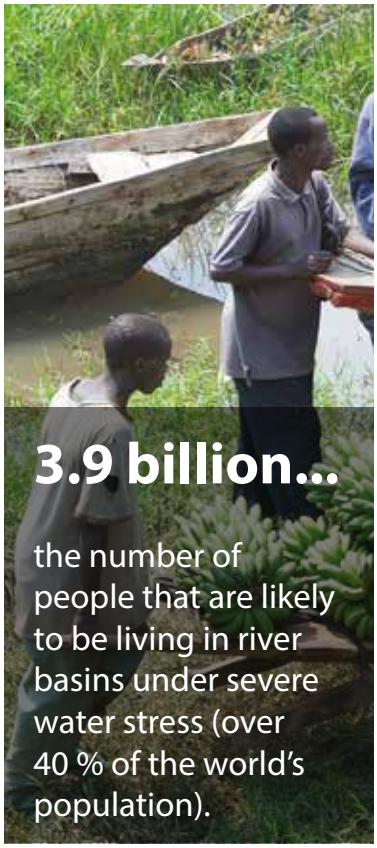
Drawing on recent OECD work on policies to support green growth, and on water economics and governance, this Policy Perspectives brochure lays out the opportunities to manage and invest in water as a means for green growth. It identifies the key policy options that governments can use to assist this transition towards greener growth.

# 1 A Policy Framework to Manage Water for Green Growth

The following policy framework acknowledges the magnitude of opportunities to invest in, and manage water as a means for green growth. Local circumstances matter, and policies must be tailored to unique national, regional or basin contexts. However, policies to manage water for green growth generally share a number of key features:

- **An explicit green growth strategy at national or regional level** that guides decisions on water allocation and related issues, such as land use, biodiversity, energy and agriculture, and the social and environmental dimensions of growth. Equity issues must be factored in: inequitable access to water or exposure to water risks can undermine opportunities for development and green growth.
- **Water allocation regimes** that reliably translate the strategy into water flows; that adjust to shifting conditions; and that drive innovation and investment. Well-designed water allocation regimes also allocate water risks in economically efficient and socially equitable ways.
- **The capacity to design and finance infrastructures** that adjust to the strategy and to shifting conditions. Green infrastructures deserve particular attention, as they can be more ecologically sensitive and more cost-effective than investment in traditional technologies.
- **Investment in water supply and sanitation services,** in particular in urban slums where lack of access generates huge health costs and lost opportunities for social and economic development. Operation, maintenance and renewal of existing assets are essential, including in OECD countries.
- **Institutions and policies** that are conducive to the development and diffusion of water-related innovation. Much can be done at domestic level. In addition, international assistance can help developing countries develop, adopt and adapt innovations to their needs and capacities.
- **A robust set of data.** Decisions on water investment and allocation will be made under uncertainty. However, a robust set of data, coupled with tools such as modelling, scenario development, planning, and real options, can enhance effective decision-making.

This Policy Perspectives discusses and illustrates the main elements of the policy framework.




# 2 Water Security as a means for Green Growth

The ***Global Dialogue on Water Security and Sustainable Growth***, a joint initiative by the OECD and the Global Water Partnership, provides new evidence on the causal link between water management and economic growth.

## Water security, defined

The OECD defines water security as achieving and maintaining acceptable levels for four water risks:

1. **Too little water** (including droughts): Lack of sufficient water to meet demand for beneficial uses (households, agriculture, manufacturing, electricity and the environment).
2. **Too much water** (including floods): Overflow of the normal confines of a water system (natural or built), or the destructive accumulation of water over areas that are not normally submerged.
3. **Too polluted water:** Lack of water of suitable quality for a particular purpose or use.
4. **Degradation of freshwater ecosystems:** Undermining the resilience of freshwater ecosystems by exceeding the coping capacity of surface and groundwater bodies and their interactions.

These risks to water security can also increase the risk of **inadequate access to safe water supply and sanitation**, and undermine the achievement of other Sustainable Development Goals on poverty alleviation, food and energy security, and gender equality.

## How water security defines sustainable economic growth

Water risks are increasing as populations, cities and economies grow, and climate changes; exerting greater pressure on water resources, increasing the exposure of people and assets, and increasing the frequency and severity of extreme climatic events.

***Securing Water, Sustaining Growth*** (Sadoff et al., 2015) provides new evidence that water insecurity acts as a drag on economic growth. The greatest economic benefits from water security come from access to safe water supply and sanitation. In some countries in Africa, the economic losses from inadequate water supply and sanitation are as high as 10% of GDP.

In addition, enhancing water security stands to reduce both the price and the price volatility of staple food crops, a key priority in the global economy.

**100-200 million**

the current number of victims (killed or affected) to floods, droughts and other water-related disasters per year.

## RELATIVE ECONOMIC IMPACTS OF WATER INSECURITY

Different parts of the world are subject to different water risks, and many countries suffer from all water risks. Some countries are more vulnerable to water risks than others. A country's hydrology, the structure of its economy, and its overall level of wealth (and associated level of water infrastructure and institutional capacity), are all key determinants of its vulnerability to water risks.

The risk of water scarcity is concentrated in locations with highly variable rainfall and over-exploitation of relatively scarce resources. Given that the dominant use of water is for agricultural irrigation (global average is 70%), the economic consequences of droughts and water scarcity are most pronounced in agriculture-dependent economies.

The economic risks from flooding are increasing in all locations worldwide, due to increasing economic vulnerability, but are greatest in North America, Europe and Asia.

The greatest economic losses are from inadequate water supply and sanitation, and associated loss of life, health costs, lost time, and other opportunity costs. The losses are greatest in Sub-Saharan Africa. China and India suffer the greatest total economic burden of water insecurity, and are subject to risks of water scarcity, floods, and inadequate water supply and sanitation.


**Source:** Sadoff et al. (2015), ***Securing Water, Sustaining Growth***: Report of the GWP/OECD Task Force on Water Security and Sustainable Growth.

# US$260 billion per year...

global economic losses from inadequate water supply and sanitation.

# 3 Steps to Address Water Security Risks

The OECD promotes a risk approach to achieving and maintaining water security through a three step process. ***Water Security for Better Lives*** (OECD, 2013) provides guidance on how to apply a risk approach to achieving and maintaining water security through a three step process:

## Know the risks

Knowledge and information are necessary to understand the causes and impacts, both short- and long-term, and to assess hazards, exposures, and vulnerability of people and assets to water risks. A number of countries are taking steps to gather relevant information. For example, flood risk maps are required in many OECD countries, including in the European Union and in the United States (for recipients of federal disaster assistance). Stakeholder engagement is an important component of knowing the risks, to understand the risk perceptions of stakeholders.

## Target the risks

Completely eliminating water risks is often technically impossible and not cost effective. Targets should be set by identifying societal values and the level of acceptability of risks. The acceptable level of water risk for society should depend upon the balance between economic, social and environmental consequences, and the cost of amelioration.

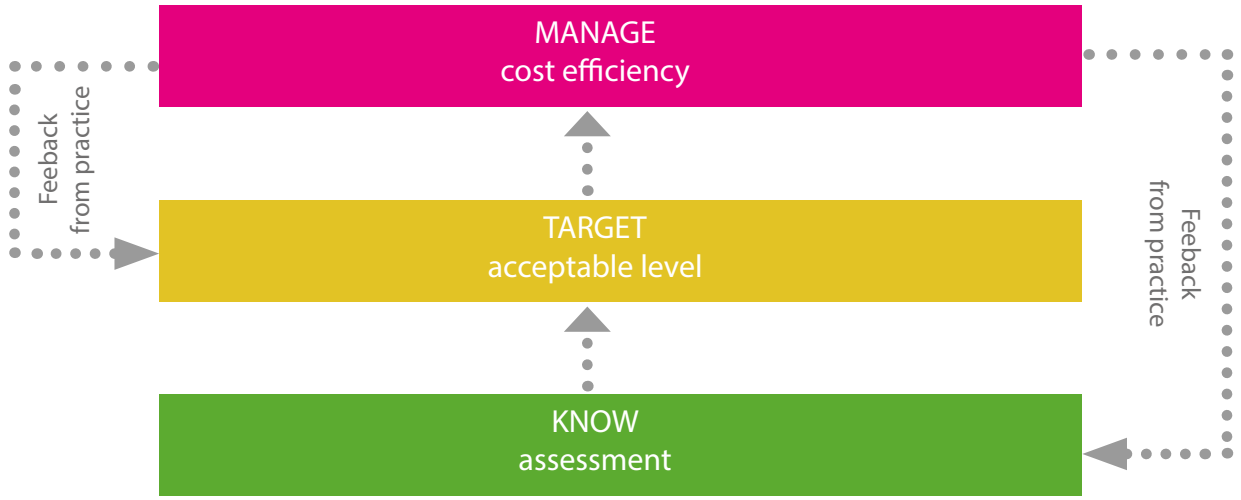
Governments need to focus on the systematic assessment of the expected costs and societal benefits of options to manage water risks, and the evaluation of risk-risk trade-offs. For example, in New Zealand, the National Freshwater Policy Statement 2011 and 2014 requires regional councils to set objectives and limits, in consultation with local stakeholders and indigenous people, to 'maintain or improve' the overall water quality across a region, which may have short-term economic trade-offs but ultimately be more sustainable.

## Manage the risks

Policies need to be identified and implemented to achieve the selected level of risk in the most equitable and cost-effective way. This risk approach fosters targeted policy responses proportional to the magnitude of the risk. A risk approach allows for assigning risks to the actors that are likely to be able to manage them most efficiently. For example, flood risks may be addressed more cost-efficiently through flood insurance, or compensating farmers for converting their land into flood plains, instead of governments investing in the construction of additional levees.

Changes in climate, regional conflicts, economic growth, ageing infrastructure, and evolving priorities make achieving and maintaining water security a moving target. Monitoring and evaluation of policy implementation, ongoing stakeholder engagement, and reassessment of the risks, is necessary in order to adapt to these changes.

**A RISK APPROACH TO ADDRESS WATER SECURITY**




**Source:** OECD (2013), ***Water Security for Better Lives***, OECD Publishing, Paris.

# 4 Investing in Water for Green Growth

Successful pathways to water security and sustainable growth combine investment in infrastructure, institutions and information that make hydrological conditions, local capabilities and strategies for economic and social development mutually supportive. Sadoff et al. (2015) documents how these pathways operate at city, basin or national levels.


Not all investment will be equally beneficial. The most beneficial water investments combine investments in **infrastructure, institutions and information**.

In addition, the most beneficial water investments are integrated into long term planning, and sequenced along coherent pathways to yield the highest returns and avoid path dependency.

## Characteristics of beneficial investments in water for green growth

- **Do not consider infrastructure projects in isolation:** a) combine investment in infrastructure, institutions and information; b) sequence investments along coherent pathways, at city, basin, national, or transboundary levels.
- **Minimise investment needs.** This includes two dimensions: a) avoid building future liabilities (such as building in flood plains, or locking-in unsustainable paths); and consider low-cost options, such as green infrastructures.
- **Use strategic investment plans** to assess the best financing combinations, match financial resources with realistic policy objectives, and take into account affordability issues and measures for vulnerable segments of society.
- **Promote economic diversification** to spread economic risks and reduce the economy's reliance on water.
- **Invest in infrastructure robust to uncertainties**, that avoid technical lock-in, and support adaptive management as risks, opportunities, and social preferences change. Green infrastructures can have decisive advantages, from this perspective.
- **Devise and assess investments in terms of outcomes** and trade-offs among economic, environmental, and social criteria.
- **Support investments by analytical tools** (such as cost-benefit analyses), a holistic perspective, innovation, and continuous monitoring, assessment, and adaptation.

A key question remains: How can we finance construction, operation and maintenance of the water infrastructures and institutions needed to underpin economic growth for the future?



**1 in 3 people...**

lack access to improved sanitation.

# 5 Financing Water Investments for Green Growth

Managing water for green growth will require sustainable financing: to upgrade and renew existing infrastructures, to build new assets, to operate the institutions involved in water management, and to collect information to make informed decisions.

Water infrastructure may take many forms, from small scale projects initiated by local entrepreneurs, to large infrastructures that serve multiple purposes, to green infrastructures that minimise financial needs and are more environmentally sensitive. Sources of finance are also increasingly diverse and offer new investment opportunities, such as carbon finance, long-term investors and new specialised institutions.

At the same time, prevailing sources of finance have become increasingly constrained as a result of the fiscal consolidation of public budgets. In addition, revenues from water charges in many OECD cities are negatively affected by increasing water efficiency and a reduction in water demand.

The OECD recommends robust financing strategies for water management to bridge the financing gap by combining three elements:

1. **Minimise operating costs and investment needs via targeted maintenance** (i.e. by reducing leakage); efficiency gains (e.g. amalgamating water services at the right scale); demand management; use of low-cost options (e.g. green infrastructure); and infrastructure options that avoid costly technical lock-in failures and future liabilities. Each option requires specific institutional arrangements and policy coherence between different sectors competing for water resources. Investment efficiency should be considered not only at the project level, but also at the level of a sequence of investments, in the context of broad social and economic development policies.

2. **Explore water tariff structures and pollution charges** that contribute to water resources management (in particular water conservation), reduce negative externalities, and improve the financial sustainability of water and sanitation services. Low tariffs typically result in: poor water supply and sanitation services, a reduced willingness to pay by consumers for a poor service, neglect to maintain infrastructure, reduced efficiency of infrastructure due to insufficient maintenance, and wastage of water by consumers. Where demand for water is falling, decoupling water revenues from the volumes of water sold may be necessary. Non-existent, or low, pollution charges create the need for costly water treatment downstream. General subsidies should be phased out, and replaced by targeted subsidies for the poor to address affordability concerns. The risks, costs, and benefits of water and water services should be allocated in an equitable manner.

3. **Diversify revenue streams and tap into new sources of capital.** The private sector, including financiers, property developers and small entrepreneurs, is gaining experience in financing discrete facilities at different scales (desalination, wastewater treatment plants and distributed infrastructures). National and local governments need to explore innovative ways to jump start and leverage private investment, where needed. Urbanisation and land development provide an opportunity for governments to consider new fiscal instruments (such as land taxes, or taxes on impervious surfaces). Utilities can also develop new services. The OECD Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action (2009) provides guidance to those governments wishing to engage with the private sector.

Governance matters, to co-ordinate across levels of government and policy areas, to strengthen capacity, and enhance integrity and transparency, and to engage with a variety of stakeholders who can have their say on the level of water security they deem proper, on how much they are ready to pay for water security, and on their perceptions of a fair allocation of the risks and costs.

## THE OECD FRAMEWORK FOR FINANCING WATER RESOURCES MANAGEMENT

The OECD ***Framework for Financing Water Resources Management*** identifies four principles and a series of practical issues, which help identify options to governments to reduce financial needs and determine who should pay for what.

- **The Polluter Pays principle** creates conditions to make pollution a costly activity, to alleviate pollution, and compensate for welfare loss. In a water security context, the point is that those who generate liabilities should cover the costs.
- **The Beneficiary Pays principle** allows for sharing the financial burden of water resources management across those who benefit from access to water services and protection against water risks.
- **Equity** is often invoked to address affordability or competitiveness issues, when water bills are disproportionate with users' capacity to pay.
- **Coherence between water policies** that affect water availability, water demand and exposure to water risks is essential to ensure that policies are mutually supportive and do not work against each other.

Economic instruments, such as abstraction and pollution charges or water pricing, have a pivotal role to play in financing water resources management. Available evidence highlights that they are most effective where due attention is paid to their design, the way they interact with other instruments, and the institutional and governance structures within which they operate.

**Source:** adapted from OECD (2012), ***A framework for Financing Water Resources Management,*** OECD Publishing Paris.

## FINANCING THE MANAGEMENT OF URBAN RAINWATER IN FRANCE

The failure to properly manage rainwater affects the capacity of French local authorities to achieve the "good ecological status" mandated by the European Water Framework Directive, adopted in 2000. A dedicated fiscal instrument has been introduced, to promote rainwater management close to the source and to limit run-off. In 2011, French local authorities have implemented a dedicated tax on urban rainwater management.

The tax is based on impervious surfaces, in urban areas or future development areas, whether or not the surfaces are connected to a drainage system. The tax rate can be reduced, in full or in part, where facilities are in place to reduce run-off. Several adjacent property owners can join, when they build and operate a common facility.

The main objective of this new tax is to create incentives to manage rainwater close to the source, by implementing mitigation measures that compensate the consequences of impervious surfaces. Another objective is also to raise revenues, earmarked for urban rainwater management.

This mandate confirms that infrastructure upgrades to reduce the impacts of stormwater runoff in France is urgently needed, and highlights the opportunity to harness property owners as a potential source of private investment in water infrastructure.

**Source:** OECD (2015), ***Water and Cities: Ensuring Sustainable Futures***, OECD Publishing, Paris. Adapted from CERTU (2012), *Taxe pour la gestion des eaux pluviales urbaines*, MEDDTL, Paris.

# 6 Green Water Infrastructure for Green Growth

Green infrastructure (GI) involves the use of natural or semi-natural systems that utilise nature's ecosystem services in the management of water resources and associated risks. GI contributes to the solutions to all four risks that affect water security: too little, too much, too polluted water, and the risk to the resilience of ecosystems.

Green infrastructure solutions can be used to support the goals of multiple policy areas. For example, conservation or expansion of floodplains can increase water infiltration and reduce flooding risks to cities, while simultaneously supporting agricultural production and wildlife, and providing recreational and tourism benefits. Likewise, permeable pavements and the creation of green spaces can enable surface water to infiltrate the soil below and reduce polluted stormwater runoff. The equivalent 'grey' infrastructure (traditional engineered infrastructure) solutions includes dams, dykes, groundwater pumping and wastewater treatment plants.

In comparison with grey infrastructure, investment in GI: is generally less capital intensive; has lower operation, maintenance and replacement costs; avoids the lock-in issues associated with grey infrastructure; and appreciates in value over time with the regeneration of nature and its associated ecosystem services (as opposed to the high depreciation associated with grey infrastructure). GI can also avoid or postpone the costs of building new, or extending existing, grey infrastructure.

Green infrastructures have their own deficiencies. For instance, they may require extensive land use and be maladapted to dense areas. The key is to combine the use of grey and green infrastructure in a way that maximises net social benefits, in the short and long term.

While the benefits of investment in innovation and GI are clear, their diffusion remains limited by a series of factors.

## LIMITING FACTORS

- Retrofitting is difficult, particularly in high-density urban areas.
- Lack of policy coherence hinders the competitiveness of innovative solutions. For example, this can occur when water prices fail to reflect the opportunity costs of resource use, or when land use and urban development do not reflect the risks of building in flood plains.
- Regulations, funding mechanisms and lock-in failures tend to favour grey infrastructures and incumbent urban water management practices over long-term sustainable practices. They often fail to recognise the capacity of users and the wider community to discuss the pros and cons of alternative technologies.
- Lack of data (e.g. on river flows) and lack of track record with GI can weaken the case for innovative technologies.
- Innovative practices combine different scales in urban water management, from indivdual buildings, to municipal and larger levels. Such combinations can be hampered by institutional arrangements, which split incentives and responsibilities along the water cycle.

## SUCCESS FACTORS

***Water and Cities: Ensuring Sustainable Futures (OECD 2015)*** identifies the success factors of cities that have overcome these barriers. They include:

- A long term vision of water challenges and opportunities for urban development.
- Business models for water utilities and land development that factor in externalities related to water security.
- Governance structures that favour a whole-of-government approach to urban water management and reach beyond the city limits.
- Information campaigns to raise city dwellers' awareness of water-related risks and the costs of liabilities that result from short term visions.

## SUCCESSFUL CASE STUDIES

Examples of successful implementation of green water infrastructures include:

- The "Room for the River" Programme in the Netherlands has increased the area of floodplains, relocating dykes further inland, thereby increasing the peak discharge level that the rivers can handle, and in doing so, ensuring the safety of over 4 million people from flooding. The Programme also combines innovative architecture, urbanisation and landscape solutions to build with nature and live with water. See OECD (2014), for more information.
- The "Greenways" programme in Auckland, New Zealand aligns city council actions and investment across a range of policy and operational units, with the aim of delivering multiple freshwater, biodiversity, transport, urban design and storm water-related outcomes from the same investment. Amalgamation of the region's seven district councils has also maximised the integration of council planning, programmes and investment, and with community and private sector collaboration, is hoping to catalyse innovative responses to complex and emergent water quality issues. See OECD (2015) for more information.

## GREEN INFRASTRUCTURES FOR URBAN WATER MANAGEMENT

| Green infrastructure solution | Urban water management issue | | | | | | |
|---|---|---|---|---|---|---|---|
| | Water supply (incl. drought) | Water quality regulation | | | Moderation of extreme events (floods) | | Protection of ecosystems |
| | | water purification | biological control | water temperature control | reverine flood control | urban storm-water runoff | coastal flood (storm) control | |
| Demand management | x | | | | | | | x |
| Local processing of black or grey water | x | x | x | | | | | |
| Wetlands restoration/conservation | x | x | x | x | x | | | x |
| Constructing wetlands | x | x | x | x | x | | | x |
| Water harvesting | x | | | | | x | | |
| Green spaces | x | x | | x | | x | | x |
| Permeable pavements | x | x | | | | x | | x |
| Green roofs | | | | | | x | | x |
| Protecting/restoring mangroves, coastal marshes, dunes, reefs | | | | | | | x | x |
| **Corresponding grey infrastructure (primary service level)** | | | | | | | | |
| Dams, groundwater pumping | x | | | x | | | | |
| Dams, levees | | | | x | x | | | |
| Water distribution systems | x | | | | | | | |
| Water treatment plant | | x | x | | | | | |
| Urban stormwater infrastructure | | | | | | x | | |
| Sea walls | | | | | | | x | |

**Source:** Adapted from UNEP (2014), ***Green Infrastructure Guide for Water Management: Ecosystem-based management approaches for water-related infrastructure projects,*** United Nations Environment Programme and OECD (2013), ***Barriers to, and Incentives for, the Adoption of Green Water Infrastructure***, OECD Publishing, Paris.

*OECD Cities are entering a new era in terms of water services and security. We need new ways of financing and managing urban waters. Planning ahead will mean a much lower bill than if we carry on as we are today.*

Angel Gurría, OECD Secretary-General

# 7 Innovation to Manage Water for Green Growth

Innovation (both technical and non-technical) can lower the costs of water management. Water-related innovation is multifaceted. In agriculture, it is associated with the development of water-efficient irrigation, planting of less water-intensive crops, and the adoption of practices that reduce nutrient flows back to water bodies. In manufacturing, it deals with more water-efficient and cleaner production practices, investment in the use of more water-efficient appliances, and more effective and cost-efficient treatment techniques. Similar opportunities are associated with water supply and sanitation. There is also room to improve storage techniques, monitoring of river flows and pollution loads, and the operation of infrastructure by investing more in leakage detection and early repair of pipes. Smart water technologies cut across these boundaries: they allow the users to monitor, manage and act on data relating to the part of the water cycle that is pertinent to their interests.

Water-related innovation is not limited to new technologies: non-technical innovations can also contribute to green growth. Innovative business models for water utilities are a good example. The revenues of most water utilities depend on the volume of water sold, and of wastewater collected and treated. There are benefits in (at least partially) decoupling revenue from the volumes of water sold. This can be done through the development of well-designed water tariff structures, and opening up opportunities to derive additional revenue by enhancing environmental performance through performance based contracts (where the utility receives a premium when it reaches certain level of performance regarding, for instance leak detection, or the quality of effluents).

Water-related innovation may derive from dedicated policies. ***Water and Cities: Ensuring Sustainable Futures*** (OECD 2015) documents case studies of several countries and states (Arizona, Australia, California, France, Israel, Korea, Malta, the Netherlands, and Ontario) that have explicitly encouraged the development and deployment of smart water systems, either to address local issues, or to support a growing global business.

## SUPPORTING WATER INNOVATION IN ISRAEL: NEWTECH

Israel NEWTech is a national government programme promoting the water technology and renewable energy sectors in Israel. In 2006, NEWTech launched its first initiative focused on the Israeli water technologies industry. The programme promotes Israel's water technologies in both local and global markets by supporting R&D, participating in water related stakeholder events, and creating marketing tools for the benefit of the entire sector. The Government has invested heavily in the programme, and has allocated substantial resources towards strengthening the foundation of Israel's water tech cluster.

The programme benefitted from a policy framework that facilitates the up-take of innovation, such as tariff policies that signal scarcity and make reclaimed water attractive for irrigation. NEWTech is led by the Ministry of Industry, Trade and Labour, in cooperation with more than ten government ministries and agencies. This wide partnership shares the goal of supporting and promoting the Israeli water and renewable energy sectors.

**Source:** OECD (2011), ***Policies to Support Eco-innovation in Israel***, Environment Directorate, OECD.

## SUPPORTING WATER INNOVATION IN EUROPE: EIP WATER

In 2012, the European Commission set up the Eco-Innovation Partnership on water (EIP Water), which aims to facilitate, support and speed up the development and deployment of innovative solutions to water challenges, and to create market opportunities for these innovations both inside and outside of Europe. The Partnership complements a series of tools already available at European level to support water sector initiatives (the Eco-Innovation Observatory inventories seven of them).

EIP Water is led by a Steering Group, consisting of 27 high-level representatives of relevant stakeholder groups and spanning both the demand and supply sides of innovation. The priorities selected by EIP Water reflect the dimensions of water-related innovation, which have to be addressed from a green growth perspective: water reuse and recycling; water and wastewater treatment; food-water-energy nexus; flood and drought risk management; and ecosystem services. In addition, crosscutting priorities have been identified: water governance; decision support systems and monitoring; and financing for innovation. Smart technologies have been identified as an enabling factor within all priorities.

**Source:** OECD (2015), ***Water and Cities: Ensuring Sustainable Futures***, OECD Publishing, Paris.

# 8 Allocating water for green growth and equity

Allocation regimes determine who is able to use water resources, how, when and where. As competition to access water resources intensifies, water resources allocation is an important instrument to manage water for green growth.

Well-designed water allocation regimes allocate water to where it creates the most value for society - economically, socially and environmentally. They can also adjust to changing conditions and preferences at least cost for society.

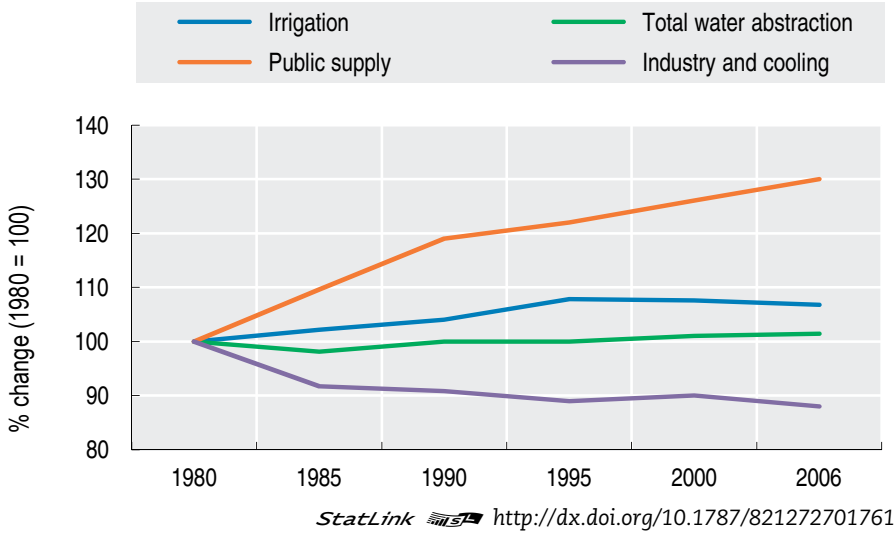
Well-designed water allocation regimes reflect the different capacities of water users to take and adapt to risks of scarcity. For example, farmers growing annual crops can make adjustments in cropping decisions if rainfall is delayed, but fruit growers, cities and some industries may not be able to make this sacrifice without significant economic or social impacts. Therefore, water allocation regimes also allocate water risks in economically efficient and socially equitable ways.

Well-designed allocation regimes provide incentives for investment and innovation in water use efficiency. For instance, water entitlements in the Murray Darling Basin, Australia, have triggered innovative responses from irrigators, freeing water for valuable uses.

However, many allocation regimes are strongly conditioned by historical preferences and usage patterns. They show a high degree of path dependency, which manifests in laws and policies, and in the design and operational rules of existing water infrastructures. As a result, water use is often locked-in to uses that are no longer as valuable today as they once were, and the risk of shortage falls disproportionately on certain users. For example, adequate flows to support ecosystem functioning are not secured in many basins, and many countries still apply very low or no charges at all for water abstraction, even though the value of water has increased as competition for the resource has intensified.

***Water Resources Allocation: Sharing Risks and Opportunities*** (OECD 2015) provides policy guidance for countries seeking opportunities to unlock the value of water resources. The OECD Health Check for Water Resources Allocation is a practical tool that can be used to undertake a periodic "health check" of current water allocation arrangements and identify opportunities for improving performance.

## CHANGE IN FRESHWATER ABSTRACTIONS IN OECD COUNTRIES 1980-2006




StatLink http://dx.doi.org/10.1787/821272701761

**Source:** OECD (2010), ***OECD Factbook 2010: Economic, Environmental and Social Statistics***, OECD Publishing. DOI: http://dx.doi.org/10.1787/factbook-2010-en.

## The OECD "Health Check" for Water Resources Allocation

**Check 1.** Are there accountability mechanisms in place for the management of water allocation that are effective at a catchment or basin scale?

**Check 2.** Is there a clear legal status in place for all water resources (surface and ground water and alternative sources of supply)?

**Check 3.** Is the availability of water resources (surface water, groundwater and alternative sources of supply) identified and possible scarcity well-understood?

**Check 4.** Is there an abstraction limit ("cap") that reflects *in situ* requirements and sustainable use?

**Check 5.** Is there an effective approach to enable efficient and fair management of the risk of shortage that ensures water for essential uses?

**Check 6.** Are adequate arrangements in place for dealing with exceptional circumstances (such as drought or severe pollution events)?

**Check 7.** Is there a process for dealing with new entrants and for increasing or varying existing entitlements?

**Check 8.** Are there effective mechanisms for monitoring and enforcement, with clear and legally robust sanctions?

**Check 9.** Are water infrastructures in place to store, treat and deliver water in order to allow for the allocation regime to function effectively?

**Check 10.** Is there policy coherence across sectors that affect water resources allocation?

**Check 11.** Is there a clear legal definition of water entitlements?

**Check 12.** Are appropriate abstraction charges in place for all users that reflect the impact of the abstraction on resource availability for other users and the environment?

**Check 13.** Are obligations related to return flows and discharges properly specified and enforced?

**Check 14.** Does the system allow water users to reallocate water among themselves to improve the allocative efficiency of the regime?

**Source:** OECD (2015), ***Water Resources Allocation: Sharing Risks and Opportunities.***

# 9 The Importance of Water Supply and Sanitation for Green Growth

Inadequate access to water supply and sanitation services has a significant impact on the global economy. The World Health Organisation (2012) estimates the total global economic losses associated with inadequate water supply and sanitation to be US$260 billion annually in 2010. The largest numbers of people without access to improved water supply and sanitation are in Sub-Saharan Africa and South East Asia, respectively. The highest percentages of the population without access to adequate water supply and sanitation are in Sub-Saharan Africa.

The benefits of adequate water supply and sanitation far outstrip the costs of providing and sustaining access to safe water and sanitation. The economic benefits of increasing access to basic water supply and sanitation services include improved human and environmental health and reduced premature mortality; improved fisheries, tourism and property markets; and reduced opportunity costs (namely increased productive time associated with reduced sickness and travel time collecting water).

Benefit-to-cost ratios have been reported to be as high as 7 to 1 for basic water and sanitation services in developing countries. Furthermore, the benefits are typically under-estimated, given that some significant values (such as pride, human dignity, education, amenity value, and reduced vulnerability to personal assault) are difficult to quantify in monetary terms.

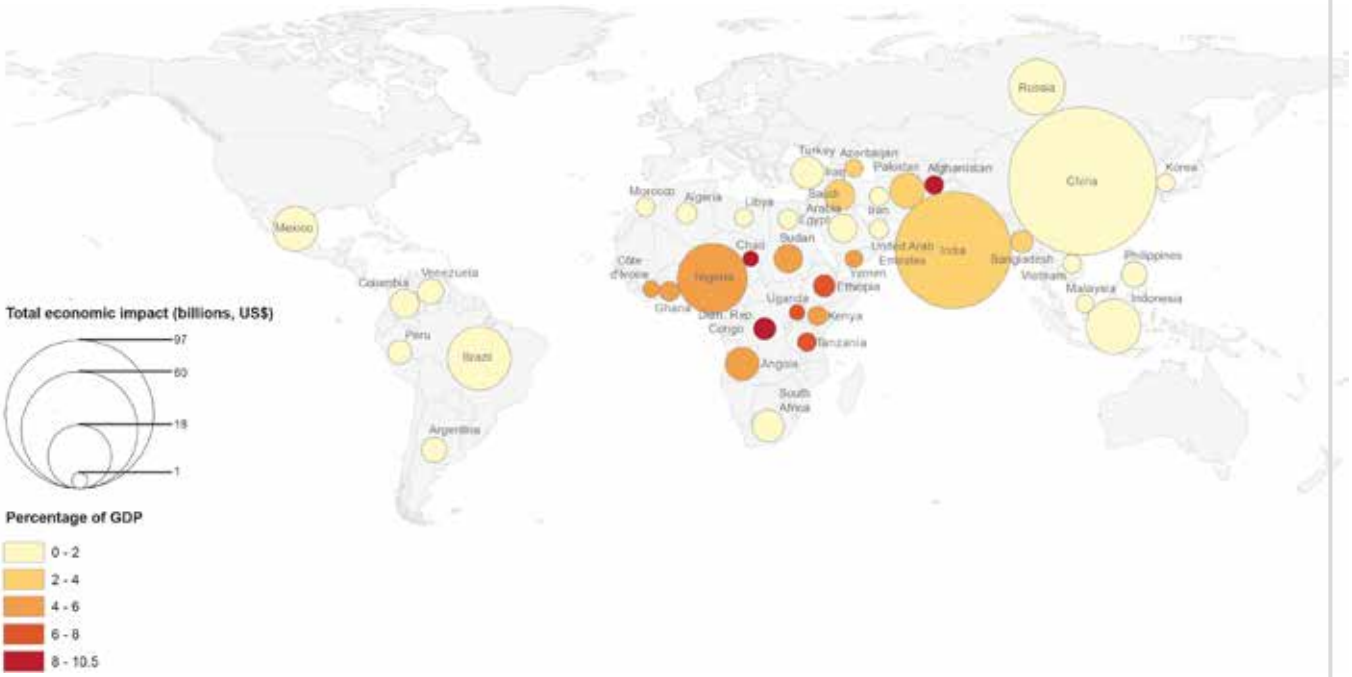
With the exception of Sub-Saharan Africa, global economic losses from inadequate water supply and sanitation are falling as a result of investment in these services. For example, from 1990 to 2011, drinking water and sanitation coverage in the developing world increased by 16% and 20% respectively.

## POLICY TOOLS TO IMPROVE WATER SUPPLY & SANITATION

The OECD recommends the following policy tools to improve water supply and sanitation:

- **Clear investment strategies and priorities** for targeted investment, where net benefits are likely to emerge for the largest and/or the lowest-income groups (such as urban slums). Often investment is needed for refurbishment of existing infrastructure (rather than investment in new infrastructure) to reduce leakage and contamination. Information on the benefits allows allocating additional

### ECONOMIC LOSSES FROM INADEQUATE ACCESS TO WATER SUPPLY AND SANITATION SERVICES




**Source:** Sadoff et al. (2015), ***Securing Water, Sustaining Growth***: Report of the GWP/OECD Task Force on Water Security and Sustainable Growth.

*"Decisions makers will be forced to make tough choices about how to manage water for inclusive growth and environmental stability. Better engaging stakeholders both within and outside the water sector can help ensure these choices are the right ones, and are implemented effectively".*

charges to those who are explicitly benefiting from service improvements.

- **Stakeholder and community engagement** to enable collaboration among a wide variety of public and private interests and partnerships; active public participation in water stewardship and ecosystem restoration; and participation in the distribution of water for domestic use and irrigation. Stakeholder engagement in the planning process helps to ensure benefits and costs are balanced among competing uses. Holistic management decisions are required, based on enhanced information and data systems, supported by good baseline information gathering, decision support systems, and monitoring systems. Empowerment through social mobilisation of stakeholders can enhance willingness-to-pay; encourage local community involvement in maintenance and monitoring; and identify where training and education can help to improve public water quality and sanitation practices.
- **Water tariff design.** Putting a price on water supply and sanitation services can ensure sufficient cost recovery for operation, maintenance, and refurbishment costs; prevent loss of services to current users; and ensure adequate access for future generations. This may require independent regulatory bodies free from political interference, with the authority to enforce and build capacity.
- **Appropriate measures for vulnerable segments of society.** When designing water tariffs and connection charges, affordability issues need to be taken into account. Strategies may include tailored tariffs or payment methods. The most beneficial strategies generally reflect the full cost of the resources and the service in the tariff structure, and address affordability issues through targeted social measures (wherever possible), outside the water bill.
- **Stimulate the diffusion of innovative approaches** that can minimise the cost of water supply and sanitation systems, and share costs and benefits in an equitable way. Examples of innovative approaches include payment for catchment protection, water reuse, energy capture from wastewater biosolids, water quality fit for purpose, and distributed systems.

# 10 Data and Information to Manage Water for Green Growth

The OECD is developing a framework for monitoring progress towards green growth. Water cuts across several groups of indicators. It is particularly relevant to measure:

- **Resource productivity.** Where available, information is useful on the productivity of all water uses. Data on alternative water sources (i.e. rainwater, reclaimed water), how they develop, and where they contribute to green growth, are required as well. The work of UNEP's International Resource Panel paves the way, with a focus on decoupling water consumption from economic development.
- **The natural asset base.** The main issues to be covered include how much water is available (both renewable and non-renewable); the existing quality of water; how stable flows are and the magnitude of variations (droughts, floods, storms); how much water is being used and consumed; and shifts in land uses, which have consequences on water availability and quality.
- **Water-related health and environmental services.** Data on access to water and sanitation services and on water-related diseases help measure some of the costs associated with (poor) water management. It also helps decipher some distributional issues. Water metering can provide data on consumption patterns and measure unaccounted water, in order to better manage demands, target leakages, improve water efficiency, and increase returns on investment. More work on the valuation of aquatic ecosystems and watershed services can improve policy-makers' understanding of the trade-offs between alternative water uses.
- **Water-related innovation.** A business perspective is appropriate to reflect how water is being used by the private sector and how it adds value to private firms. Efforts in, and outcomes of, R&D can document the operation of markets for water-related innovation, and can signal where policies are needed to compensate for market failures.

## SYSTEM OF ENVIRONMENTAL-ECONOMIC ACCOUNTING: THE SEEA

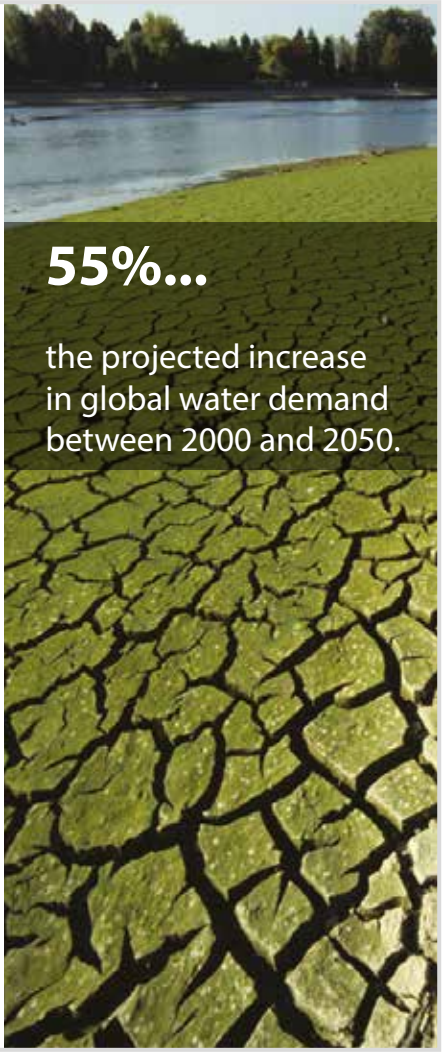
The integrated System of Environmental-Economic Accounting (SEEA) was developed in 1993 as a satellite to the System of National Accounts (SNA). A first revision was carried out in 2003; a second multi-year revision process was initiated in 2006. The purpose was to establish accounts that reflect the depletion and degradation of natural assets, and that integrate information on the economy and the environment by using concepts, definitions and classifications consistent with the SNA.

The SEEA describes three categories of accounts: (i) physical flow accounts for pollution, waste, energy, water and other materials; (ii) environmental activity accounts and related flows, including environmental protection expenditure, and environmental goods and services; and (iii) physical and monetary accounts of environmental assets. The SEEA discusses different approaches for the valuation of environmental assets and comprises three volumes, all of which were updated in 2012:

- **Volume I:** The central framework consisting of agreed concepts, definitions classifications, accounting rules and tables that describe the interactions between the economy and the environment, and the stocks and changes in stocks of environmental assets (adopted by the United Nations Statistical Commission at its 43rd Session in 2012, as the first international standard for environmental-economic accounting).
- **Volume II:** Experimental accounts for ecosystems describing the flow of benefits to humanity provided by ecosystems in physical and in monetary terms using a systems approach, and building on recent work by the World Bank, the EEA and others (forthcoming).
- **Volume III:** Extensions and applications of the SEEA.

Environmental economic accounts (EEA) can provide policy makers with coherent indicators and statistics to support strategic planning and policy analysis. Several countries have explored or adopted elements of EEA. Practical applications generally focus on areas where the demand for accounting tools is clearly identified and linked to specific policy questions – such as the management and planning of natural resources and materials use (e.g. water, energy, material flows) or pollution control (emission accounts) – and the associated indicator development. Only a few countries have established comprehensive accounts.

**Source:** OECD (2011), ***Policies to Support Eco-innovation in Israel,*** Environment Directorate, OECD.



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The OECD is working to help developed and developing countries meet the water challenge. With a multi-disciplinary team drawn from across the organisation, the OECD contributes analyses to improve the information base, identify good practice, and provide a forum for exchanging country experiences. Recent work has addressed issues of financing, governance, policy coherence, private sector participation, and water and agriculture. Ongoing work also covers the issues of water security, water and green growth, climate change adaptation, water allocation and urban water management.

In addition to analytical work, the OECD works with selected countries to facilitate the reform of water policies. This confirms our aspiration to make reform happen. The OECD has recently enhanced its convening power and capacity to structure discussion among stakeholders on water issues, by setting up the Water Governance Initiative.

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

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**April 2015**