Managing Water for All

AN OECD PERSPECTIVE ON PRICING AND FINANCING

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Foreword

Sustaining human and economic development, and maintaining ecosystems, require more effective management of water resources. This need is becoming more urgent as we witness increasing pressure, competition, and, in some regions, even conflict over the use of water resources. Poor governance and inadequate investment are resulting in billions of people not having access to water and sanitation services.

The OECD has been working over the last two years to address these challenges, focusing on areas where it can provide value-added. The results are summarised in this report, which emphasises: the economic and financial aspects of water management; the need for a cross-sectoral perspective to address this complex policy challenge; and the importance of establishing a firm evidence base to support policy development and implementation.

The report reviews current approaches in the agricultural sector in OECD countries, including market-based mechanisms for allocating water and cost recovery for irrigation. It concludes that we need to implement integrated water resources management more effectively. The OECD will strengthen its work in this area by examining a wider range of water uses, and the impacts of climate change on this agenda.

The report also explores how to strengthen financing for water supply and sanitation, and the related governance issues. Many OECD countries must replace ageing water infrastructure, and ensure that it complies with new environmental requirements. Developing countries face a major challenge to mobilise and allocate financial resources in order to provide access to safe water and basic sanitation for their populations.

The report focuses on the ultimate financial sources of investment for the water sector: taxes, tariffs and transfers – the "3Ts". It underlines the importance of strategic financial planning to find the right mix of the 3Ts for achieving water and sanitation targets, and for leveraging other sources of finance. The report stresses the vital role that tariffs play in achieving sustainable cost recovery while ensuring affordability. Tariff design is examined while stressing that keeping tariff levels artificially low for all is likely to harm the poor.

The most recent data on aid flows show an increase in recent years, which is encouraging. Aid flows to the water and sanitation sector should continue to increase and align with country-owned strategies. The report also examines the changing role of private sector participation in the water sector. Based on international experience, the report presents an OECD Checklist for Public Action that provides guidance for those governments wishing to engage the private sector.

This report, *Managing Water for All: An OECD Perspective on Pricing and Financing*, and the companion report, *Managing Water for All: An OECD Perspective on Pricing and Financing – Key Messages for Policy Makers*, have been prepared for the 5th World Water Forum in Istanbul on 16-22 March 2009. I am delighted that OECD is joining forces with other international organisations, governments, business and civil society to address the water challenge. Good water management is so fundamental to human and economic development, and to the maintenance of ecosystems, that we cannot afford to fail.

Angel Gurría
OECD Secretary-General

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This report synthesises a two-year OECD Horizontal Programme on Water. It presents the main findings and policy recommendations from the programme, and is based on several analytical reports prepared by several OECD directorates (see Background Materials). The Environment Directorate has contributed its expertise on water pricing and financing in OECD countries and in transition economies, and has co-ordinated efforts from other parts of the Organisation. The Directorate for Co-operation and Development has monitored and analysed official development assistance flows to the water sector. The Directorate for Financial and Enterprise Affairs has examined how the "OECD Principles for Private Sector Participation in Infrastructure" could be tailored to the water sector. The Directorate for Trade and Agriculture has analysed water policies and the associated support provided to farmers.

The report has been put together by the following individuals of the OECD secretariat, under the supervision of Brendan Gillespie: Julia Benn, Peter Börkey, Valérie Gaveau, Céline Kauffmann, Naoko Kubo, Xavier Leflaive, Wilfrid Legg, Roberto Martin-Hurtado, Remy Paris, Kevin Parris, Cécilia Piemonte, Florence Poppe and Monica Scatasta. The authors have worked with support from Carla Bertuzzi, Virginia Dagostino and David Kimble. Julie Harris copy-edited and prepared this report for publication. The comments from Kumi Kitamori and Lorents Lorentsen, Environment Director at the OECD, are acknowledged.

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Background Materials

The main findings and policy recommendations found in this report are based on:

- OECD/WWC (2008), *Creditor Reporting System: Aid Activities in Support of Water Supply and Sanitation - 2001-2006*, OECD, Paris.
- OECD (2009), *Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action*, OECD, Paris, *www.oecd.org/daf/investment/water*.
- OECD (2009), "Strategic Financial Planning for Water Supply and Sanitation", OECD internal document, *www.oecd.org/water*.
- OECD (2009), "Pricing Water Resources and Water and Sanitation Services", OECD internal document, *www.oecd.org/water*.
- OECD (2009), "Alternative Ways of Providing Water and Sanitation: Emerging Options and their Policy Implications", OECD internal document, *www.oecd.org/water*.
- OECD (forthcoming), *Sustainable Management of Water Resources in Agriculture*, OECD, Paris, *www.oecd.org/tad/env*.

A companion report, *Managing Water for All: An OECD Perspective on Pricing and Financing – Key Messages for Policy Makers*, is available at *www.oecd.org/water*.

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List of Abbreviations and Acronyms

3Ts	tariffs, taxes, transfers
BOT	built, operate, transfer
BRIC	Brazil, Russian Federation, India, China
BRIICS	Brazil, Russian Federation, India, Indonesia, China, South Africa
cap	capita
CBOs	community-based organisations
DAC	Development Assistance Committee
DFID	Department for International Development (United Kingdom)
EAP Task Force	The Task Force for the Implementation of the Environmental Action Programme for Central and Eastern Europe (OECD)
FCR	full cost recovery
EEA	European Environmental Agency
EECCA	Eastern Europe, Caucasus and Central Asia (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, the Kyrgyz Republic, Moldova, the Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan)
EU	European Union
FS	financing strategy (another term to designate SFP)
GDP	gross domestic product
GRP	Government of the Republic of the Philippines
GWI	Global Water Intelligence
GWP	Global Water Partnership
IBT	increasing block tariff
IFI	international financial institution
ILO	International Labour Organization
IMTA	*Instituto Mexicano de Tecnologia del Agua* (Mexico)
INEGI	Mexican National Institute of Statistics and Geography
IPCC	Intergovernmental Panel on Climate Change
IWA	International Water Association
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Programme (WHO-UNICEF)
MC	marginal cost
MDGs	Millennium Development Goals
NGO	non-governmental organisation
NWSC	National Water and Sewerage Corporation (Uganda)
O&M	operation and maintenance
OBA	output-based aid
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
PPP	public private partnership
PWRF	Philippines Water Revolving Fund

RoW	rest of the world (countries which are neither OECD nor BRIC)
RWSI	relative water stress index
SCR	sustainable cost recovery
SFP	strategic financial planning
SRMC	short range marginal cost
STP	sewage treatment plant
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP FI	United Nations Environment Programme Finance Initiative
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
UTC	unwillingness to pay
WHO	World Health Organization
WRM	water resources management
WSP	Water and Sanitation Programme
WSS	water supply and sanitation
WSSD	World Summit on Sustainable Development
WTP	willingness to pay
WWDR	World Water Development Report
WWF	World Wide Fund For Nature (formerly World Wildlife Fund)

Executive Summary

Water is a key prerequisite for human and economic development, and for maintaining ecosystems. Poor governance and inadequate investment, however, are resulting in large populations not having access to the water services they need. Failure to manage water resources effectively is also resulting in increased pressure on these resources, mounting competition for their use among different economic activities, and, in some regions, conflict.

Major economic benefits potentially accrue from improved water resource management and water services, especially for agriculture, industry, and water and sanitation. The World Health Organization (WHO) estimates that the health benefit/cost ratio for investment in water supply and sanitation (WSS) alone is between 4 and 12. But these benefits are not adequately quantified, nor communicated in a way that could inform public and political debate. This results in water resources management institutions being unable to carry out their functions, and in insufficient funding for investment and maintenance of water infrastructure. The outcome is that the potentially large benefits of investing in water are not being realised in practice, and the social costs linked to poor water management continue to increase.

In OECD countries, access to safe water supply and sanitation has largely been ensured following substantial investment over many decades. Access to water by agriculture and industrial users is generally ensured. However, significant investments will still be required to rehabilitate existing infrastructure, to bring it into conformity with more stringent environment and health regulations, and to maintain service quality over time.

In non-OECD countries, the challenges are more daunting. Large parts of the population have no access and many others suffer unsatisfactory services. Water services for agriculture and industry are also inadequate. The international community is committed to achieving the Millennium Development Goals (MDGs) that aim, *inter alia,* to halve the proportion of people without access to safe drinking water and basic sanitation by 2015. The costs of not meeting these objectives are very significant, and it is important to recognise that meeting them would still leave millions of people without access to adequate services. Inadequate access to water, sanitation and poor hygiene account for 1.8 million child deaths per year – the second largest cause of child mortality after malnutrition – in addition to having other health impacts.

The challenges of providing access to safe water and basic sanitation are further underlined by increasing demands from other uses of water. The increased demand is linked with a variety of factors: population increase, pressures for food production, rapid urbanisation, degradation of water quality, and increasing uncertainties about water availability and precipitation regimes, in part due to climate change. In 2005, 2.8 billion people lived in areas under severe water stress.[1] By 2030, the *OECD Environmental*

Outlook to 2030 estimates that this number will increase by about 1 billion, to 3.9 billion (47% of the world population), without taking climate change into consideration.

Despite strong calls for action at the international level, and considerable efforts at local, national and international levels, the world is still off track with respect to achieving internationally agreed water-related targets. Few countries have defined water resources management strategies, as called for in the Millennium Declaration. With regard to the water-related MDGs, the 2008 World Health Organization-United Nations Children's Fund (WHO-UNICEF) Joint Monitoring Report states that, while the world globally is on track to achieve the drinking water target, a number of regions will not reach this goal, and the world as a whole is off track with regards to the sanitation target.

Substantial additional finance is required to meet these challenges. A recent WHO report[2] estimates that USD 18 billion will be needed annually to extend existing infrastructure to achieve the water-related MDGs, roughly doubling current spending. But what is also growing clear is that the cost of maintaining and modernising existing systems will grow steeply and already greatly exceeds the annual costs of extending the networks. WHO estimates that an additional USD 54 billion per year will be needed just to ensure continued services to the currently served population. This does not include the additional needs generated by new infrastructure.

Additional financial resources are a necessary, but not sufficient, condition for achieving internationally agreed, and other, water policy objectives. There is also considerable scope to improve the cost-effectiveness of expenditures on water. These two issues dovetail each other and are linked to the way institutions are established and their policies are implemented. This is particularly challenging in the water sector as it usually cuts across the responsibility of several ministries, and requires the involvement of national, regional and local authorities. In addition, the implementation of effective water policies is often hindered by political and public opposition to increasing the price of water, which impinges on the establishment of effective financing arrangements and efficient system performance.

Thus realising the benefits of improved water policies requires not only more finance, but also improved governance of the sector, as well as effective strategies that can overcome the vested interests and opposition that often block reform. Effective communication of fact-based analysis can contribute to informed policy debates and transparent decision making.

The benefits of strategic financial planning for water supply and sanitation

The water and sanitation sector is seriously under-financed in many countries. In some developing and transition economies, this has led to the deterioration and the eventual collapse of infrastructure.

One approach to address these challenges is through strategic financial planning for the water sector. Such plans should establish realistic policy objectives regarding access to water and sanitation services that are affordable to public budgets and households. They should consider ways of mobilising more financial resources, reducing excessive demand, and improving the cost-effective use of resources. Strategic financial planning should help to reach consensus on policy choices and how they should be achieved. Ideally such planning processes should be led by ministries of finance, in co-ordination with other ministries, and engage other relevant stakeholders. This must be done in a way

that ensures a more rational use of existing financial resources and access to additional ones.

Effective financial planning for the water sector requires finding the right mix of revenues from the so-called "3Ts": tariffs, taxes and transfers (including official development assistance [ODA] grants). These are the ultimate sources of revenue for the sector and they need to increase to a level where they allow the recovery of costs. This will help to attract other sources of finance – such as loans (including ODA loans by bilateral donors and international financial institutions), bonds and private investors. These additional sources of finance are important for making the large, upfront investments normally required in the water sector, but they need to be repaid by some combination of the 3Ts. In addition, the water sector will be able to attract these external sources of finance only if revenues (the 3Ts) are sufficient and reliable.

Full cost recovery from tariffs which may theoretically be the ideal solution, in practice remains a distant objective in many countries. However, even very poor countries can reach important cost-recovery targets at the sub-sector level: such as cost recovery for operation and maintenance (O&M) and investments in urban water supply, or cost recovery for O&M expenditures in rural water supply. Increasing revenue from tariffs requires a comprehensive approach, which includes reforming tariff levels and structures and increasing bill collection rates, but also increasing levels of service and putting in place social protection measures.

Where full cost recovery from tariffs cannot be achieved, public budgets and, for poorer developing countries, ODA will need to play an important role in financing sector costs. The water sector should therefore aim to achieve cost recovery from a combination of financial sources, including user charges, public budgets and ODA, rather than from tariffs alone – a concept that has been termed "sustainable cost recovery".[3]

The latest statistics on ODA indicate a renewed emphasis on the water sector in donors' aid programmes. In 2005-06, total aid for water rose to USD 6.2 billion which represented 9% of total sector allocable aid. Over the last five years, aid for water was allocated mostly to Asia (55%) and Africa (32%). However, the share of the region most in need of improved access to water supply and sanitation, Sub-Saharan Africa, declined from 22% over 2001-04 to 17% in 2005-06 for Development Assistance Committee[4] (DAC) members. ODA transfers to the water sector are in the form of both grants and loans with the latter representing almost 40% of the DAC total.

Although from a global perspective ODA provides a relatively small part of revenues for the water sector, it can help close the financing gap in poorer countries. Donor support for country-owned strategic financing plans can enhance the effectiveness of donor aid for the water sector, in line with the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action.

Effective strategic financial plans for the water sector should also emphasise opportunities to reduce costs. This could include improving the operational efficiency of utilities – though this is largely dependent on local conditions and governance. Improved contractual arrangements, better incentives, and clearer roles for utility operators can help reduce costs. Other important opportunities are linked to policy decisions such as adopting lower cost technologies, accepting lower service levels, extending deadlines for attaining targets, and rationalising construction and environmental standards.

Tariffs: reconciling different policy objectives

Tariffs often provide the major share of financing for the water sector, though this is usually well short of the theoretical goal of "full cost recovery". A number of obstacles constrain a fuller role for tariffs, including lack of awareness of the broader economic benefits of water supply, and particularly sanitation, and concerns about the impacts on low-income households. These factors are relevant to a greater or lesser extent in both OECD and non-OECD countries.

Tariffs have to meet diverging financial, economic, environmental and social objectives, some of which may be conflicting. A major challenge therefore is designing tariffs in a way that strikes an appropriate balance among competing objectives. This is ultimately a political task and needs to be addressed through a transparent, democratic, participatory process. This requires a debate about the appropriate balance between the various policy objectives, assessing the costs and benefits of different tariff levels, examining the distributional impacts of tariff structures, and developing appropriate compensatory or mitigation measures to avoid affordability problems. Such a debate is likely to be more effective if tariff reforms are considered in combination with issues such as the level of service and the efficiency of service provision.

It is especially important that two objectives are met simultaneously: the financial sustainability of the service provider and the affordability of the service for low-income households. Two questions need to be addressed. The first concerns the portion of the costs that should be covered by revenues; and the second, the share that should be covered by different income groups, family types, or different geographical units. The way in which costs are allocated provides the basis for considering cross-subsidisation across regions' user groups.

Affordability limits are better assessed at the local level, and need to take into consideration local knowledge on low-income households' current spending on services, ability and willingness to pay (WTP) for improved services, although caution should be used in interpreting WTP estimates. In the absence of this information, the risk is that decisions about tariff levels and structures will be based on exaggerated assessments of affordability constraints that underestimate willingness to pay.

In such cases, the result is a vicious circle of underfinanced services, lower than needed investment and maintenance, and lack of access to water services. This hurts the poor most, as they are the first to suffer from low quality services. Moreover, keeping tariffs artificially low prevents the extension of services to the currently unserved and is not an effective measure to help the poor.

A review of tariff policies for water supply and sanitation in OECD countries reveals a number of trends:

- continued real price increases – at times, substantial – for household service over recent years, both in OECD and non-OECD countries, which may signal an increased role of tariffs in cost recovery;
- a continued decline in the use of decreasing block tariffs and flat fee systems for household tariffs, in favour of two-part fixed charge + variable fees with a uniform or increasing block volumetric component;
- the limited application of decreasing block tariffs for industrial uses (or for the larger amongst them) in only a few OECD countries;

- the increased application of taxes on water bills;
- increasing separation of wastewater from drinking water charges, and charging for wastewater on the basis of actual costs thus raising charges, with consequent substantial increases in the price of wastewater management services;
- evidence that the response of domestic consumers to marginal price changes may be limited, while more significant – but possibly temporary – impacts on demand may follow changes in tariff structure, and especially a shift from flat to volumetric rates;
- continued attention to social concerns, addressed through innovative tariff structures or parallel income-support mechanisms.

How to best harness the capabilities of public and private actors for water supply and sanitation services

Many countries have engaged the private sector in operating, modernising and/or expanding their water and sanitation infrastructures. Experience has been mixed. There are many examples of well-run public and privately operated utilities. The bad experiences can be largely attributed, among other factors, to a misunderstanding of the risks involved and unclear allocation of responsibilities among stakeholders. Debate has now moved on from public *vs.* private ownership, to consider ways in which water services can be provided not only safely but also most efficiently, effectively and sustainably, regardless of ownership.

Private actors in the water sector today are more diverse than 10-15 years ago: in addition to international companies, they include local and regional actors, small-scale water operators, private sector whose core activity is not water (financiers, big users), joint ventures between public and private companies as well as public companies operating abroad (effectively as private entities). Mimicking this diversity, contractual arrangements are also becoming increasingly diverse and context-specific, covering the spectrum from divestiture of assets to non-financial forms of participation.

Governments have taken various measures to improve the stability and predictability of their regulatory frameworks for water. However, managing the flexibility required to sustain long-term commitments in a constantly changing environment remains a major challenge. Most developing countries find it difficult to make the long-term policy decisions necessary to harness private sector capabilities. The choice of whether or not to engage the private sector should be based on an analysis of costs and benefits and involve careful definition of contractual arrangements – typically output-based, providing realistic incentives to improve coverage and efficiency and including dispute resolution mechanisms.

Private sector participation does not relieve governments of their responsibility to ensure safe and efficient water services and to prevent the abuse of monopoly position. OECD has developed a Checklist for Public Action[5] that can help governments to make the best use of the capabilities of both public and private actors in the development, maintenance and operation of water supply and sanitation services. It provides a coherent set of policy directions, including the allocation of roles, risks and responsibilities, as well as the framework conditions necessary to make the best of private sector participation.

Economic instruments to promote sustainable water use for agriculture

The issue of water resources management should be addressed in a co-ordinated manner, looking at the interactions between competing water uses (including pollution and ecosystem requirements). Integrated water resources management is a holistic approach that aims to reconcile competing requirements through a negotiated process that will inevitably require trade-offs between economic sector users, and between these users and social and environmental concerns. This analysis lies beyond the scope of this report, which focuses primarily on advancing understanding of the role of pricing and financing issues in different parts of the water sector. By treating them in the same report, however, common principles can be identified. Future work by OECD will address integrated water resources management issues, particularly their financing and pricing aspects.

To improve water resources management, it is critical to manage the way water is used in agriculture. Agriculture is by far the largest water user and also contributes to pollution of surface waters and groundwater. Improving agricultural water management is a key aspect of achieving more sustainable water resources management. Agricultural water use needs to be part of an integrated approach. In particular, the report highlights the importance of providing the agriculture sector with the right signals to increase efficiency in water use or to modify production patterns.

Charges for surface water supplied to farms have been increasing in most OECD countries. But, while the principles of sustainable cost recovery should hold true for agriculture water use as well, often farmers are only covering the operation and maintenance costs for water supplied, with little or no recovery of capital costs for water delivery infrastructure. Water pricing policies rarely take into account social or environmental values. Groundwater policies usually involve licenses and other regulatory instruments. But illegal connections to surface water distribution systems and illegal groundwater pumping is difficult to observe or control and remains a major challenge for the sustainability of farming. Where countries have increased water charges to farmers, the available evidence indicates that it has not led to reduced output.

Agricultural policies linked to production encourage less efficient use of water, lead to off-farm pollution and exacerbate flood damage in many OECD countries. There has been some progress in lowering overall agricultural support levels and in decoupling support from production and inputs (including water and energy). This is beginning to encourage more efficient use of water, better adaptation to water scarcity, and lower off-farm pollution. Adoption of improved farm practices can promote the efficient use of water and infrastructure for production, help flood mitigation, and provide other environmental benefits, such as wetland conservation. And well-targeted agricultural support can maintain farming systems in those countries where there is an association between farming and the provision of ecosystems. But isolating and quantifying the overall economic efficiency and environmental effectiveness of agricultural and agri-environmental support on water resources is difficult and further analysis on causation is needed.

Water reforms are addressing an increasingly complex set of policy objectives including: ensuring robust water entitlements (property rights); achieving cost recovery targets; developing water charges reflecting cost of service provision; establishing trading systems (of water use permits) to enable highest value use of water, and refining institutional arrangements to efficiently plan, allocate, manage and regulate water use. These policy reforms need to be underpinned by improved knowledge, research, capacity

building, and monitoring. The basis for determining water supply costs often lacks transparency. Developing markets for water use permits, and planning water allocation between different users and the environment, require detailed monitoring of water extractions and flows and the ecological outcomes that are sought. Improved information on the costs and benefits of agriculture's use of water (*e.g.* groundwater recharge, wetland conservation, flood mitigation) would better inform policy decision making. Farmers also need more advice on best practices to adopt.

Many OECD countries are reporting the growing incidence, severity and costs of flood and drought events on agriculture linked to climate change. This is leading to the emergence of mitigation and adaptation policy strategies. These include efforts to improve food security and water use efficiency by farmers in areas of water scarcity, to develop new crops or farm practices where climate change alters temperatures and precipitation, and to alter management practices and systems that can contribute to slowing water transport across farmland and reducing flood damage in urban areas. These approaches are more likely to be effective if they are embedded in longer term strategies closely linked with overall agricultural policy reform, risk management policy and market approaches.

Notes

1. Where water withdrawals exceed 40% of available water resources.
2. WHO (2008), "Regional and Global Costs of Attaining the Water Supply and Sanitation Target (Target 10) of the MDGs", WHO, Geneva.
3. Sustainable cost recovery is about combining user charges and public transfers in a sustainable way, which requires that tariffs are affordable for each category of users and transfers are predictable, enabling the water utility to count on them to finance investment. This concept is acknowledged by the European Union Water Framework Directive.
4. The OECD Development Assistance Committee is made up of 23 members: 22 OECD countries (among them the most important bilateral donors) and the European Commission.
5. OECD (2009), *Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action*, OECD, Paris, *www.oecd.org/daf/investment/water.*

Introduction

Overview

Policies related to water can be considered under two inter-related headings: providing water services, especially water supply and sanitation, and managing water resources. This report focuses on the economic foundation and financial basis for sustainable water service provision and the role of economic instruments in sound water resource management. A considerable effort has been made to base the analysis on recent experience in OECD and partner countries. This report examines practical ways to close the financial gap between the costs of providing water services with the sources of financing available, in both OECD and non-OECD countries. Closing this financial gap is a prerequisite for ensuring affordable water services for all segments of society. Tariffs have a special role to play in this, but need to remain affordable. This report examines some of the related governance and institutional issues.

Regarding the management of water resources, this report essentially covers municipal and agricultural water uses, two areas which are major water uses (agriculture accounts for 40% of overall water uses in OECD countries, and 70% globally) and where the OECD has accumulated experience. This report considers that these uses (and others, not covered in the report, such as industrial and environmental water uses) interact and should be addressed in a co-ordinated, if not integrated, manner. In particular, this report examines how market-based instruments can enhance agricultural water management. The broader issues of integrated water resources management remain beyond its scope, but will be addressed in future OECD work, particularly with regards to financing and pricing aspects.

Structure of the report

The report has five chapters. Chapter 1 sets the stage. It presents some of the key principles of water economics on which the report relies; in particular it clarifies that water is both a natural resource and a service that comes at a cost. Second, it explains the main challenges facing the water sector. Third, it situates this report in the lineage of debates in the international community on water finance. These debates have sometimes been muddled by some confusion surrounding the key principles of water economics. They need to be revisited in light of the emerging challenges. These elements provide the rationale for the OECD Horizontal Water Programme, as was derived in 2006.

The subsequent four chapters focus on specialised issues related to the economic and financial bases for sustainable water service provision and sound water management. Chapter 2 takes stock of the experience gained in designing realistic finance strategies for water supply and sanitation; the analysis draws on 18 country case studies. The focus primarily is on developing countries and the water-related Millennium Development

Goals,[1] although some lessons are relevant for OECD countries as well. The chapter also examines the role of official development assistance to water supply and sanitation.

Chapter 3 examines the ways tariff levels and structures can be designed to meet various objectives such as the financial sustainability of service operators and the access to, and affordability of, the service for the poor. It builds on an updated survey of current practices of water pricing and financing sources in OECD and developing countries, identifying best practices and emerging challenges, such as the need to build social assessment procedures into pricing policies.

Chapter 4 takes stock of the recent developments in private sector participation in water supply and sanitation. It elaborates a checklist of policy directions for consideration by governments wishing to effectively harness the capacities of the private sector and other stakeholders. The OECD Checklist for Public Action builds on three regional workshops in Africa, Asia and Latin America. This chapter also draws on a background study of the opportunities arising from new approaches for providing water supply and sanitation services in urban areas (reusing water; decentralised approaches).

In Chapter 5, the focus is on agricultural water management, specifically the use of economic instruments to increase water productivity. The chapter explores recent trends and the future outlook for the use of water in agriculture, and explores policy options to address the related challenges. The chapter builds on a systematic review of OECD country experience in water policies, pricing and financing in the agriculture sector.

Notes

1. This phrase covers both the initial Millennium Development Goal on access to water and the sanitation-related target from the Johannesburg Plan of Implementation.

Chapter 1

Setting the Stage

Water is a resource that has to be managed and a source of services that come at a cost. How can these costs be shared among different categories of users and beneficiaries, and fully covered is essentially a policy issue. As regards water supply and sanitation, costs can ultimately be covered by three sources of finance: tariffs, taxes and transfers. The appropriate combination will depend on policy objectives and contextual features.

The current context is dominated by three major challenges which are consequential for water policies, financing needs and possible responses: water scarcity, which results from the excessive usage of available resources; access to water supply and sanitation in developing countries; and rehabilitation of water supply and sanitation infrastructure in OECD countries.

These challenges and related issues emerged on the international policy agenda in the 1970s. This report builds on this process to move the dialogue forward.

This chapter has three related objectives. First, it recalls some of the key principles of water economics on which the report relies (see Box 1.1 for key definitions). Second, it explains the main challenges facing the water sector; it highlights the connection of often artificially separated issues, *e.g.* water resource management and water supply and sanitation. Third, it situates this report in the lineage of debates in the international community on water finance. These debates have sometimes been muddled by some confusion surrounding the key principles of water economics; they need to be revisited in light of the emerging challenges.

Box 1.1. **Definitions**

In this report:

- **Water sector** signifies all water-related activities, *i.e.* water resources management and the provision of water-related services.
- **Water services** refer to all services provided through manmade capital.
- **Water supply and sanitation (WSS) services** refer to the sub-set of water services dealing with the provision of drinking water and sanitation services (from basic sanitation to wastewater treatment).

The economic backbone of water policies

Complex issues pervade political debates about water economics. One is the debate about the public versus private good dimension of different water services and how to deal with the externalities they produce. A second issue is the distinction between water resources and their management *vs.* water services and their provision. A related issue is how to ensure the financing of water resources management and water service provision, and the role of charges on water resources and tariffs for water services as a source of revenue and/or for other policy objectives.

The economic nature of water services

Box 1.2 clarifies the economic nature of different water-related services. Their economic characteristics need to be taken into consideration when defining water policies, as they affect the effectiveness of different policy instruments as well as the perception of benefits and the willingness to pay for different services by final users.

Box 1.2. The economic nature of water services: a clarification

It is important to distinguish between those services that primarily benefit their direct users (*e.g.* water supply and sewerage) from those that provide benefits to a pool of beneficiaries that extends beyond the direct users due to positive externalities (*e.g.* wastewater treatment has downstream positive externalities).

Another important distinction lies between private and public goods, which gives rise to four classes of goods along two dimensions depending on two characteristics:

- The degree of rivalry in consumption. Rivalry implies that the resource has a scarcity value and that there is a non-negative marginal cost of supplying an additional customer.
- The degree of excludability of users from accessing the good or enjoying its benefits. This can be measured by the transaction costs that have to be incurred to exclude possible beneficiaries.

	Excludable	Non-excludable
Rival	Private good (*e.g.* drinking water supply)	Free access or "common pool good" (*e.g.* groundwater aquifer when individual pumping for irrigation is not monitored)
Non-rival	Club good (non-rival until a "saturation threshold" is reached) (*e.g.* networked services, with the threshold linked with the capacity of the system; recreational use of a water body, if monitoring of access is feasible)	Public good (flood management, resource and ecosystem protection, hydrological monitoring, storm-water drainage)

As people will not be willing to pay for something from whose fruition they cannot be excluded, the competitive market will not provide sufficient quantities of public goods.

While externalities can arise from private and public goods, public goods always produce positive externalities for all users that cannot be excluded from their benefits. For instance, the fact that downstream dwellers benefit from upstream wastewater treatment is definitely a case of positive externalities. But can wastewater treatment be seen as a public (or at least quasi-public) good? While users can be excluded from being connected to wastewater treatment, this does not exclude polluters in an area with a wastewater treatment from its benefits. Therefore, this service appears to have some public good characteristics.

An additional category that is relevant for some water services is that of "merit goods", whose consumption has a "general interest" dimension. This concept is also linked with that of externalities. The consumption of merit goods tends to be below the social optimum for two possible reasons: *(i)* positive consumption externalities are not taken into consideration by private consumers; or *(ii)* individuals are myopic and maximise short-term utility, not taking into consideration their private long-term benefits. Some components of WSS services have important consumption externalities providing a complex set of benefits at community, regional and even national levels. A typical example is that of basic sanitation services and wastewater collection, for which willingness to pay tends to be lower than their societal value as households cannot fully take into account the additional community benefits that their use of these services entails.

Source: OECD (2009a), "Pricing Water Resources and Water and Sanitation Services", OECD internal document, *www.oecd.org/water*.

There are other elements that can differentiate water services. For instance, water provision services can differ in terms of the quality of water provided (*e.g.* drinking water provided to domestic users *vs.* bulk water provided untreated or at lower levels of treatment to agriculture or industrial users).

Water: a resource to be managed and a source of services that come at a cost

Water resources are a natural capital that provides useful functions to humans and ecosystems. Recital 1 of the European Union (EU) Water Framework Directive states that "Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such." The availability of water resources and the functions and services that this natural capital is able to provide over time depend on a cycle governed by nature and climate, and affected by human activities.

Water policy is therefore first of all concerned with the allocation of water resources among competing uses[1] (including environmental uses) and its protection against excessive deterioration. This has led to the concept of an integrated approach to water resources management (GWP, 2000) that recognises the need for a negotiated process to co-ordinate and adjudicate among competing users to ensure sustainable management of valuable water resources; experience indicates that this process works best at the river basin level. Water resource management also relates to upstream ecosystems and forests, wetlands and marshes, due to their function of regulating water flows (see OECD, 2003); this is the concept of "nature for water".

Water services are based on the natural capital of water resources, but their provision also needs man-made capital: water needs to be treated to achieve required quality levels (which can differ for different uses) and transported to the point of use; wastewater needs to be removed and treated, and also water resources management activities require physical infrastructures (*e.g.* monitoring networks). All this requires the construction and operation of storage structures, treatment plants, piped networks, etc. These infrastructures can increase the productivity of a watershed (*i.e.* the environmental, social and economic functions obtained from the resource) or mitigate its deterioration over time.

Water policy, therefore, also deals with the creation, operation and maintenance of infrastructures and the operation of water services. Man-made capital is costly, either in monetary terms or because of negative externalities linked to its use (*e.g.* negative impacts on ecosystems of the construction of a dam). Its cost has three elements:

- **Financial or supply costs** are directly associated with supplying water and sanitation services to users. They consist of two elements: *(i)* operation and maintenance costs, associated with daily running of the water supply system, such as electricity for pumping, labour, water treatment and repair costs; *(ii)* capital costs, covering both capital for renewal investment of existing infrastructure and new capital investment costs; the financial cost of servicing debt. Table 1.1 shows estimates of the average costs of water infrastructure in developed countries. Water supply costs do not include large dams or similar infrastructure as these are locally specific.

- **Economic costs** are the sum of the supply costs, plus the opportunity costs, which reflect the scarcity value of the resource and the costs of depriving the next possible user, and the economic externalities, consisting of positive externalities (for example the groundwater recharge benefits from irrigation or water re-use) and negative externalities (typically, upstream diversion of water or the release of pollutants downstream within an irrigation system). It should be noted that there is an opportunity cost to public finances that are provided for water as well, as they are not available for alternative purposes.

- **Full costs** include the sum of the supply and economic costs, plus externalities associated with costs to public health and ecosystems, such as salinisation of soils and pollution of water from farm chemicals used in irrigation.

Cardone and Fonseca (2003) add to this the administrative costs of sustaining the service, which include the costs incurred in regulating the service, institutional capacity building, and the cost of devising and implementing the policy and enabling environment for the sector. Rees, Winpenny and Hall (2008) argue that this should be further extended to more systematically include the **costs associated with water resources management activities** that are needed for the stewardship of the water resource base, and therefore for the long-term sustainability of service provision.

An essential aspect of water policies is ensuring that these costs are covered so that water-related infrastructure and services continue to perform their functions. This raises the question of who should pay for these costs.

Table 1.1. **Cost of water supply and wastewater infrastructure for centralised systems (USD)**

Service	Water supply[1]	Sewage disposal		Separate storm water
		Combined sewer[1]	Separate sanitary sewer[1]	
Networks (cost fraction)	85%	90%	88%	100%
Treatment (cost fraction)	15%	10%	12%	Storage only
Financing costs[2]	Up to 40	15-25	10-16	9-15
Maintenance costs[2]	Up to 45	13-25	8-15	5-13
Operating costs (30% labour)[2]	15-60	30-40	15-35	12-18
Taxes[2]/other	3-15	4	2.5	2
Infrastructure cost per head	700-800 average	1 000-1 300	700-900	650-700
For 180-210 l/h/d (min.-max)	(450-1 800)	(900-2 200)	(650-1 400)	(970-1 250)

1. Includes centralised treatment system.

2. Costs per 100 m^3 per year.

Source: Lee, T., *et al*. (2001), "Economic and Financial Aspects", in C. Maksimovic and J.A. Tejada-Guibert (eds.), *Frontiers in Urban Water Management – Deadlock or Hope*, pp. 313-343, quoted in OECD (2006), *Infrastructure to 2030: Telecom, Land, Transport, Water and Electricity*, OECD, Paris, p. 313.

Financing water services: an essentially political issue

The issue of who should pay for water services is difficult for two reasons. One is that the value attached to services by users is not related to the costs of these services. Typically, city dwellers pay more attention to the quality of the water they drink than to the quality of the wastewater they return to the ecosystem. Consequently, they are more willing to pay for access to safe and reliable drinking water and removal of wastewater than for wastewater treatment, independently of the respective costs of these services.

The other reason why the issue of who should cover the costs of water services is difficult is that the benefits of water services (or the cost of a lack thereof) do not necessarily accrue to the users of the service or to the party that pays for this service. A combination of institutional arrangements, policy choices and market failures results in a difference between the private costs of water services and their social benefits.

For instance, the money that businesses or households allocate for improved wastewater treatment will benefit health and economic development for the wider community, *e.g.* including downstream users who cannot be excluded from the fruition of improved quality of resources. The World Health Organization estimates that each US dollar invested in water supply and sanitation generates between USD 4-12 in health benefits alone, depending on the intervention (WHO, 2008).[2] Similarly, the money invested by a community to improve water services can increase the value of the land owned by private owners, who will collect rent.

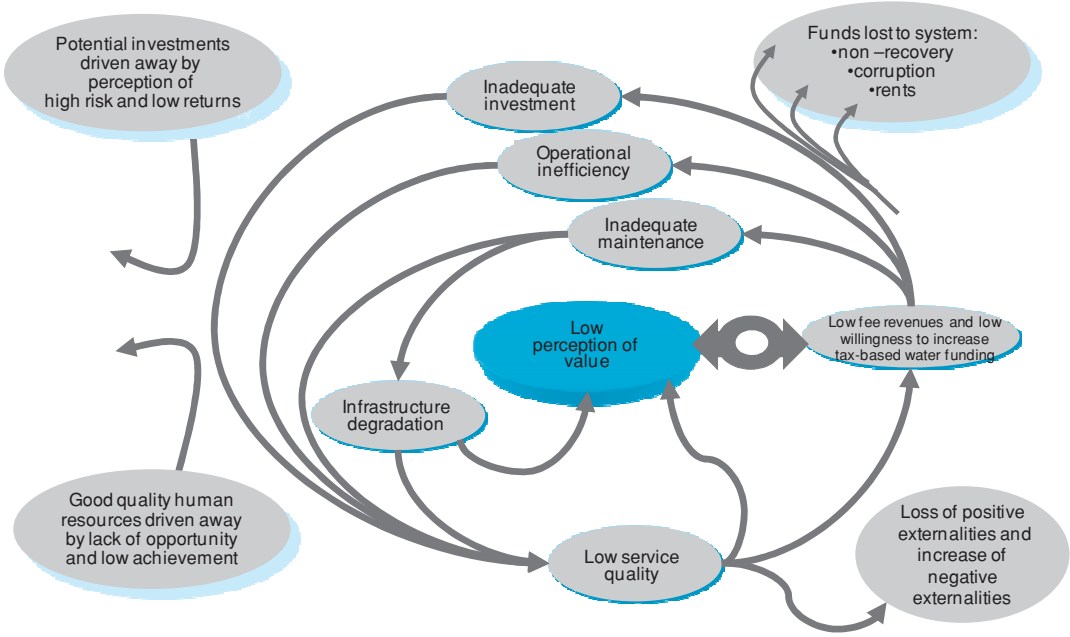
It follows that, for water services, the distinction between public and private goods is less discernable.[3] This has consequences for decisions about who should bear the cost of water services. With regard to wastewater treatment, for instance, public support could be justified because it has a public good dimension. On the other hand, (part of) the investment in the infrastructure could be covered by property owners, if they can extract a rent from the investment. The relative contribution of public and private sources of finance is a political issue, which can be informed, but not determined, by economic analysis.

Incidentally, the examples above suggest that approaches to finance sanitation can differ from those financing water supply. Some components of sanitation services, particularly wastewater treatment, generate significant positive externalities and can be seen as having a public good character for some non-connected populations, while others (*e.g.* wastewater removal) have a merit good character. In both cases, economic theory indicates that consumers' willingness to pay would be lower than socially optimal.

Selected pitfalls of financing for water services

Two consequences follow. One is a vicious cycle of underinvestment in water-related infrastructure and water resources management activities (Figure 1.1). Water-related infrastructure requires significant levels of investment and has long payback periods. The benefits are not fully recognised, therefore funds are difficult to mobilise, resulting in lower than needed investments and inadequate maintenance of infrastructure and in the difficulty of attracting good quality resources to the water sector (including management). This in turn results in low quality services, which reinforces the cycle by further reducing their value in the eyes of users and governments.

Figure 1.1. **The vicious circle of underinvestment and unrealised benefits**



Source: Devised by Jack Moss on the basis of ideas provided by Alain Mathys. This diagram was published in a simpler form in Moss *et al*. (2003), "Valuing Water for Better Governance – How to Promote Dialogue to Balance Social, Environmental and Economic Values", CEO Panel Business and Industry, 10 March, p. 13, *www.wbcsd.org/DocRoot/8d4hpTlQ6FCa4jn7Y5Cl/Valuing_water_report.pdf*.

Another consequence of the points discussed above is that water finance relies on a mix of financing instruments. The costs of water services can be covered by three sources of revenues:

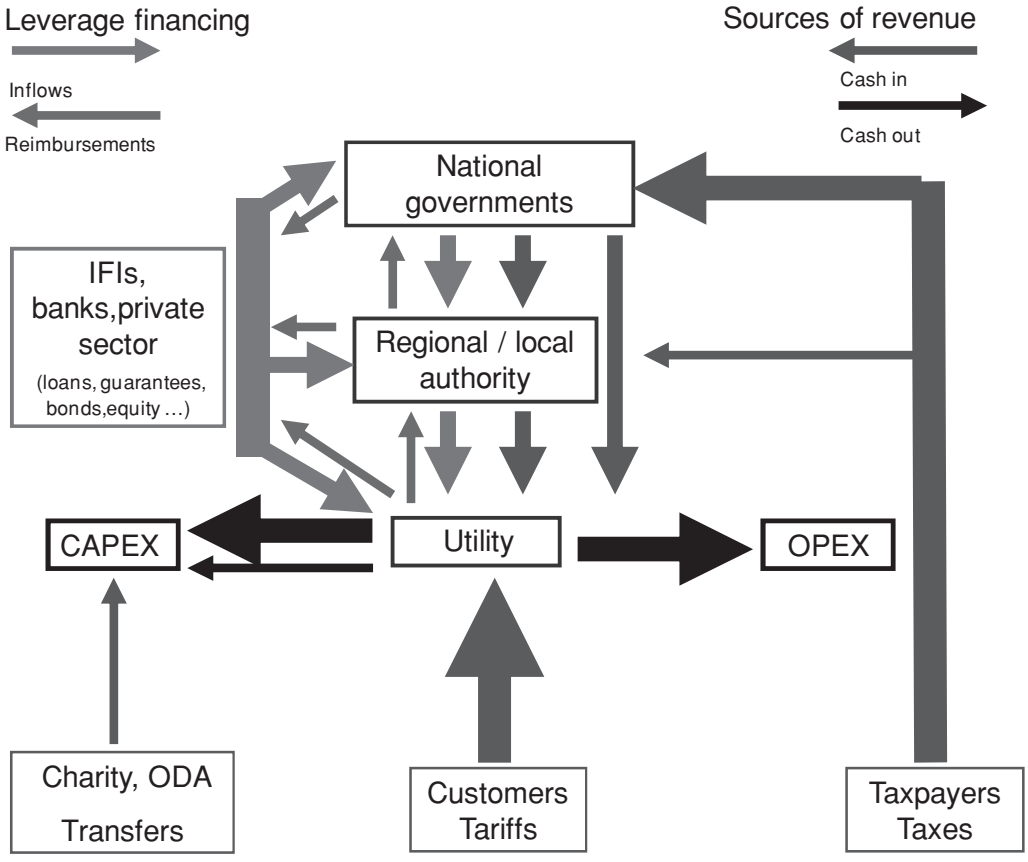
- Tariffs: users of the water services can cover (part of) the costs of these services. Experience shows that tariffs have different impacts on different water services. Chapter 5 indicates that pricing water has only a limited role in stimulating resource allocation, whereas it is used as an instrument to manage demand for water supply and sanitation.
- Taxes: beneficiaries from water services can contribute to the costs of these services, whether or not they use them. However, deciding upon the precise frontiers of the "community of beneficiaries" (local, regional, national, international) can be difficult. For water management, countries tend to favour a watershed (or river basin) approach, as the benefits of improved water use tend to materialise at this level; but other levels or scales may be appropriate for selected services.
- Transfers from international donors or from private charities: ideally, official development assistance (ODA) should be assimilated to taxes in the 3Ts (tariffs, taxes, transfers), as aid policies suggest more aid be delivered in the form of budget support, which implies that they would be disbursed in much the same way as national public budget resources. In this report, ODA has been kept under transfers, as donors are still disbursing most of their aid through projects and programmes, rather than through recipient country budget processes. Another

important feature that distinguishes ODA from taxes is that they are levied in foreign countries, rather than nationally and the political and administrative process of securing ODA resources is very different from taxes.

The 3Ts represent who actually pays for water (see Figure 1.2 and Chapter 2). Additional sources of finance (public and private loans, bonds and funds provided by public and private investors) can help cover upfront investment costs and thus enable governments to leverage available sources of revenues and, hopefully, reduce financing costs; but they have to be repaid. The 3Ts and the stability of the financial flows they generate determine the creditworthiness of water utilities and hence access to additional sources of finance.

Figure 1.2. **Financial flows to water supply and sanitation**

Leverage financing *vs.* sources of revenues



Source: OECD (2009b), "Strategic Financial Planning for Water Supply and Sanitation", OECD internal document, *www.oecd.org/water*.

Recognising that there are three ultimate sources of finance to cover the costs of water services is an important departure from the doctrine (the "full cost recovery" principle, FCR) which holds that all costs should be covered through the revenue generated by tariffs. Revenues from these three sources contribute to "sustainable cost recovery" (Box 1.3) which, on the basis of country experience, is now considered a more realistic and practical policy principle than "full cost recovery".

Box 1.3. **Sustainable cost recovery**

The concept of "sustainable cost recovery" was formulated by the Camdessus Panel. The panel's report identified three main characteristics of sustainable cost recovery:

- An appropriate mix of the 3Ts to finance recurrent and capital costs, and to leverage other forms of financing;
- Predictability of public subsidies to facilitate investment (planning);
- Tariff policies that are affordable to all, including the poorest, while ensuring the financial sustainability of service providers.

Source: Winpenny, J. (2003), "Financing Water for All", Report of the World Panel on Financing Water Infrastructure, chaired by Michel Camdessus, *www.financingwaterforall.org*.

There is no "one size fits all" model to financing. At one extreme, poor countries tend to draw heavily on transfers from ODA and local and international philanthropy to cover capital costs as well as many recurrent costs. At the other extreme, some developed countries with mature water systems raise all or most of their revenues from water users through tariffs, earmarked taxes and other charges (*e.g.* England and Wales, France and the Netherlands; see Box 1.4 for an illustration). The appropriate combination will depend on policy objectives and a number of contextual features. Consistency and efficiency will be assessed on a case-by-case basis.

Box 1.4. **Water agency subsidies in France**

France operates a major programme of transfers for municipal water supply and sanitation funded from earmarked taxes collected at the river basin level through user charges (charges for water withdrawals or discharges levied by the *Agences de Bassin*). These transfers, aimed at equalising affordability between urban and rural areas and used mainly to support the achievement of environmental objectives within basins, amount to a total of EUR 8.3 billion over the period 2007-12. In practice, these earmarked taxes are included in water tariffs paid by customers.

French "water taxes" are thus, in effect, environmental prices meant to integrate external/environmental costs, which are paid as a proportion of water consumed or discharged, and used as an income source for financing water-related investment within the same river basin.

Source: France case study prepared for the OECD Task Team on Water and Sanitation.

Current water policy challenges

This section highlights some of the key challenges for water policies[4]: *(i)* water scarcity; *(ii)* access to water supply and sanitation in developing countries; and *(iii)* rehabilitation of water supply and sanitation infrastructure in OECD countries. It stresses that both OECD and non-OECD countries are facing daunting water-related challenges, albeit of a different nature. These challenges call for adjustments in the international water policy agenda.

Water scarcity and possible consequences and responses

This section reports current trends in water scarcity and considers their possible consequences for water policies and financing needs, as well as possible policy responses.

Current status and future prospects

Water scarcity is an increasing threat in many countries and regions, as water pollution and overuse reduce available sources, while populations grow and competition between different uses increases. Global water withdrawals from the environment doubled between 1960 and 2000 (WWF, 2006). In particular, groundwater abstraction has risen from 100-150 km^3 to 950-1 000 km^3 per annum since the 1950s. Abstraction in OECD countries has remained largely stable since 1990. Water use is projected to increase at a much higher pace in developing countries, where agriculture is by far the main user, resulting in a global share of agriculture water use of about 70%.

Scarcity is not a mere physical phenomenon. It results from excessive usage of the available resource (see Box 1.5). Currently, 1.4 billion people live in basins where the water usage rates exceed recharge rates. In some Middle Eastern countries, abstractions exceed annual resource replenishment by five times (UNDP, 2006).

Box 1.5. Water stress definitions

Two definitions of water stress exist. The first sets a fixed physical quantity per person, setting at 1 700 cubic metres per person as the norm for water availability for all uses below which a country/region is under increasing "water stress", reaching "scarcity" at 1 000 cubic metres per person (*e.g.* Northern China has only 757 cubic metres per person) and "absolute scarcity" below 500 cubic metres per person (Palestine has only 320 cubic metres per person, and the Middle East region as a whole is projected to be below 500 by 2050).

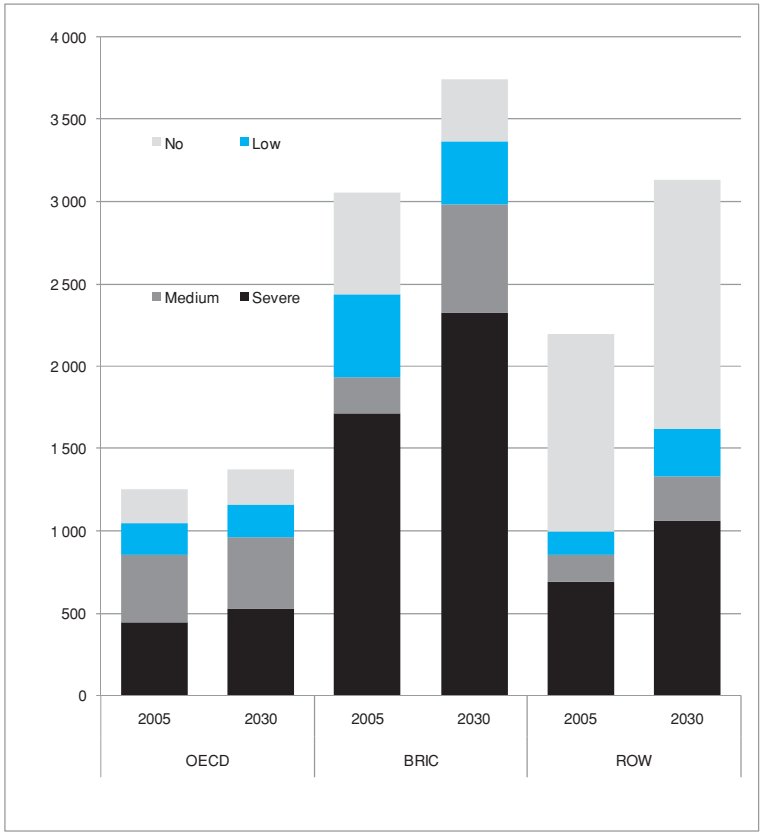
A different definition of water stress uses the ratio of withdrawals to available resources, and is therefore better able to reflect different geographical, economic and cultural circumstances. The 2006 United Nations (UN) World Water Development Report (UNDP, 2006; World Bank and IMF, 2008) presents the Relative Water Stress Index (RWSI), defined as the "ratio of total water use (sum of domestic, industrial and agricultural demand) to renewable water supply – available local run-off (precipitation less evaporation) as delivered through streams, rivers and shallow groundwaters" (UNESCO, 2006). Water stress exists for ratios above 40%, while physical scarcity is reached for ratios above 75% (UNESCO, 2006).[1] This definition is consistent with OECD's indicator for water stress, based on the ratio of water withdrawal to annual water availability, which uses the following thresholds: below 10% water stress **low**; the 10-20% range indicates **moderate** stress, *i.e.* "water availability is becoming a constraint on development and that significant investments are needed to provide adequate supplies"; above 20% stress is **medium** and "both supply and demand will need to be managed and conflicts among competing uses will need to be resolved"; while above 40% stress is **severe** (OECD, 2007).

1. According to UNESCO (2006), 15 countries were in excess of 100% total use of total annual renewable water resources.

In 2005, 35% of the population of the OECD was living in areas characterised by severe water stress, compared with 44% worldwide. By 2030, the number of people living under severe water stress, as defined by OECD, is expected to increase by 1 billion from the 2005 baseline to an estimated 3.9 billion people (47% of the world population), mostly in non-OECD countries (Figure 1.3). This baseline does not include climate change impacts.

Figure 1.3. **People living in areas of water stress**

Projections, by stress level (in millions)



Source: OECD Environmental Outlook baseline in OECD (2007), *Environmental Outlook to 2030*, OECD, Paris. The OECD baseline used for the *Environmental Outlook* is policy neutral, *i.e.* it assumes no new policies and projects current policies into the future to show what the world will be like in 2030 if currently existing policies are maintained, and no new policies introduced to protect the environment.

Climate change is expected to affect the capacity of water systems to meet human and other needs while preserving resource quality and availability. Climate change's main water-related impacts are expected to be felt in terms of shifting, and more variable, hydrological regimes, *i.e.* changes in water distribution around the world, changes in its seasonal and annual variability, and an increase in the frequency and/or intensity of extreme events (EEA, 2007). Rising sea levels threaten the world's mega-deltas, while the vast populations dependent on glacial melt (one-sixth of the world's population[5]) are losing their "water towers": the high altitude glacial reservoirs.

Similarly, changes in the ecosystems that contribute to water provision (*e.g.* forests, wetlands and marshes; see the concept of nature for water, as previously mentioned) will also affect resource availability. It is therefore increasingly important to manage these systems as a component of water policy.

These trends, and their associated uncertainties, drive investment needs regarding water-related infrastructure: resilience of infrastructure becomes a factor of performance; adaptation to climate change will call for alternative plans, technologies, and services (see OECD, 2006).

Possible policy responses

Four policy responses are anticipated to mitigate and adapt to water scarcity. They will have consequences on water policies and the costs attached to them.

One is to preserve or improve the quality of the available resource, through enhanced pollution abatement and wastewater treatment. While most OECD countries have tackled surface water pollution problems, mainly by regulating discharges from large point sources and investing in municipal wastewater treatment (reaching a population coverage rate that is about 70%), pollution from diffuse sources continues, particularly from agriculture. In addition, pollution by new substances (*e.g.* endocrine disruptors) is an emerging concern. In the European Union, the EU Water Framework Directive 2000/60/EC requires that member states address and reduce pollution from diffuse sources. Protection of freshwater resources is an even more formidable challenge in non-OECD countries, where more than 5 billion people are expected to be without a connection to public sewerage in 2030, and wastewater treatment facilities are largely non-existent or poorly functioning.

Another policy response is to allocate the resource to where it adds most value. There is a diversity of approaches to water management policies across OECD countries, with different emphasis on water pricing and cost recovery, property rights, quasi water markets, taxing pollutants, payments to farmers providing aquatic ecosystem services, acknowledgement of (and rewards for) nature for water services, and other policy approaches; the EU Water Framework Directive requires that member countries set a water price that contributes to the efficient allocation of the resource. Chapter 5 argues that countries where water scarcity is becoming more acute, such as in regions of Australia, Spain and the United States, have witnessed a more rapid implementation of policy actions.

Another response is to manage demand. Demand management changes the nature of needs for infrastructure. Increasing water productivity and efficiency, and improving conservation can reduce the need for new and expensive water supply or wastewater treatment projects. As new water supply projects become more expensive to source water from further distances, the cheapest new source of water has often been water gained through conservation, efficiency, and improved management. In recent years, many OECD countries have successfully reduced water use per capita and in total, indicating that the right policies, those in which appropriate pricing plays a prominent part, can lead to a decoupling of water use from economic and population growth.

Water re-use is part of the answer. Markets for water re-use are booming in emerging economies. Experience is more limited in OECD countries; however, Australia, Spain, and some parts of the United States are pioneering these technologies, spurred by serious constraints on water resources. Reuse allows for the reduction of new abstractions of

water resources and investment in modular, decentralised infrastructure. This, and other decentralised ways of providing water and sanitation, create both opportunities and threats, which require an adjustment of the institutional and regulatory framework (see the separate module on alternative ways of providing water and sanitation in OECD, 2009c).

More generally, water policies can benefit from the impact of institutional innovation, new ways of approaching water and water services, and technological changes on water demand and supply needs. New crops, dripped irrigation, and technologies for treated water, among others, will all have an impact on the way water services are designed and financed.

Access to water supply and sanitation in developing countries

In 2002, acknowledging the strong public interest nature of water supply and sanitation services, the UN Committee on Economic, Social and Cultural Rights formally recognised the "right to water" as a human right: "Water is a limited natural resource and a public good fundamental for life and health. The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights […] The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses" (see *www.unhchr.ch/html/menu2/6/cescr.htm*). The international community committed to the Millennium Development Goals (MDGs) target of halving the proportion of people without access (see Box 1.6 for definitions of access) to safe drinking water by 2015; a similar target was set for access to improved sanitation at the Johannesburg World Summit for Sustainable Development. OECD countries are committed to working with developing countries to achieve this.

Progress towards achieving the WSS targets of the MDGs has been disappointing. Overall the target for access to drinking water may be met, but not in all regions/countries, and particularly not in Sub-Saharan Africa; from 2004 to 2006, the number of people without access to drinking water declined from 1.1 billion (WHO-UNICEF, 2006) to 880 million people (WHO-UNICEF, 2008), 84% of which in rural areas. For sanitation, the situation is worse: even taking a longer reference period, *i.e.* between 1990 and 2006, the number of people without improved sanitation decreased by only 8% (from 2.6 billion to 2.5 billion people). At the current rate, the world will miss the MDG sanitation target by over 700 million people; southern Asia and Sub-Saharan Africa are especially off track in terms of sanitation coverage. In addition, it is important to recognise that meeting the MDGs would still leave millions of people without access to adequate water and sanitation services.

The MDG challenge differs in rural and urban areas. The water supply service deficit in urban areas is projected to be 240 million people in 2015, compared with 679 million people in rural areas. For sanitation, it is projected that 692 million urban dwellers and 1 698 million rural inhabitants will remain without improved sanitary facilities in 2015 (WHO-UNICEF, 2006).

Box 1.6. **Defining access**

Final users can face a range of water and sanitation services levels – from the network services familiar to most users in OECD countries to decentralised solutions. Since the definition of the water supply and sanitation (WSS) targets of the Millennium Declaration, the international community has agreed on what counts as "access" in estimating progress. Such definition has evolved over time.

The World Health Organization-United Nations Children's Fund (WHO-UNICEF) Joint Monitoring Programme (JMP) defines access to water supply and sanitation in terms of the types of technology and levels of service afforded. Access to **water-supply services** is defined as the availability of at least 20 litres per person per day from an "improved" source within 1 kilometre of the user's dwelling. An **"improved"** source is one that is likely to provide "safe" water. In the 2008 report by the JMP, the "ladder" of services looked like this:

Drinking water

- **Unimproved drinking water sources**. Examples include unprotected dug well, unprotected spring, cart with small tank/drum, tanker truck, surface water, bottled water.
- **Piped water on premises**, such as piped household connection located inside the user's dwelling plot or yard.
- **Other improved drinking water sources**. These include public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection.

Sanitation

- **Open defecation**.
- **Unimproved sanitation:** excreta disposal systems were considered unimproved if they did not ensure hygienic separation of human excreta from human contact. Examples include: pit latrines without slab or platform, hanging latrines, bucket latrines.
- **Shared sanitation**: otherwise acceptable but shared between two or more households. This category includes public toilets.
- **Improved sanitation**: Facilities that ensure hygienic separation of human excreta from human contact. They include: flush or pour flush toilets or latrines running to: piped sewer system, septic tanks or pit latrines; VIP latrines (ventilated improved latrines), pit latrines with slabs, composting toilet.

Source: WHO-UNICEF (2008), "Progress on Drinking Water and Sanitation: Special Focus on Sanitation", report of the Joint Monitoring Programme for Water Supply and Sanitation (JMP), UNICEF, New York and WHO, Geneva.

The Camdessus report (Winpenny, 2003) estimated that meeting the MDG targets would require extra annual worldwide investment of USD 10 billion, while full water and sewerage connections and primary wastewater treatment for urban areas would require USD 17 billion for water and USD 32 billion for sanitation/sewerage (Winpenny, 2003, p. 3). The EU Water Initiative Finance Working Group estimated that an additional USD 9-30 billion per annum would be needed on top of current funding flowing to the sector (Cardone, Shah and Waughray, 2005). The benchmark figure most commonly used estimates that what is needed is a doubling of the annual rate of investment (Winpenny, 2003, p. 13; Toubkiss, 2006).

These investment requirements regard solely the cost of expanding coverage by water supply and sanitation services. They do not reflect the costs of operation, maintenance and renewal. This is a problem as lack of funds for these activities results in deteriorating services to served populations and in additional investment requirements at a later stage, as infrastructure wears out due to lack of maintenance. In Ethiopia a recent survey (Ethiopian Ministry of Water Resources and other ministries, 2006) of almost 7 000 rural water schemes found that 30-40% were non-functional, due in large extent to a shortage of finance for wages, fuel, materials and spare parts. Many Eastern Europe, Caucasus and Central Asia (EECCA) countries are already confronting the high costs of operating and maintaining ageing water and wastewater systems (Box 1.7).

In the future, emerging and developing countries will also face an increasing bill as their systems expand to complete service coverage. The cost of sewerage and wastewater treatment will escalate (in a mature networked system, these costs normally exceed that of water supply). It is therefore necessary to consider the full set of financial implications of extending first-time access, particularly to networked services.

Box 1.7. **The burden of legacy in EECCA countries**

In **Armenia**, the present infrastructure is oversized, needs renovation and much more maintenance. There is a high cost of operating the system, involving excessive volumes of water being distributed, much of it lost and wasted. There is great scope for efficiency savings. There is an urgent need to downscale and optimise the present infrastructure. Investment needed to renovate the existing infrastructure is much greater than that required to extend it to those without services.

In **Moldova**, the current level of financing is insufficient even to maintain assets at their present low operational levels or to provide adequate levels of service. The financing deficit is manifested in poor water quality, regular daily shortages, water-related morbidity, pollution of surface waters, etc. The baseline scenario used in the new Financing Strategy aims at halting deterioration and providing modest improvements. Even this unambitious aim would require increased user charges, a sizeable increase in budgetary support, and more international finance.

In **Georgia**, there has been a clear deterioration in infrastructure and services, causing growing public health hazards. Even to preserve the current level of services would require major reforms, since the baseline situation shows a financing gap. These reforms would include improving the collection rate of revenue owed, an expansion of metering, better control of leakage, increasing budgetary transfers, and raising household charges to the highest affordable level.

Source: Financial Strategies for the respective countries produced under the auspices of the OECD Task Force for the Implementation of the Environmental Action Programme for Central and Eastern Europe ("EAP Task Force").

Rehabilitation of water supply and sanitation in OECD countries

In most OECD countries, 100% of the population have access to safe drinking water. With few exceptions, water supplied to the main centres is bacteriologically safe (OECD, 2006). However, in some countries (*e.g.* Mexico, New Zealand, Poland, Turkey and the United States), a part of the population is not yet connected to public water supplies, especially in rural areas (Table 1.2). Moreover, quality monitoring and surveillance of smaller drinking water supplies need to be improved (OECD, 2006).

With regards to sanitation, considerable variations exist among OECD countries in terms of coverage and of level of treatment (Table 1.2). Some OECD countries are still completing sewerage systems or implementing the first generation of municipal wastewater treatment plants, including Belgium, Mexico, and Turkey, which have however all made significant progress. Japan, Korea, Luxembourg, Spain, and the United Kingdom exhibit high secondary treatment coverage.[6] The countries which have a particularly high level of tertiary treatment[7] include: Austria, Denmark, Finland, Germany, Netherlands, Sweden and Switzerland.

Significant investments will be required to rehabilitate existing infrastructure, bring it into conformity with more stringent environment and health regulations, and maintain service quality over time. Annex 1.A1 to this chapter shows the projected investments that would be required to provide and maintain adequate levels of water infrastructure services for all sectors of a country's economy and population in OECD and emerging economies (Brazil, Russian Federation, India, China). As illustrations, France and the United Kingdom will have to increase their water spending as a share of gross domestic product (GDP) by about 20% to maintain water services at current levels; Japan and Korea may have to increase their water spending by more than 40%.

The evolution of the policy debate

The policy debate has followed a long route since the emergence of water on the international policy agenda in the 1970s. A brief history of the international conferences on water is found in Annex 1.A2 to this chapter. This report builds on preceding steps, in particular the Camdessus Panel and the Gurría Task Force. It weaves together issues which have, up to this point, only been considered separately.

The evolution of the international consensus on water-related issues

Since the early stages of the international dialogue on water-related issues, the international community recognised the existence of the two inter-related but separate aspects of water policy as previously discussed: *(i)* managing the resource so that it is available for human and ecosystem uses for current and future generations; and *(ii)* providing adequate, sustainable and affordable water services to all, in particular water supply and sanitation.

While the global policy framework for water can be traced back to 1972 and the Stockholm Declaration, the first international forum dedicated to water took place in 1977 in Mar del Plata, where the international community called for an integrated approach to water resources management, and started the process that led to the declaration of the 1980s as the UN Water Supply and Sanitation (WSS) Decade, aimed at achieving universal access to water supply and sanitation by 1990.

Table 1.2. **Coverage of water supply and sanitation services in OECD countries**

Percentage, latest available year

Connected to public water supply			Connected to public sewerage					Not connected to public sewerage	
					And connected to a sewage treatment plant (STP)		But not connected to a STP[4]		But connected to private or independent sewerage[5]
	Year		Year	TOTAL	Public treatment[2]	Other treatment[3]		TOTAL	
Canada	1999	92	1999	**74.3**	71.7	-	2.6	**25.7**	25.7
Mexico	2004	90	2005	**67.6**	35.0	-	32.6	**32.4**	15.9
United States	2000	85	..	**..**	..	..	..	**..**	..
Japan	2002	97	2005	**69.3**	69.3	-	-	**30.7**	8.6
Korea	2003	89	2005	**83.5**	83.0	0.5	-	**..**	..
Australia	2004	95	2004	**87.0**	..	..	..	**..**	..
New Zealand	2001	87	1999	**..**	80.0	..	..	**..**	..
Austria	2002	90	2004	**88.9**	88.9	-	-	**11.1**	11.1
Belgium	2002	96	2005	**85.9**	54.6	-	31.3	**12.2**	..
Czech Republic	2004	92	2006	**80.0**	73.6	2.4	4.0	**20.0**	..
Denmark	2002	97	2002	**87.9**	87.9	-	-	**12.1**	12.1
Finland	2001	90	2002	**81.0**	81.0	-	-	**19.0**	..
France	2001	99	2004	**82.4**	80.1	-	2.3	**17.6**	15.7
Germany	2004	99	2004	**95.5**	93.5	0.6	1.4	**4.5**	3.4
Greece	..	..	..	**..**	..	..	..	**..**	..
Hungary	2002	93	2004	**63.9**	59.8	-	4.1	**36.1**	14.0
Iceland	2003	95	2005	**89.0**	57.0	-	32.0	**10.0**	6.0
Ireland	2002	90	2001	**93.0**	70.0	-	23.0	**..**	..
Italy	1999	100	1999	**..**	68.6	..	..	**..**	..
Luxembourg	2004	100	2003	**94.8**	94.8	-	-	**5.2**	5.2
Netherlands	2002	100	2005	**99.0**	99.0	-	-	**1.0**	..
Norway	2002	89	2005	**82.0**	77.1	-	4.8	**18.0**	16.3
Poland	2003	85	2006	**59.8**	61.4	..	-	**40.2**	25.6
Portugal	2003	92	2005	**74.0**	65.0	-	9.0	**26.0**	..
Slovak Republic	2004	85	2005	**57.1**	55.2	-	1.9	**42.9**	..
Spain	..	..	2005	**100.0**	92.0	-	8.0	**-**	-
Sweden	..	..	2005	**86.0**	86.0	-	-	**14.0**	14.0
Switzerland	..	..	2005	**96.7**	96.7	-	-	**3.3**	..
Turkey	2004	74	2004	**68.1**	35.9	-	32.1	**..**	..
United Kingdom	2004	99	2005	**97.7**	97.1	-	0.7	**2.3**	..

1. National population connected to public wastewater treatment. Includes primary, secondary and tertiary treatment. May include wastewater delivered to treatment plants by trucks.

2. Population connected to public sewerage and to wastewater treatment in non-public treatment plants, *e.g.* industrial wastewater plants.

3. Population connected to public sewage network but not served by any sewage treatment.

4. Individual private wastewater disposal facilities (*e.g.* septic tanks).

Source: OECD (2008) "Compendium of Environmental Data", *www.oecd.org/document/49/0,3343,en_2649_34283_39011377_1_1_1_1,00.html,* and official country data.

Both international objectives and the consensus on how to achieve them have evolved over time. International goals have been progressively revised from the initial call for universal access to the more targeted objectives of the 2000 Millennium Declaration, and the subsequent addition of a target for sanitation at the 2002 World Summit on Sustainable Development (WSSD).

The importance of financial considerations in turning the global water promises into a reality has been explicitly recognised since the 2002 World Summit on Sustainable Development. The report of the Camdessus Panel, launched at the 2003 World Water Forum in Kyoto, put the accent on the need to increase the **supply** of finance to the water sector, calling for the need to recover the costs of water services from users and from taxpayers, and a doubling in ODA flows. The Camdessus report also called for the increased use of financing mechanisms aimed at improving risk management for water supply and sanitation.

Taking an important step forward, the Gurría Task Force, whose output was unveiled at the 2006 World Water Forum in Mexico City, focused on improving the **demand** for finance by strengthening the governance structures of governing bodies and service providers in developing countries, their capacity to absorb additional funds, and the improvement of projects/programmes so that available finance could be channelled to beneficial undertakings. The report discussed in particular the key role of local government and local providers and the special challenges they face both in terms of access to finance and in terms of capacity. Finally, the report also emphasised the need to extend the focus beyond WSS to address the financing needs of providing sufficient water for food production.

Moving the dialogue forward: this report's value-added

This report moves the dialogue forward in three directions.

First, the geographical scope is broader, as the focus is both on OECD and developing countries. While the challenges of reaching the MDG targets for WSS in developing countries is still central to the discussion, the report also explores the considerable challenges that OECD countries face in rehabilitating their WSS services. In addition, it draws lessons from the experience of OECD countries in managing water use in agriculture.

Second, the report attempts to weave together water resources management and water supply and sanitation. Most discussion focuses on financing the latter, but there is also a strong link between financing and water resources management. There are many strands to this relationship as discussed by Rees, Winpenny and Hall (2008). This link requires more analysis and debate and is at an early stage of development. As a contribution to the debate, this report focuses on one key aspect of water resources management: the management of water used for agriculture, which is by far the biggest user in most countries; it deepens the analysis of economic and financial aspects and the use of water pricing and other economic instruments to encourage sustainable and efficient water use in agriculture. This builds on the Camdessus and Gurría reports and their call for additional work in the area of financing water for food. While other reports have looked at both water resources management and service provision challenges (*e.g.* the UN World Water Development Report [WWDR] series, and especially the upcoming WWDR No. 3), this report focuses on how specific policy instruments – particularly pricing mechanisms and other economic instruments – can be used to address either of them.

Third, when considering financing for water supply and sanitation, the report addresses both supply- and demand-side considerations, and brings them together in an integrated approach. It highlights the relevance of strategic financial planning as a process to match supply and demand of finance, while discussing realistic objectives in a national policy dialogue. This dialogue considers investment needs, not as a given, but as the outcomes of policy choices (*e.g.* policy goals in terms of coverage and service levels, environmental and other regulations influencing technology choices, etc.), which have to be informed by financial realism. In that process, financial considerations are best focused on the three fundamental sources of revenue, namely tariffs, taxes and transfers.

Notes

1. They can involve abstraction of water from surface water bodies or aquifers, or be "in-stream", with in-stream uses including the use of water as a sink for pollutants. Water uses can be consumptive or non-consumptive.
2. For additional information, see *www.who.int/water_sanitation_health/economic/en/*.
3. Threshold effects add to the complexity of the health benefits of sanitation at the community level: they only materialise after coverage has reached a certain level.
4. Based on OECD (2009a).
5. Estimate from IPCC (2008).
6. Dissolved biological matter is progressively converted into solids by using indigenous, water-borne micro-organisms.
7. Tertiary treatment means a more stringent treatment of wastewater, aiming at a further reduction of phosphorus and/or nitrogen. After tertiary treatment, the purified wastewater may, in case of special sensitive receiving water-bodies, undergo further treatment, *e.g.* by flocculation and sand filtration and may finally get disinfected.

Annex 1.A1

Projected Expenditures on Water and Wastewater Services

	GDP	GDP/cap	GDP growth	Current expenditure on water infrastructure	Projected expenditure on water infrastructure as % of GDP		Average annual investment (USD billion)	
	(USD billion)	(USD)	%	(USD billion)	By 2015	By 2025	By 2015	By 2025
Australia	602	29 893	2.3	4.515	0.75	1.08	6.86	9.95
Austria	254	31 254	2.3	1.905	0.75	0.89	2.59	3.91
Belgium	309	29 707	2.3	2.318	0.75	0.69	2.75	4.38
Canada	1 050	32 921	2.3	7.875	0.75	0.83	10.27	15.74
Czech Republic	187	18 370	2.3	3.553	1.90	0.85	3.12	2.83
Denmark	178	3 389	2.3	1.335	0.75	0.89	1.82	2.74
Finland	152	29 305	2.3	1.140	0.75	0.69	1.35	2.15
France	1 724	27 738	2.3	12.930	0.75	0.83	16.86	25.84
Germany	2 391	28 988	2.3	17.932	0.75	0.83	23.38	35.84
Greece	224	20 362	2.3	1.680	0.75	0.81	2.17	3.34
Hungary	152	15 546	2.3	1.140	0.75	1.37	2.02	2.79
Iceland	10	33 269	2.3	0.075	0.75	0.69	0.09	0.14
Ireland	152	37 663	2.3	1.140	0.75	0.69	1.35	2.15
Italy	1 620	27 984	2.3	12.150	0.75	0.92	16.83	25.23
Japan	3 817	29 906	1.9	28.627	0.75	1.26	46.98	63.41
Korea	1 030	21 419	2.3	7.725	0.75	1.23	12.76	18.00
Luxembourg	28	63 609	2.3	0.210	0.75	0.64	0.24	0.39
Mexico	1 006	9 887	2.4	19.011	1.90	0.85	16.78	15.36
Netherlands	477	29 332	2.3	3.577	0.75	1.08	5.43	7.88
New Zealand	97	23 943	2.3	0.727	0.75	1.13	1.14	1.63
Norway	184	405	2.3	1.380	0.75	0.64	1.58	2.55
Poland	475	12 452	2.3	9.025	1.90	0.85	7.93	7.18
Portugal	194	18 503	2.3	1.455	0.75	0.88	1.96	2.97
Slovak Republic	81	1 566	2.3	1.539	1.90	0.85	1.35	1.22
Spain	971	23 627	2.3	7.282	0.75	1.06	10.97	15.96
Sweden	254	28 205	2.3	1.905	0.75	0.69	2.26	3.60
Switzerland	230	31 690	2.3	1.725	0.75	0.64	1.97	3.19
Turkey	530	7 503	3.5	10.07	1.90	0.85	9.33	9.66
United Kingdom	1 736	28 938	2.3	12.499	0.72	0.86	19.14	27.96
United States	11 724	39 496	2.5	87.930	0.75	0.64	101.65	167.63
Brazil	1 462	849	2.4	2.924	0.2	1.9	19.8	32.02
Russian Federation	1 449	10 179	3.5	4.637	0.32	0.85	11.49	26.41
India	3 291	380	4.1	23.366	0.71	2.5	74.8	108.31
China	7 334	5 642	5.3	110.01	1.5	1.9	182.1	247.18
Total				405			6 212	9 003

Source: OECD (2006), *Infrastructure to 2030: Telecom, Land, Transport, Water and Electricity*, OECD, Paris, p. 313.

Annex 1.A2

A Brief History of International Conferences on Water

International fora	Agreed goals and objectives
United Nations Conference on Water Mar del Plata, Argentina 1977	The first global-scale conference on water. Main objective: to promote a greater sense of awareness of global problems related to water: • called for an integrated approach to water-resources management; • led to declaration of 1980s as the UN Water Supply and Sanitation Decade, with the objective of providing drinking water and sanitation for all people by 1990.
International Conference on Water and Environment (ICWE) Dublin, Ireland 1992	Its main achievement was the development of the Dublin Principles: • Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment. • Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels. • Women play a central part in the provision, management and safeguarding of water for all. • Water has an economic value in all its competing uses and should be recognised as an economic good.
UN Conference on Environment and Development (UNCED) Rio de Janeiro, Brazil 1992	Agenda 21, Chapter 18 "Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources" dealt with basis for action, objectives and activities concerning: • integrated water resources development and management; • water resources assessment; • protection of water resources, water quality and aquatic ecosystems; • drinking water supply and sanitation; • water and sustainable urban development; • water for sustainable food production and rural development; • impacts of climate change on water resources.
Millennium Declaration New York, United States 2000	Millennium Development Goals include the following water-related goals: • "To halve, by the year 2015, the proportion of the world's people whose income is less than one dollar a day and the proportion of people who suffer from hunger and, by the same date, to halve the proportion of people without sustainable access to safe drinking water." • "To stop the unsustainable exploitation of water resources by developing water management strategies at the regional, national and local levels, which promote both equitable access and adequate supplies."
2nd World Water Forum The Hague, Netherlands 2000	The Ministerial Declaration identified the following main challenges: • meeting basic needs – access to safe and sufficient water and sanitation; • securing food supply, particularly for the poor and vulnerable; • protecting ecosystems – ensure the integrity of ecosystems through sustainable water resources management; • sharing water resources by peaceful co-operation between water users at all levels; • managing risks from floods, droughts, pollution and other water hazards; • valuing water: manage water so that it reflects its economic, social, environmental and cultural values; • governing water wisely, including involving the public and the interests of all stakeholders.
International Conference on Freshwater Bonn, Germany 2001	The focus was on better managing the world's limited supplies of clean water. The Bonn conference was an input into the 2002 World Summit for Sustainable Development.

International fora	Agreed goals and objectives
World Summit for Sustainable Development (WSSD) Johannesburg, South Africa 2002	The summit dealt with the following freshwater-related issues: • decentralisation of governance; • community empowerment; • service provision: rural and urban challenges; • information management; • integrated water-resources management; • education and awareness; • financial and economic mechanisms. Regional challenges were particularly recognised and identified at the summit. A new target was agreed: "To halve, by the year 2015, the proportion of people who do not have access to improved sanitation."
3rd World Water Forum Kyoto, Japan 2003	Forum outcomes included: • a Water and Climate Dialogue, including agreed action points; • a Water and Poverty Dialogue, including agreed action points; • a seminal report on financing water infrastructure; • outcomes from the Dialogue on Food, Water and Environment; • a detailed document on water actions.
Water for Life Decade 2005–15	Launched by the United Nations System, the Water for Life Decade aims to promote efforts to fulfil international commitments made on water and water-related issues by 2015, with special emphasis on the involvement and participation of women in these efforts.
4th World Water Forum Mexico City, Mexico 2006	The ministers at the forum reaffirmed commitments made at the UNCED, WSSD, and the Commission on Sustainable Development during 2005, emphasising the following items: • expedite implementation in water, sanitation and human settlements; • the importance of enhancing the sustainability of ecosystems; • the importance of innovative practices such as rain water management and development of hydropower projects in some regions; • the involvement of relevant stakeholders, particularly women and youth in planning and management; • improving demand for finance by strengthening governance systems; • the Hashimoto Action Plan.

Source: Adapted from UNESCO (forthcoming). "United Nations World Water Development Report: Water in a Changing World", WWDR No. 3, *www.unesco.org/water/wwap/wwdr/wwdr3/*.

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Chapter 2

Financing Water and Sanitation Services: Key Challenges and the Way Forward

Substantially more investment is needed in both OECD and developing countries to achieve water and, especially, sanitation policy objectives, and to realise the associated economic, social and environmental benefits. Optimising the need for investment through demand-side measures, such as better planning and low-cost technologies, and ensuring an adequate supply of finance will be essential to meet those objectives.

Strategic financial planning that blends the "3Ts" – tariffs and other user contributions, tax-based subsidies and transfers including official development assistance – provides an important means for agreeing on water- and sanitation-related targets and how they will be achieved. This requires good information and analysis, policy dialogue among stakeholders, and appropriate measures to reduce the demand for, and increase the supply of, finance. This chapter reviews good practices in strategic financial planning in OECD and developing countries and summarises key lessons for policy makers.

Chapter 1 identified the challenges posed by increasing funding requirements to cover investment, operation, maintenance and replacement of water supply and sanitation (WSS) infrastructure, both in OECD countries and in emerging and developing economies. Based on the work of an OECD Task Team on Sustainable Financing of Water and Sanitation (OECD, 2009a), this chapter discusses what policy options exist to close the financing gap and presents good practices in carrying out the policy dialogue that is required to achieve consensus on these issues. By doing so, it moves the debate beyond the focus on the supply of financing (Camdessus Panel) and the demand for financing (Gurría Task Force), to how to balance the two through an iterative process of successive adjustments.

Financing water supply and sanitation: redefining the perspective on the problem

Providing more and better WSS services in developing countries is a goal shared by OECD and non-OECD countries alike. However, progress towards this goal will continue to be patchy, slow and unsustainable unless it is accompanied by more economic and financial realism. Goals that are set politically and are not matched by real revenue streams result in major financing gaps and unexecuted plans, with the consequence that the poor suffer most through absent or deficient services.

In order to deal with this challenge, governments have to select realistic objectives for the development of the WSS sector, checked against available resources, and agreed in a multi-stakeholder policy dialogue (a process termed "strategic financial planning"). Country case studies have shown that, in general, the Millennium Development Goals (MDGs) can be achieved if investments are strategically planned and resources allocated wisely.

In reality, however, sector plans are often developed on the basis of a political vision and not grounded in an understanding of the costs of achieving targets, and how those costs will be met. For instance, Ethiopia has adopted a Universal Access Programme, which foresees improving access to improved drinking water sources from 22% in 2006 to 98% in 2012, but it is unclear how this policy would be financed. In some cases, donors share responsibility for lack of realism, for instance when they require the use of best available wastewater treatment technologies that may not be affordable if scaled up beyond the project level.

There are essentially three options for closing the existing financing gap:

- Cost savings through efficiency improvements. Operation and maintenance costs are inflated by current high energy consumption, large water losses in the distribution network of water utilities, and oversized infrastructures. There is room for substantial cost savings. Utilities therefore need to target scarce maintenance and re-investment funds to achieve such cost savings.
- Cost savings by adapting service levels. Technological choices, in particular in the context of network rehabilitation and extension, have to be backed by realistic assumptions on the sustainability of the operation of these technologies.
- Increased supply of finance, in particular from the ultimate sources of revenues (Figure 1.2 in Chapter 1), *i.e.* tariffs, taxes and transfers. These "3Ts" are the only funds that can **fill** the financing gap.

While improved planning will be effective only if sector governance systems that ensure the execution and implementation of such plans are improved in parallel, experience in OECD and non-OECD countries has shown that policy dialogue on national or regional strategic financial plans for water supply and sanitation can help to justify and motivate such reforms. Such policy dialogues can also produce a number of other useful outcomes that can support the financial sustainability of the water supply and sanitation sector.

Strategic financial planning: policy options to reduce costs

The starting point in a reflection on strategic financial planning is the existence of a clear statement of a country's policy objectives for WSS. This could include expanding service coverage, protecting the poor, ensuring sustainable use of water resources, reducing fiscal deficits, etc. There will commonly be trade-offs between these objectives. These need to be assessed along with the respective costs and benefits of the various initiatives, so as to gauge their feasibility and financial realism. If a financing gap exists, planners have a number of policy options in front of them; the first that needs exploring is whether system costs can be reduced.

Reducing costs: improve the efficiency of operations

The operational efficiency of water utilities can be very low compared to best practice benchmarks. For instance, leakage, which in well-run water utilities in the OECD is usually in the range of 10-20% of water production, frequently exceeds 40%, and sometimes reaches 70% in developing country utilities (as shown in OECD, 2009b; see also Chapter 4). This means that significantly more water needs to be produced and transported than finally reaches the consumer, therefore having a negative impact on investment and production costs: infrastructure is oversized and operating costs, both in absolute terms and per unit of water sold, rise.

Similarly, electricity and chemical consumption per unit of water produced is often well in excess of best practice standards and may represent a significant share of production costs (in some utilities in the former Soviet Union as much as 50-70% of total production costs). This situation is usually due to the poor efficiency of outdated water pumps, as well as the poor design of water systems.

Corruption is another problem that is affecting the operational efficiency of water utilities world wide. Transparency International estimates that corruption may inflate the costs of water services by as much as 30% (Box 2.1).

Box 2.1. Transparency International's Global Corruption Report 2008

The 2008 Global Corruption Report from Transparency International provided a first assessment of the extent to which corruption in WSS adds to the cost of infrastructure and services. The methodology that was used to calculate the figures is being widely debated, so that estimates should be taken with some caution. For developing countries, the report indicates that corruption may raise the price of connecting a household to a water network by as much as 30%, potentially inflating the cost of achieving the MDGs on water and sanitation by billions of dollars.

More important than the estimate of the additional burden imposed by corruption in the sector are the indications of how this may materialise. A manifestation of corruption in the sector is the tendency to over-build, as the construction phase is often the one where most funds can be "diverted". This can contribute to excessive investment costs and the choice of inappropriate solutions. Another corrupted practice is when users bribe meter readers to reduce their water bills.

Source: Transparency International (2008), "Global Corruption Report", Transparency International, Berlin.

As a consequence, ministers of finance, as well as donor agencies, expect significant improvements of productivity before more public budget funds are spent in the sector. They are likely to be just as interested in **where the money is going** as in **where the money is coming from**.

Inefficient operation and insufficient revenue collection will generally result in inadequate operation and maintenance (O&M) of infrastructure and eventually in reduced quality of services. Users will be unwilling to pay tariffs for poor services or if they believe that they are being charged to cover for the inefficiencies in the system.

In many cases the operational efficiency of water utilities can be significantly improved through low-cost measures. For instance, the Yerevan water utility in Armenia achieved a 50% reduction in electric energy consumption through a string of measures, including the redesign of the distribution system and the shutdown of excess pumping stations. Similarly, measures that help to develop the capacities of workers and other staff in water utilities can achieve significant productivity improvements. Therefore, much could be achieved if utilities had sufficient cash flow available to invest in such measures, as well as the incentives to improve their efficiency. In the Yerevan water utility, which involves a private operator in a management contract, performance targets linked to an incentive payment included the reduction of energy consumption and water leakage (EAP Task Force, 2008a).

Some countries actively embrace benchmarking between WSS providers as a form of coercive comparison. In the Netherlands (publicly owned) drinking water companies are obliged by law to report their performance against various benchmarks which are published to act as an efficiency incentive. In England and Wales, the performance of private WSS companies is benchmarked and the results are used for comparative assessments by OFWAT, the economic regulator of the industry.[1] In Asia, Africa, Latin America and Eastern Europe, Caucasus and Central Asia (EECCA), the collection of comparative performance indicators for WSS utilities helps to define good practice and indicates the scope of efficiency gains for specific utilities.[2] Experience suggests that the

"threat" of private sector participation has improved the performance of the public sector (*e.g.* in North America). The reverse is also true: the "threat" of returning to public provision of the service can spur the performance of private operators (also see Chapter 4).

Revising investment plans and adapting service levels

Policy objectives, which may result from domestic political commitments, sometimes in response to urgings of the international community, often allow for considerable latitude in the way they are "translated" and implemented locally. This gives some scope for more realistic strategies to emerge.

Infrastructure development targets to achieve the MDGs need to be realistically translated at the national and local levels, based on consideration for local conditions, so as to make them affordable for the population and for public budgets, as well as desirable for local users. The definition of the water-related MDGs leaves considerable latitude for interpretation in relation to levels of service (see Box 1.7 in Chapter 1) and the technological solutions to achieve them. Ethiopia's Universal Access Programme is an example of the choice of standards which the government deems appropriate and realistic in order to achieve the desired level of service coverage. Service standards are a combination of several elements:

- the type of facility specified or approved (*e.g.* WC toilet, "improved" latrine, public standpipe, individual house water tap);
- the quality of household or communal water supplied; the acceptable quality of effluent, implying a standard of wastewater collection and treatment;
- the standard of daily service (water pressure, regular availability of supply, attention to leakage and consumer complaints);
- accessibility levels (in-house service, public standpipes or toilets, number of people sharing, distance to travel for water source, time waiting, *e.g.* for public toilet).

Choice of hardware and technologies also can make a big difference to costs. The per capita costs of different options for meeting the MDGs have recently been estimated (WHO, 2008; as set out in Table 2.1). Clearly, a change in the relative weights of different options in the overall programme can greatly affect total costs. When assessing the cost of different technological solutions, their full life cycle cost should be considered, including annual recurrent costs of each option (which, depending on the type of service and other factors, could fall on individual households or public authorities) and the cost of future replacement and upgrading, which will depend also on the longevity of different solutions, and how far future upgrading (*e.g.* from latrines to indoor toilets) should be programmed in. Neither aspect is taken into consideration in Table 2.1.

The scale and scope of water supply and sanitation services are important cost drivers and can determine the choice of hardware and technology (see OECD, 2009c) design can optimise economies of scale and avoid diseconomies, but the appropriate answer will depend on how the components of water services (including water supply for potable and non-potable uses, wastewater collection and treatment, storm water collection, water re-use) are combined (scope effect).

Table 2.1. **Per capita investment costs of water supply improvements (USD)**

Type of improvement: water	Africa	Asia	Latin American countries
Household connection (treated)	164	148	232
Standpost	50	103	66
Borehole	37	27	89
Dug well	34	35	77
Rainwater	79	55	72

Source: WHO (2008), "Regional and Global Costs of Attaining the Water Supply and Sanitation Target (Target 10) of the MDGs", WHO, Geneva.

Choices such as those discussed previously create a large number of potential cost scenarios. The World Health Organization (WHO) compared high-technology options with low-technology ones, showing that the total global costs of attaining the water and sanitation MDGs range from USD 135 billion to USD 327 billion, equivalent to a range of average annual spending of USD 14 billion to USD 33 billion (Hutton and Bartram, 2008). In Georgia, policy makers have been discussing the possibility of providing some water for urban populations through standpipes instead of in-house taps in order to make sector targets more financially realistic (EAP Task Force, 2005).

Other important choices concern the mode of construction, phasing of development, choice of implementation partners, delivery models, etc. These factors are inter-related, and provide considerable latitude in the way targets are implemented, with corresponding financial implications.

An important element in this complex choice is the timescale for implementation of investment. Although there may be economies of scale from bundling many programmes together and executing them in a short period of time, there are strong offsetting advantages in phasing the work over time. A phased approach to infrastructure can match outlays to annual budgetary and investment constraints, avoid bottlenecks and cost pressures on contractors and suppliers, and provide more time for experience to develop in creating and operating new systems. It also allows time for cash flows to build up as a source of finance for future programmes. Finally, a phased approach is more flexible and therefore better able to face possible changes in demand, technological innovation, as well as evolving regulatory or other requirements.

While the MDGs do not provide specific targets for wastewater treatment, many donor agencies impose levels of effluent treatment that is analogous to those achieved domestically. Sometimes these requirements are incorporated in local environmental regulations. Given financial and capacity constraints (as operating a sophisticated wastewater treatment plant is a complex endeavour), this can lead to the use of a sizeable portion of public budgets allocated to the sectors for the development of wastewater treatment facilities in a few "hotspots". An alternative, for countries that are just starting on the path to wastewater treatment and disposal, would be a broader development of primary wastewater treatment that could yield better environmental and public health benefits per unit of outlay.

Decisions about service levels should not be purely technocratic, but should also reflect users' demands, as well as political objectives. The norms and standards existing in developing countries or imposed by external agencies may frustrate the choice of cost-effective solutions. Such norms may, for instance, stipulate construction materials with a long design life, in circumstances where rapid economic and demographic development might warrant their replacement or upgrade much sooner.

Transitional countries in the EECCA region face a different and possibly more challenging dilemma. Typically, they have high rates of service coverage for both water and sanitation, particularly in urban areas, but their infrastructure is failing to maintain existing levels of service. Much of it is old and oversized for its present needs, and it is ill-suited to present economic and demographic realities. A number of these countries can ill afford to maintain even existing services in their present form, and face an unenviable choice of how much to lower standards for the sake of affordability (Box 2.2 provides the example of Moldova).

Design specifications and service standards can evolve rapidly, which argues for systems that are flexible and capable of being upgraded to meet demand. Norms and standards should be challenged, with the aim of developing the most pragmatic and effective approaches to achieving the MDGs. While the reform of norms and standards will often be difficult and time-consuming (as a broad range of institutions and stakeholders needs to be involved in their definition), a number of countries (*e.g.* Estonia and Viet Nam) have shown that with the right political will, it can be achieved.

Box 2.2. **The challenge of achieving the water-related MDGs in Moldova**

A European Union (EU) Water Initiative Policy Dialogue on the financing of urban and rural water supply and sanitation in Moldova took place in 2006 and 2007 with support from the OECD EAP Task Force.

Using the FEASIBLE financial model, the initiative assessed annual cash flow needs for different WSS infrastructure development targets and the available financial resources from user charges, public budgets and official development assistance (ODA) under certain assumptions. The so-called "baseline scenario" essentially assumes the maintenance and rehabilitation of existing, extensive Soviet-built WSS infrastructure, with no extension of service to previously not connected populations. To achieve financial sustainability it has been assumed that user charges would increase to an average of 5% of household income (with social protection measures to support the poorest who would have to pay much more than this average). Even with this very heavy burden on consumers, user charges would only generate about 50% of cash flow needs for the foreseeable future, eventually covering up to 95% in 2028. Hence, significant public budget and ODA resources would be needed to close the financing gap.

More ambitious sector targets, including the achievement of the water-related MDGs by extending services to poor populations in rural areas, or better wastewater treatment levels to approximate requirements of the EU Water Framework Directive, would cost more and reduce the share of funding that can reasonably be expected from tariffs further. Achieving the MDGs would require additional financial resources and even larger infusions of public budget and ODA resources, or, if this is not possible, decisions to lower service levels in some areas that have coverage (typically in urban areas) so as to free up resources for expansion.

In Moldova, various alternative policy targets have been costed:

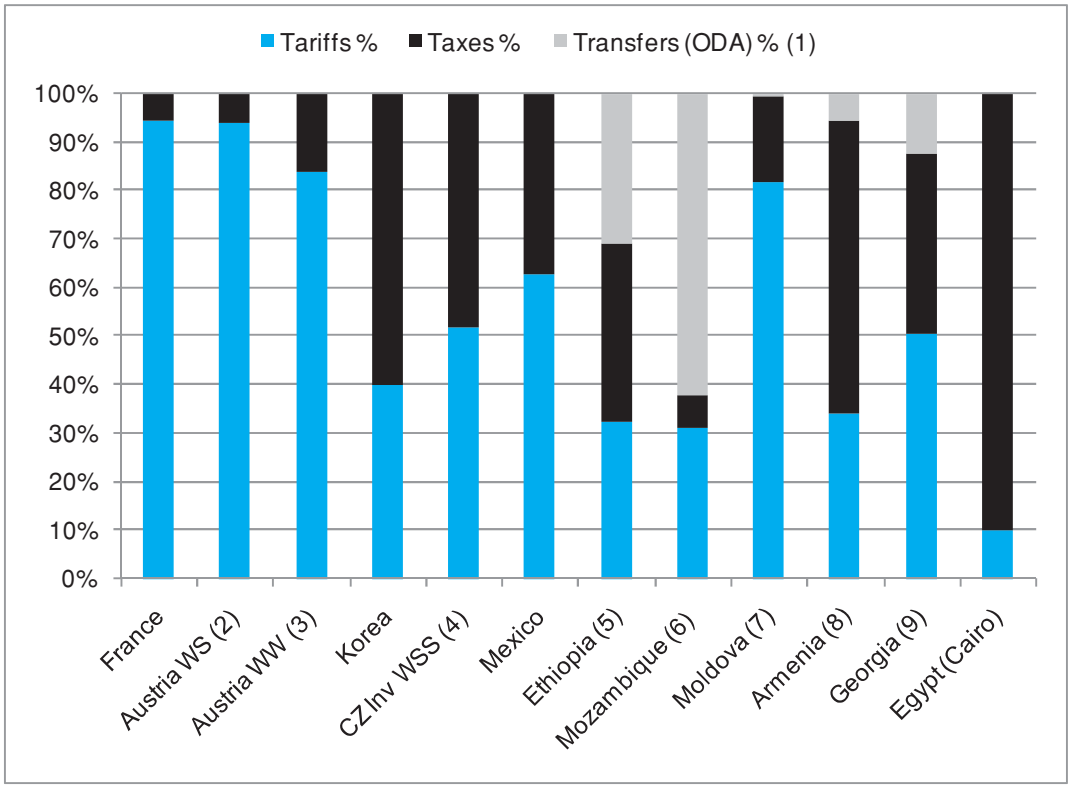
Target strategy	Total 20-year spending (in EUR millions)
1. Baseline: Halt deterioration of existing infrastructure and provide modest improvements. Improved operation and maintenance.	1 320
2. Baseline + meeting MDGs: For rural areas, investment in non-piped supplies and on-site sanitation, modest improvements in simple piped water supply.	1 820
3. Baseline + key EU Directives: As for Baseline, plus water supply for 95% of urban population, wastewater connections for 90% of urban population, water and wastewater treatment.	1 840
4. Baseline + MDGs + critical wastewater treatment plants (WWTPs): As for 2 above, plus full rehabilitation of seven WWTPs.	1 910
5. Baseline + MDGs + EU Directives	2 340
6. Government Water Sector Strategy	2 845

Source: EAP Task Force (2007a), "Facilitating Policy Dialogue and Developing a National Financing Strategy for Urban and Rural Water Supply and Sanitation in Moldova", OECD, May.

Strategic financial planning: policy options to increase revenue from the 3Ts

Chapter 1 identified the 3Ts as the ultimate sources of finance for water supply and sanitation services. Although there is no clear pattern in the relative shares of the 3Ts between different countries (Figure 2.1), there is clear evidence of a diversification of financial sources[3] for water as incomes rise and access to capital and financial markets improves.

Figure 2.1. **Shares of official development assistance, national governments and users in water supply and sanitation finance in various countries**



1. Includes ODA grants as well as private grants, such as through non-governmental organisations.
2. WS = water supply.
3. WW = wastewater.
4. CZ Inv WSS = Czech Republic, composition of capital investment for water supply and sanitation.
5. 2005/06.
6. Rural WS, 2006.
7. 2006.
8. 2005.
9. 2007.

Source: OECD (2009a), "Sustainable Financing for Water Supply and Sanitation: A Strategic Approach", OECD internal document, *www.oecd.org/water*.

Several trends can be noted:

- As countries develop, there tends to be a shift towards more use of commercial, increasingly local, finance, reimbursed ultimately by growing cash flows from user charges. The case studies of Austria and Korea clearly show such a progression.
- There is increasing use of pollution charges[4] as sources of finance, a longstanding feature of the French and Dutch systems, also evident in Korea.
- There is greater reliance on sub-national fundraising by municipal bonds and other means, as evident in India and South Africa.
- There is initial reliance on a dedicated water financing agency. This may persist (*e.g.* Dutch Water Bank, Turkey's Iller Bankasi), or may lessen in relative importance over time (*e.g.* India's HUDCO bank, Mexico's BANOBRAS bank), or be superseded (Austria's Water Management Fund).

Arriving at a sustainable financing strategy for WSS requires the appropriate combination of the ultimate sources of revenue, in light of each country's circumstances and options. Governments need to recognise, however, that the effectiveness of water sector spending may be sensitive to the sources of funds, and to the modalities of their delivery. In the United States for instance, public subsidies were provided in the form of grants for the construction of water facilities in the 1980s and converted to subsidised loans with long tenures and low interest rates in the 1990s. There is clear evidence that this change has brought about significantly improved capital investment efficiency. The mix of the 3Ts and the way in which this revenue is delivered to the water sector therefore requires careful consideration by governments.

The remainder of this section reviews the potential for raising financial resources from each of the basic revenue sources: tariffs, taxes, and transfer/solidarity instruments.

Increasing revenues: tariffs

The conventional wisdom regarding cost recovery through tariffs is that water tariffs should be sufficient to cover all the direct economic and financial costs of water supply and sanitation, including the capital costs of replacing and expanding the network infrastructure, and ultimately its scarcity value and externality costs as well (see Chapter 1 for their description). This principle is evoked by the EU Water Framework Directive, which requires member states to take account of the principle and ensure adequate contributions by all users.

In reality, very few countries, developed or developing, practice full cost recovery (FCR) through tariffs, even if this definition is limited to direct economic and financial costs. The EU Water Framework Directive, for instance, allows member states to diverge from full cost recovery after accounting for the social impacts of cost recovery. In the United States, a system of annual federal grants underpins state revolving funds for lending to local authorities for WSS, and bond issues have the additional attraction of being interest-free. Amongst developing countries, Senegal, which claims to be in "financial equilibrium" since 2003, funds practically all its investment from ODA. The National Water and Sewerage Corporation (NWSC) in Uganda had its government debt converted to equity in order to improve its balance sheet to increase its creditworthiness. In the majority of developing countries the assumption – and practice – of policy makers

is that WSS investment costs will be met from government grants and soft loans, and/or from ODA.

In most contexts it would be reasonable to expect tariffs to fully cover O&M and renewal costs for water supply. But the practical answer to this will depend on a number of factors.

Different cost recovery mechanisms for different water services

First of all, as discussed in Chapter 1, water services differ as to their economic nature, and their value is perceived differently by final users. This has implications on the users' willingness to pay for different WSS services. For instance, it is important to distinguish between drinking water provision, a private good for which willingness to pay is generally high, and some components of sanitation services, such as wastewater treatment, for which willingness to pay may be lower due to their externalities and their quasi-public good nature (see Chapter 1).

In urban settings, FCR for drinking water service provision can be a realistic objective, and it is desirable as it would release scarce public funding for the supply of public goods. In rural communities, FCR may be a more distant prospect, though even in rural areas there are many cases of users paying the cost of O&M and renewal of water infrastructure, though rarely the full cost of investments.

Sanitation is a different matter. As the benefits of sanitation also accrue at the community level (or even at regional level for wastewater treatment) and not only at the household level, there is generally a lower willingness to pay for sanitation services than justified by their value to society, while investment costs tend to be much larger than for drinking water. This provides a rationale for public intervention, including the use of public subsidies, in the provision of sanitation and wastewater management services.

Affordability constraints

Probably the main obstacle to full cost recovery water pricing has been its perceived social impacts, and their political consequences. In many of the poorest countries, household affordability issues seriously constrain the contribution of tariff revenue to sector finance (see Box 2.2). However, the question has sometimes also been used to avoid adjusting tariffs for political expediency. This is not to say that politicians should not give consideration to social concerns, but rather a call for a more careful local assessment of actual affordability constraints and to consumers' willingness to pay before political decisions are made (see Chapter 3).

Nevertheless, there are often significant opportunities to move progressively towards higher levels of cost recovery through tariffs, while ensuring that poor and vulnerable groups have access to water services. Indeed, there is probably no alternative given the limitations of other sources of revenue that will be discussed later.

A widespread practice in developing countries is a refusal of public enterprises and institutions to pay their bills. Politicians and other people of influence often avoid paying their utility bills. In some countries bribery exacted by meter readers diverts revenues into private pockets, leaving the utility short. As a result, the collection of user charges from households and other consumer groups is often as low as 60-70% of billed amounts. In Georgia, recent figures indicate that collection has fallen as low as 34% for household customers (EAP Task Force, 2006a); in Cairo this figure stands at about 50% across

different consumer groups (OECD, forthcoming a). Strengthening the payment discipline has been shown to generate substantial additional funding and should be contemplated before actual increases of tariffs are considered.

Water charges are not a significant burden on most households in OECD countries; typically they account for less than 1% of household income (see Figure 3.2 in Chapter 3). The same holds true for a number of emerging economies; for example in Egypt, even the poorest households pay significantly less than 2% of their income for water services (OECD forthcoming b). However, in many of the poorest developing countries, water bills may represent a more significant portion of the income, and this is also the case in some OECD countries (see Figure 3.3 in Chapter 3).

Donors and international financial institutions (IFIs) often use a benchmark of 3-5% of household income for water tariffs when they plan water infrastructure investment projects and assess their affordability. While such estimates may be a useful rule of thumb in a first approach, they are also disconnected from local situations and need to be complemented by more detailed analyses of how projected tariff levels would impact different income groups.[5] For example, projected tariffs may be less than 4% of average household income, but for the poorest 25% of the population they might represent 5-20% of income. A social assessment of water sector reform policies in the city of Yerevan, Armenia, carried out in 2004, showed that the 20% of the population with the lowest income would have to pay about 8% of their income if water prices were increased close to levels that allow the recovery of operational and maintenance costs, and almost 50% of the population would have to pay more than 4% of their income (EAP Task Force, 2004).

Subsidies are therefore often justified in terms of keeping services affordable for poor households, but there is mounting evidence that they are often not well targeted and not very effective. Instead of benefiting the poor (who are frequently not connected to water distribution and sanitation networks), such subsidies often benefit richer people who are capable of paying the full costs of water services. The effectiveness of public spending on water infrastructure could be much increased if subsidies were restructured and better targeted. A variety of approaches has been developed to mitigate the impacts of increased tariffs on the poor (see Chapter 3).

Regardless of whether there are affordability problems or not, and of whether alternative sources of revenue can be tapped, it is important to ensure that the water systems that are being built can realistically be financed. To do so, the analysis has to move away from tariff levels and structures and focus on the factors that determine tariff levels, and particularly investment cost, and the operational efficiency of utilities, including their collection rate. The regulator or other authority presiding over the approval of tariff changes should be able to assess whether the costs whose recovery is being proposed are reasonable, while being adequate to ensure financial sustainability.

Process matters: gradual tariff increases

The path to improved cost recovery may involve a phased approach, with tariffs increasing in stages to cover O&M costs, and thereafter depreciation of assets, new investment and, eventually – where relevant – environmental and resource costs of water. Where tariffs are extremely low relative to FCR or sustainable cost recovery (SCR), a gradual approach may not be sufficient and more drastic action may be called for.[6]

Particularly if a phased approach is adopted, the tariff-setting process becomes a vital consideration. Many countries have decentralised responsibilities for services, including

those for tariff setting. This can delay tariff reform and the regular adjustments necessary to account for inflation. In some countries the central government determines the tariff structure and level, for the local governments to implement. A realistic central-local balance of obligations and responsibilities is the key to tariff reform. Where central government requires local administrations to follow unaffordable tariff policies, they should be prepared to provide fiscal help (*e.g.* social welfare payments to needy consumers or programmed help to the utility, subject to performance contracts) (OECD, 2009d).

Increasing revenues: taxes

In some of the poorest countries, where there are severe constraints on household affordability, public budget spending will need to play a significant role for the foreseeable future in order to help the water and sanitation sector deal with the reconstruction of deteriorated assets or to allow an expansion of water systems to meet the water-related MDGs (see the Moldova example in Box 2.2). Even in OECD countries, where affordability for households is less of a problem, public budgets sometimes represent an important share of revenue for the sector (see Figure 2.1).

While public funds are limited by budgetary constraints and multiple demands from different sectors, in some countries, there appears to be considerable scope for increasing public budget spending. For instance, Moldova only spends 0.5% of its public budget expenditure on the water sector, while other countries of similar population and gross domestic product (GDP) level in the region spend about four times more.

Just as there is a solid case for setting an economic tariff, there are sound arguments to justify a subsidy in certain cases (also see the section on alternative cost allocation mechanisms for sanitation services in Chapter 3):

- to compensate for market failures, by rewarding WSS providers for supplying public goods (public health) and external benefits (amenity, avoidance of groundwater depletion);
- to promote the consumption of merit goods (meritorious goods and services whose value consumers may not fully realise, *e.g.* household sanitation and hygiene);
- as a transitional measure to enable tariffs to rise gradually and in order to address concerns about the affordability of higher charges;
- to provide services at below normal cost to vulnerable consumer groups, *e.g.* the very poor, large families, those with certain medical conditions.

In order to be efficient and effective, subsidies of this kind should be transparent, targeted and – ideally – taper off over time. They should also be intentional (*i.e.* defined *ex ante* and well planned, as opposed to announced *ex post* as a political gesture, or available *de facto,* as when tariffs are not actually collected). An example of a clearly stated WSS subsidy policy is given in Box 2.3.

Box 2.3. **Subsidy policy in Uganda**

For urban water, there is in principle no subsidy, though in practice donor funds lower the cost of capital. Tariffs are intended to recover the full cost of O&M. For small towns, a full capital subsidy is available and some subsidy is also available to operating costs through the O&M conditional grant. For rural water supply, around 2% community contribution is expected for capital items. In principle no subsidy is offered for O&M though full cost recovery is rare in practice. For sanitation, no subsidy is offered to households, but school toilets, public latrines and hygiene promotion are fully subsidised. For sanitation O&M, no subsidy is available for households, whereas schools and promotional programmes are fully subsidised.

Source: Uganda case study prepared for the OECD Task Team on Water and Sanitation.

The form of subsidy probably most widespread among OECD and developing countries alike is capital expenditure. This is usually provided in the form of grants, long-term subsidised loans or sovereign guarantees. It is usually expected that utilities should recover O&M costs from tariffs and then gradually move towards full recovery of capital charges as affordability rises.

From an economic viewpoint, however, there is no strong reason for subsidising capital rather than O&M; both are components of the total cost of providing the service and in the long run cash flow is required for both. Subsidising capital may also produce distortions (such as over-engineered, capital-intensive solutions). It is preferable for nominal tariffs to reflect full (marginal) costs, and to adjust for affordability in other ways (see below). While this may represent good practice, countries tend to be highly pragmatic in their use of public money for WSS. The experience of Korea is typical of many (Box 2.4).

Box 2.4. **Evolution of subsidy policy in Korea**

Direct subsidies are available from the central government to local governments or service providers. The proportion of subsidy to the cost of each project depends on the size of the city and the type of facility. Different subsidies are available for construction and operation. Typically, water source development in rural areas attracts subsidies of 50-80%, and local waterworks improvements 50%. Wastewater treatment is eligible for a 50% grant, and sludge treatment for loans of 30-70% of costs.

For water supply run by municipalities, revenue from water tariffs covers an increasing share of production costs, rising from 69.4% in 1997 to 82.8% in 2005. For regional water supply systems full cost recovery was achieved by 2004. In the case of sewerage treatment, the revenue from tariffs falls short of the actual total cost. Over the period 1997-2004, the central government paid 53% of the total investment costs for sewerage treatment, using proceeds from the national liquor tax.

The funding scheme for the provision of infrastructure has varied according to the status/stage of economic development or urbanisation. At earlier stages of economic development and urbanisation, the central government supported the provision of infrastructure through several subsidies and administrative assistance. As the economy developed, the portion of central government support has decreased and the cost of environmental service has been transferred to polluters, users and local governments.

Source: Korea case study prepared for the OECD Task Team on Water and Sanitation.

However, in a decentralised sector, municipalities, which usually own the assets, often lack the financial means to support these efforts themselves. In the OECD and many developing countries, a significant share (about 25% in OECD and up to 50% or more in many developing countries) of local government budgets are provided through fiscal transfers from central budgets. It is therefore crucial that such transfers are provided in a way that ensures an effective contribution to the long-term sustainable financing of the water sector. Experience gained in the OECD and in countries of Central and Eastern Europe shows that two important criteria should be taken into account when organising these transfers (see EAP Task Force, 2006a; 2006b).

First, intergovernmental transfers should generate stable revenues, which can be incorporated in the medium-term financial strategies of municipalities. Schemes in use in some countries, which allow for extensive revision of the amounts to be transferred, generate uncertainties in sub-sovereign governments' revenues, and run counter to the needs of a sector that is capital intensive and involves long-living assets.

Second, the procedure should be designed in accordance with one of two objectives:

- Either to ensure that national targets are reached, *e.g.* to ensure the efficiency of WSS operations, or to support the implementation of environmental or other standards. Funds can then be transferred on a non-permanent basis, as transfers should be stopped once the target is achieved. Earmarking can be an option, as it facilitates monitoring of the allocation of the funds.
- Or to allow municipalities to allocate funds according to their own priorities. This option is economically justified, if local governments can establish that they have the capacity to elaborate sound and realistic plans, to implement them, and to be fully accountable for their implementation. Under such circumstances, general purpose grants have proved to be the most flexible and efficient means of transfer, as in the case of the "Sub-National Governments Financial Support Fund" in the Russian Federation.

When designed according to these criteria, intergovernmental transfers create incentives for improved financial sustainability and creditworthiness of local jurisdictions, thereby eventually helping to decrease demands on central budgets.

In addition, environmental administration and local governments should allocate their budget resources in a way to leverage other sources of finance. All things being equal, the aim should be to minimise the contribution of public financial resources and to maximise the contributions of alternative sources of finance. Public funds should not crowd out private financing for projects that are commercially viable. Where possible, public finance, including loans from bilateral donors and international financial institutions, should be channelled through (or complemented by) commercial banks in order to build capacity to support investments in water supply and sanitation.

*Increasing the supply of finance: transfers (*i.e. *ODA)*

Official development assistance[7] and other forms of aid (*i.e.* private charities, etc.) have a role to play to help close the financing gap.[8] The share of ODA to water and sanitation varies across recipient countries. In some countries ODA subsidises most investments, while in other it plays a more marginal role. Nevertheless, ODA has an important role to play both as a source of finance and of capacity development for the provision and financing of water services. If the MDG targets are to be achieved, the

increasing levels of ODA to the water sector need to be sustained, together with increased mobilisation of financial resources within developing countries.

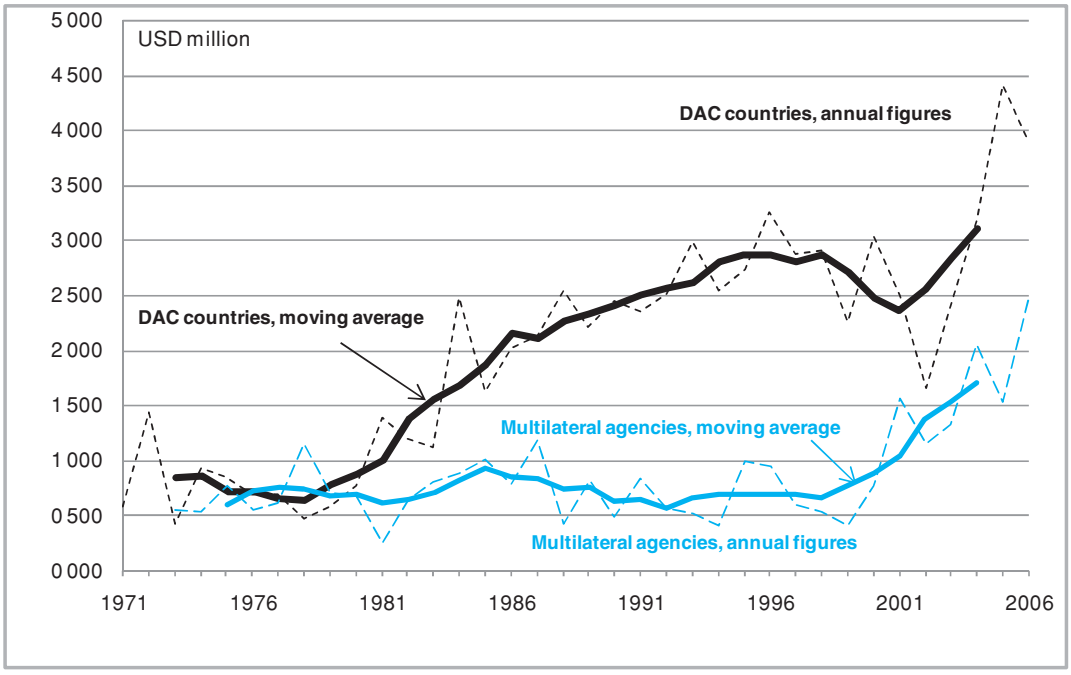
While the bulk of ODA is extended in the form of grants, loans constitute a large share of ODA to certain sectors. About half of ODA to water supply and sanitation in 2001-06 was in the form of loans. In the context of an analysis that distinguishes between the ultimate sources of revenue (tariffs, taxes and transfers) and other financial means, the different roles of ODA grants and loans need to be borne in mind.

ODA grants consist of "transfers" and are considered as ultimate sources of revenue. ODA loans lower the cost of capital and are useful in helping water utilities "bridge" the financing gap that is created by the need for large upfront infrastructure investment.

Aid for water supply and sanitation has been rising again since 2001, after a temporary decline in the second part of the 1990s. In 2005-06, DAC[9] members' bilateral annual aid commitments to the water and sanitation sector rose to USD 5 billion, double the amount of years 2001-02 in real terms. Taking into account multilateral agencies' outflows, which rose by 21% in 2002-06, ODA amounted to USD 6.2 billion (Figure 2.2).[10]

Figure 2.2. **Trends in official development assistance to water supply and sanitation**

1973-2006, commitments, 5-year moving averages and annual figures, constant 2006 prices[1]



1. Figures based on five-year moving averages take into account commitments' volatility, thus facilitating the analysis of long-term trends.

Source: OECD/WWC (2008), *Creditor Reporting System: Aid Activities in Support of Water Supply and Sanitation - 2001-2006,* OECD, Paris.

DAC members dedicated 9% of their total sector allocable aid to projects and programmes in the water sector (including water resources management activities) over

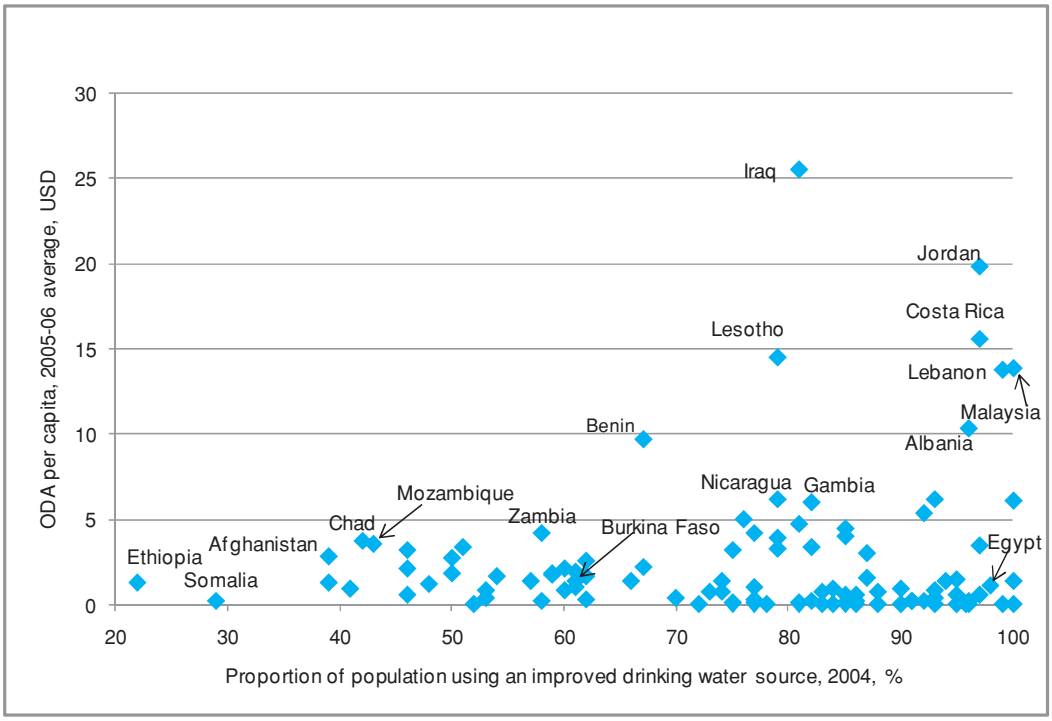
the last two years. This illustrates a renewed prioritisation of the water sector in members' aid programmes in 2005-06, after a drop to 6-7% in 2001-04.

Among DAC members, the largest contributors over 2005-06 were Japan (on average USD 1.6 billion per year), the United States (USD 903 million) and the European Commission (USD 730 million). The bulk of Japanese aid related to ODA loans for infrastructure projects is in China, Costa Rica, India, Indonesia and Malaysia. On their own, these projects represented one-fourth of total DAC members' aid for water. Reconstruction projects in Iraq by the United States also made up a significant proportion (15%) of the total.

Main recipient regions were Asia (55%) and Africa (32%) over 2001-06. The region the most in need, both in terms of access to water supply and sanitation, Sub-Saharan Africa, received a significant share of total aid (24%) although this share decreased in recent years (from 22% in 2001-04 to 17% over 2005-06 for DAC members). The other region suffering the most from a lack of sanitation services, South Asia, was also a relatively large recipient of aid for water (South and Central Asia received 19% of total aid for water).

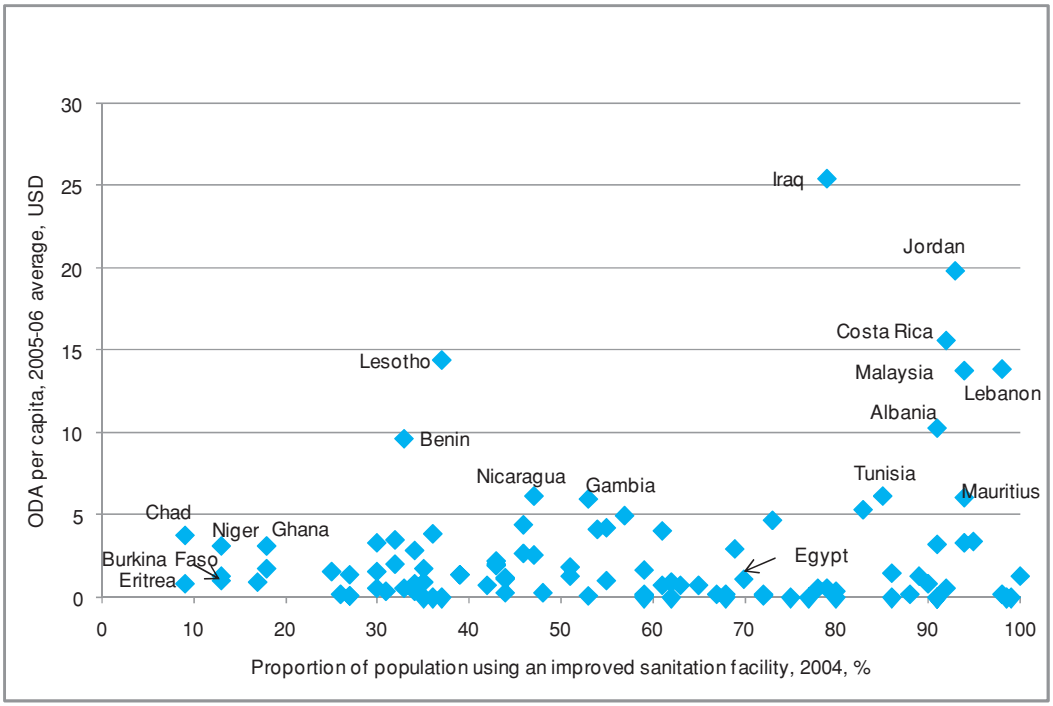
However, an analysis of aid allocations in relation to the degree of current access to water and sanitation of recipient countries (see Figures 2.3 and 2.4) reveals that numerous countries with low levels of access receive little aid (*e.g.* Angola, Central African Republic, Republic of Congo, Somalia, Togo receive less than USD 0.5 per capita) while countries with higher levels of access receive significantly more (*e.g.* Albana, Costa Rica, Iraq, Jordan, Lebanon, Malaysia received at least USD 13 per capita).

Figure 2.3. **Aid to water supply and sanitation per capita in relation to the degree of access to water supply by recipient countries**



Source: OECD/WWC (2008), *Creditor Reporting System: Aid Activities in Support of Water Supply and Sanitation - 2001-2006,* OECD, Paris.

Figure 2.4. **Aid to water supply and sanitation per capita in relation to the degree of access to sanitation facilities by recipient countries**



Source: OECD/WWC (2008), *Creditor Reporting System: Aid Activities in Support of Water Supply and Sanitation - 2001-2006,* OECD, Paris.

Aid resources are scarce. They need to be spent strategically, so as to maximise their leveraging capacity and effectiveness. Experience suggest that aid is more effective when partner countries exercise strong and effective leadership over their development policies and strategies, as set out in the Paris Declaration on Aid Effectiveness and recently emphasised in the Accra Agenda for Action.

Areas where the use of ODA could have a catalysing effect include:

- Reducing bottlenecks in the sector – particularly reducing the capacity bottlenecks faced by both public authorities, especially local ones, and local operators.
- Supporting the financial planning process by helping to develop relevant capacity, by aligning assistance with the resulting financing strategies, by participating in the policy dialogue and contributing to better co-ordination, and by supporting parallel capacity development at the local level. Donors can also draw on their domestic experience of planning the financing of the water sector and share this experience with developing countries that wish to follow such approaches.
- Ensuring access to services by the poor, through tailored, targeted grant-delivery systems (*e.g.* output-based aid[11]).
- Supporting the development and use of risk-management mechanisms that could help attract private funding (and especially private local funding) to the sector (see Box 2.5 for an example).

Box 2.5. **The Philippine Water Revolving Fund (PWRF)**

The Philippines Financing Reform combines the judicious use of ODA (United States Agency for International Development [USAID]), with a focus on improving the "fundamentals" of the sector and financial ingenuity. The main challenges the Philippines face with regard to the water supply and sanitation sector are: 80% of the population has access to water supply, but only 44% have piped connection; 84% have access to latrines and septic tanks, but only 4% of the population has access to sewerage systems, and infrastructure for wastewater treatment is missing. In the past, progress in expanding and improving services has been slow. In terms of financing, public resources can cover only half of the investment requirement to meet MDG targets and nil for wastewater treatment facilities. Internal revenues and ODA have been the traditional sources of financing for water utilities. Both have been declining over the past decade – a trend that is expected to continue. The government thus became interested in attracting private finance (particularly from local financial markets) to the sector, as a way to bridge the financing gap.

The Philippine Water Revolving Fund (PWRF)[1] is one of several innovative financing mechanisms. It has the following objective: blending public and private resources to offer affordable financing to utilities without distorting market terms. Initially, the idea was to establish a fund similar to the US State Revolving Funds. However, there were two major constraints in setting up the scheme. First, no government grants were available to be used as collateral, due to the very tight fiscal position of the Filipino Government (GRP). Moreover, private financing institutions were not familiar with utilities. On the other hand, there were opportunities. If GRP would provide a sovereign guarantee, public banks could borrow ODA money directly. ODA funding could then be used to leverage private funds. The positive aspect of the Filipino financial market was the presence of high liquidity and the prevalence of low interest rates. Finally the creditworthy utilities were able to afford market-based rates, but needed longer maturities than were offered by local banks.

Responding to this, the PWRF was designed as a co-financing facility, blending concessional loans from the Japan International Cooperation Agency (JICA) (borrowed and on-lent by the Development Bank of the Philippines) with funds of local private commercial banks. Donors' development agencies also contributed in a second way: a domestic guarantee corporation backed by a co-guarantee from USAID Development Credit Authority will provide the credit risk enhancement for private lenders. Moreover, commercial loans that currently have maturities of ten years at the most will be supported by a standby credit line from government financing institutions to lengthen the amortisation period. The revolving nature of the Fund comes from the longer grace periods of the JICA loan (ten years) and the shorter grace period of the loans to water utilities (two to three years). Their early principal repayments will be put in a ring-fenced account and dedicated to lending for new water projects or enhancing future capital market-based instruments. The fund became operational on 30 September 2008.

Early gains: The new government water policy and the dialogue between public and private financing institutions stimulated interest in financing WSS projects before the creation of the Revolving Fund. Since 2007 private banks have originated ten loan transactions for WSS projects with a total value of USD 23 million. These projects will provide piped water to some 720 000 Filipinos.

1. USAID and JICA have been assisting the Philippine Government from conceptualisation, feasibility assessment and design, and currently execution of the PWRF.

Source: Philippine Financing Reform Case Study received from DAI for USAID; Moore, D. (2006), "Developing Sustainable Financing for Water Supply and Sanitation: Philippine Water Revolving Fund", presented at the 4th World Water Congress, 14 September 2006, Beijing, China.

Policy dialogue on WSS financing: good practices from OECD and developing countries

Informing policy choices: the value of strategic financial planning

One approach that can help countries address the challenge of sustainable financing for the water supply and sanitation sector is that of strategic financial planning. Strategic financial planning is a multi-stakeholder policy dialogue process that attempts to develop national consensus on what water supply and sanitation services a country can or should afford in the next 20-30 years, and how it will pay for them. At present, policy decisions are rarely based on such comprehensive long-term analyses. The alarming evidence of current underfunding, and the looming costs of future development lend urgency to these exercises.

In this report, the terms "strategic financial planning (SFP)" and "financing strategies (FSs)" are used interchangeably. Some countries undergo a formal process of dialogue and stakeholder consultation, prior to the production of a written Financing Strategy, based in some cases on a financial model such as FEASIBLE or SWIFT.[12] Other countries evolve their financing strategies over time through the development of relevant policies and institutions, and SFP is embedded in routine public financing and expenditure processes.

SFP/FS have several objectives. They provide a structure for a policy dialogue to take place, involving all relevant stakeholders including ministries of finance, with the aim of producing a consensus on a feasible future WSS. They illustrate the impact of different objectives and targets from a long-term perspective, linking sector policies, programmes and projects. They also serve the important aim of facilitating external financing, providing clear and transparent data on financing requirements.

Based on the experience reviewed in this chapter, a number of outcomes can be expected (Box 2.6 shows some examples): a shared understanding of issues; consensus on realistic WSS infrastructure targets; more objective discussion of tariff policy; reflection of the realism of social and environmental objectives; the opportunity to improve dialogue with the Ministry of Finance; and the possibility of incorporating results into the national Medium-Term Expenditure Framework and into Poverty Reduction Strategy Papers (which may be a condition of donor support).

Through these country-led processes donors support the development of the water and sanitation sector in a way that is consistent with the Accra Agenda for Action and the Paris Declaration on Aid Effectiveness. This entails both financial and capacity development support.

Box 2.6. **Results of strategic financial planning processes in Moldova and Armenia, using the OECD's FEASIBLE methodology**

In order to support the policy dialogue processes that underlie strategic financial planning, the OECD, with the support of the Government of Denmark, has developed a decision-support tool called FEASIBLE. The basic approach underlying FEASIBLE is to collect detailed technical data on existing infrastructure, select public policy targets in water supply and sanitation – usually the Millennium Development Goals – determine costs and timetables for achieving them, and compare the schedule and volume of expenditure needs with available sources of finance. This reveals any financial deficits likely to arise along the way. FEASIBLE can be used to develop various scenarios to determine how the gaps might be closed, such as identifying ways to help achieve the targets at lower cost or to mobilise additional finance; setting less ambitious targets, or rescheduling the programme. To date, the FEASIBLE tool has been used in more than 15 countries, mainly in the former Soviet Union and with the support of the OECD EAP Task Force.

In Moldova, policy dialogue to develop a financing strategy for water supply and sanitation took place over an 18-month period, and was led by the Minister for Local Public Administration. It provided important input to the National Water Strategy, initiated by the president. The process helped to inject realism into these plans and led to a demand to translate the financing strategy into an action and investment plan and to link it into the Medium-Term Expenditure Framework.

In Armenia, policy dialogue on water supply and sanitation sector financing has been going on for several years under the leadership of the State Water Committee and with strong involvement of the Ministry of Finance. The dialogue and analysis that it produced led the Ministry of Finance to recognise the sector's need for prolonged public subsidies and to an extension of public subsidies that were meant to be phased out. The dialogue also identified realistic policy objectives for minimal water supply standards in rural areas. A law incorporating these conclusions is in the process of adoption.

The FEASIBLE tool is currently being applied in a number of countries in the former Soviet Union (Moldova, Georgia, Kyrgyzstan), but also in Egypt (with support from the OECD and the Mediterranean Component of the EU Water Initiative), in Lesotho (with support of the OECD and EU Water Initiative Finance Working Group), and Cambodia (with support from the Water and Sanitation Programme).

Source: EAP Task Force (2007b), "Implementation of a National Finance Strategy for the Water Supply and Sanitation in Armenia", OECD; EAP Task Force (2008b), "National Policy Dialogue on Financing Strategy for Rural Water Supply and Sanitation in Armenia", OECD; EAP Task Force (2008c), "Financing Water Supply and Sanitation in Moldova", OECD.

Making strategic financial planning work: basic principles from lessons learned

SFP is no panacea, nor is it an effortless process. The recent experience of developing countries is that it can be a difficult and time-consuming exercise, yielding partial successes from considerable effort. It is still well worth doing. It should be recalled that developed countries have taken decades to evolve their present financing systems for WSS, and sometimes key reforms have only been prompted by catastrophes and internal financial crises.

Actors and stakeholders

SFP needs ownership and championing by key actors and stakeholders. These crucially include political leaders and officials from the national financial community, including ministries of finance. Stakeholders should be of sufficient seniority to carry weight within the community they represent and to be able to deliver the support of their

constituents. Some of these will be outside the water sector, as is normally construed. Donor agencies and other external partners should lend judicious support.

Process

The process involved in SFP involves substantial dialogue and consultation with all major parties (stakeholders). Assembling information, clarifying goals and negotiating options are just as important for the FS as the eventual production of a document or model. It is important to start with a clear understanding of objectives and their relative importance, since this will determine the tools used, the stakeholders involved and the expectations that are raised. All of this takes time (at minimum, a year) and plans should be periodically revisited to ensure that they remain realistic.

The ambition of SFP hinges on how the scope of the sector, and the sub-sectors it includes, is viewed. A FS can be confined to a single coherent sub-sector (such as rural WSS) or it could be widened to include urban areas, water resources management and institutional reforms. The strategy can be limited to the public sector or could also include the contributions from charities, civil society, the private sector and individual householders. SFPs can be developed at the national or regional level, depending on the governance structures. It involves an iterative process, in which different targets and financial requirements are successively tested against available resources until a balance is reached.

Analytical base

The credibility of SFP rests on the quality of the data on which it is erected. If a model is used, it should be robust and its structure should be intuitively and intellectually clear to its ultimate users. Different countries have different needs from SFP and there is no "one size fits all". There has to be a balance between simplicity (making the FS easy to implement) and credibility, which may demand a more sophisticated and rigorous approach. Models should be designed to support decisions, not to replace them, and should be easy to update.

Capacity

Investing in the development of capacity for SFP can have high returns. Creating an effective dialogue between water sector experts and financial specialists entails communicating in language intelligible to the other side, and in terms which have mutual resonance. Water professionals need to understand more about finance: finance specialists should acquire a better understanding of water. The ambition and modalities chosen for SFP should reflect local needs, expectations and implementation capacities.

WSS champions need to present a more effective case to ministries of finance for its proper share of budgetary allocations, against a background where politicians, particularly at local levels, have an insufficient awareness of WSS and its needs. This affects the low priority they often give it compared to other sectors, and hinders their capacity to give it effective support.

The "absorptive capacity" of WSS for financial resources needs to grow: it is often limited due to weak project preparation and poor capacity for implementation. It is also determined by the predictability of funds and their timely arrival. Related to this, essential

data on the status and performance of WSS is often lacking, insufficient and unreliable, thereby hindering credible sector planning.

Role of donors

International donors can be the midwives of SFP. They are in a position to promote the concept to their development partners, provide material support for capacity development, harmonise their procedures in line with their partner's needs, and offer their own national experiences where relevant. However, they should avoid hijacking or short-circuiting the process, which would be counter-productive to its long-term success.

Notes

1. OFWAT has periodically vetoed proposed mergers between companies on the grounds that this would reduce the scope of benchmarked competition.
2. For example, through the World Bank's IB-Net, the former Water Utility Partnership for Africa (now taken over by the Water and Sanitation Programme [WSP] and the Water Operators Partnership), the Asian Development Bank's Water Utilities Data Books, reports of the Environmental Action Programme Task Force (for EECCA countries), and various utility and professional networks in Latin America.
3. Recall the important distinction between the ultimate sources of revenue (tariffs, taxes and transfers) and other financial means that can defray immediate costs (loans, bonds, equity) but which have to be eventually repaid from one or other of the ultimate sources of revenue. In that context, ODA grants are considered as ultimate sources of revenue while ODA loans need to be paid back by water users or public budgets.
4. This can be regarded either as a user charge or an earmarked tax.
5. In addition, as will be discussed in Chapter 3, even in poor countries, lower income people may be willing to pay higher portions of their income for improved services; thus, international thresholds should only serve as a general indication.
6. In such situations presenting tariff increases in percentage terms, as critics often do, will be misleading, since a 100% increase in a trivial sum still leaves a trivial sum. Even after a tenfold increase in tariffs in the Czech Republic, the share of average household incomes required to pay the water bill is about 1% (Czech case study prepared for the OECD Task Team on Water and Sanitation).
7. Comprehensive statistics on ODA for water supply and sanitation are provided in OECD/WWC (2008).
8. ODA figures measure flows transferred to recipient countries. As an ultimate source of revenue for the water sector, ODA is therefore kept under "transfers" in this report. ODA funds delivered in the form of budget support are managed in accordance with the recipient's budgetary procedures, in the same way as other government resources

obtained through "taxes". In this case ODA becomes part of the recipient "public budget spending", but the political and administrative process of securing ODA resources is still very different from "taxes".

9. The OECD Development Assistance Committee, founded in 1961, is made up of 23 members: 22 OECD countries (among them the most important bilateral donors) and the European Commission.

10. This includes both grants and concessional loans. If a loan satisfies the ODA criteria, the whole amount is recorded as ODA and not just the grant element. The grant element is not used to discount the face value of a loan in DAC reporting. Repayments of the principal of ODA loans count as negative flows, and are deducted to arrive at net ODA, so that by the time a loan is repaid, the net flow over the period of the loan is zero (interest is recorded, but is not counted in the net flow statistics).

11. Output-based aid (OBA) focuses on using development aid to support the delivery of public services in developing countries using targeted performance-related subsidies.

12. FEASIBLE is a strategic financial modelling tool that has been developed by the OECD with the support of the government of Denmark. SWIFT has been developed by the Water and Sanitation Programme at the World Bank.

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Chapter 3

Water Services: The Central Role of Tariffs

Well-designed tariffs are crucial for sustainable cost recovery and provide incentives to use water efficiently. Nevertheless, even in OECD countries, tariffs rarely cover the full costs of water services. This stems partly from an unawareness of broader economic benefits of water and sanitation, but also from legitimate concerns about impacts on poorer households.

But financial sustainability and affordability of services are not necessarily incompatible. Artificially low tariffs for all customers may in fact hurt poor households the most, particularly when they prevent extending services to communities that are paying much more from alternative sources.

Reconciling different policy objectives is a political task and should entail a transparent, democratic, participatory process. This chapter discusses how tariff levels and structures can be defined to meet different objectives while taking into account local circumstances, and how the tariff setting process can be improved by linking the debate on tariffs with that on service quality and efficiency of service provision.

Chapters 1 and 2 made it clear that revenues from tariffs[1] are an important source of sustainable finance for water supply and sanitation (WSS). However, financial sustainability of WSS services is only one of several objectives of water policies. Therefore, tariff setting for WSS needs to reconcile a variety of objectives (*e.g.* economic efficiency, affordability of services for lower income households).

This chapter will consider in more depth how this difficulty can be addressed. In particular, it will discuss the pros and cons of a variety of tariff structures, arguing that these are more than just technical issues. Tariffs are core instruments of water policies and should be considered as such. Setting tariffs requires an informed and transparent debate about the acceptable balance between potentially conflicting objectives and about the appropriate compensatory measures that may be needed to achieve such a balance.

The objectives of this chapter are to:

- clarify the multiple objectives that policy makers face when designing a tariff policy, the potential conflicts between them, and how tariffs can be designed to balance different policy considerations;
- discuss the possible difficulties in reconciling the role of tariffs as part of a sustainable cost recovery strategy and other objectives, particularly affordability considerations;
- indicate what factors may influence the choice of tariff **levels** and what drawbacks may derive from suppressing them (discussed in part in Chapter 2);
- show how different tariff **structures** respond to different objectives and may help find a balance between them;
- discuss the peculiarities of different components of WSS services, which may require the design of specific pricing mechanisms;
- highlight the importance of the tariff-setting **process**.

The 2007-08 OECD survey: main trends and data limitations

In 1999, OECD carried out an extensive review of water pricing practices in OECD countries (OECD, 1999; partly updated in OECD, 2003). In 2007-08, the review of OECD country experiences was updated (see Box 3.1) to test how well some of the trends identified in 1999 had stood the test of time and whether new trends were emerging. The analysis was extended to include experiences in non-OECD countries. The survey did not cover the pricing of water in agriculture, as this was the object of another component of the Horizontal Water Programme of which this work is part and will be discussed separately in Chapter 5.

Box 3.1. **The 2007-08 OECD survey: difficulties in data collection and solutions adopted**

For OECD countries, a first round of data collection and analysis on pricing levels and structures was carried out based on publicly available data. Information gaps were identified and a questionnaire was sent to member countries. Country experts were given two options: they could compile data at the national level, clarifying the methodology followed for their aggregation) or provide disaggregated data collected directly from local service providers (or a sample thereof, to be defined by the national expert). This choice recognises the fact that pricing, cost and other relevant WSS data is fundamentally local and that extreme care should be taken in proposing cross-country comparison on such variables.

The difficulties encountered in data collection, as well as the discussion with a number of country experts, provided valuable information concerning: *(i)* limitations in data availability on key aspects of the WSS sectors at the national level, and difficulties in mobilising such information from the relevant local entities; and *(ii)* possible future work aimed at improving data collection, and reducing inconsistencies, in view of creating a set of core indicators that may allow meaningful comparability on policy-relevant variables across OECD countries.

In parallel to the OECD survey, two surveys on pricing levels and structures were launched with Global Water Intelligence (GWI) in 2007 and 2008. These covered over 150 cities in all OECD countries, and 100 cities in non-OECD countries on all continents, including key emerging economies (Brazil, China, India, Indonesia, South Africa) and Eastern Europe, the Caucasus and Central Asia (EECCA) countries.

Additional empirical evidence came from the data collected biennially by the International Water Association (IWA), and that contained in the IB-net database managed by the World Bank. Relevant information on topics on which data collection was expected to be difficult (*e.g.* cost recovery, demand elasticities) was derived from case studies collected as part of the Horizontal Water Programme work on strategic financial planning, those presented at an expert meeting held in Paris on 14-15 November 2007, those on EECCA countries carried out under the EAP Task Force, and a review of recent literature carried out by a consultant. Specific studies were launched to address the recent experiences with specific "social" tariff structures and the issue of cost recovery and financial sustainability of service providers.

The following list highlights a few of the key trends for OECD countries that the 2007-08 survey identified as compared to those identified in 1999. These and other results from the survey will be discussed in the following sections to illustrate the main messages that emerge from the work:

- continued real price increases – at times, substantial – for household service over recent years, both in OECD and non-OECD countries, which may signal an increased role of tariffs in cost recovery;
- continued decline in the use of decreasing block tariffs and flat-fee systems for household tariffs, in favour of two-part fixed charge + variable fees with a uniform or increasing block volumetric component (see Box 3.2 for definitions);
- limited application of decreasing block tariffs for industrial uses (or for the larger amongst them) in only a few OECD countries;
- increased application of taxes on water bills;
- increasing separation of wastewater from drinking water charges, and charging for wastewater on the basis of actual costs thus raising charges, with consequent substantial increases in the price of wastewater management services;

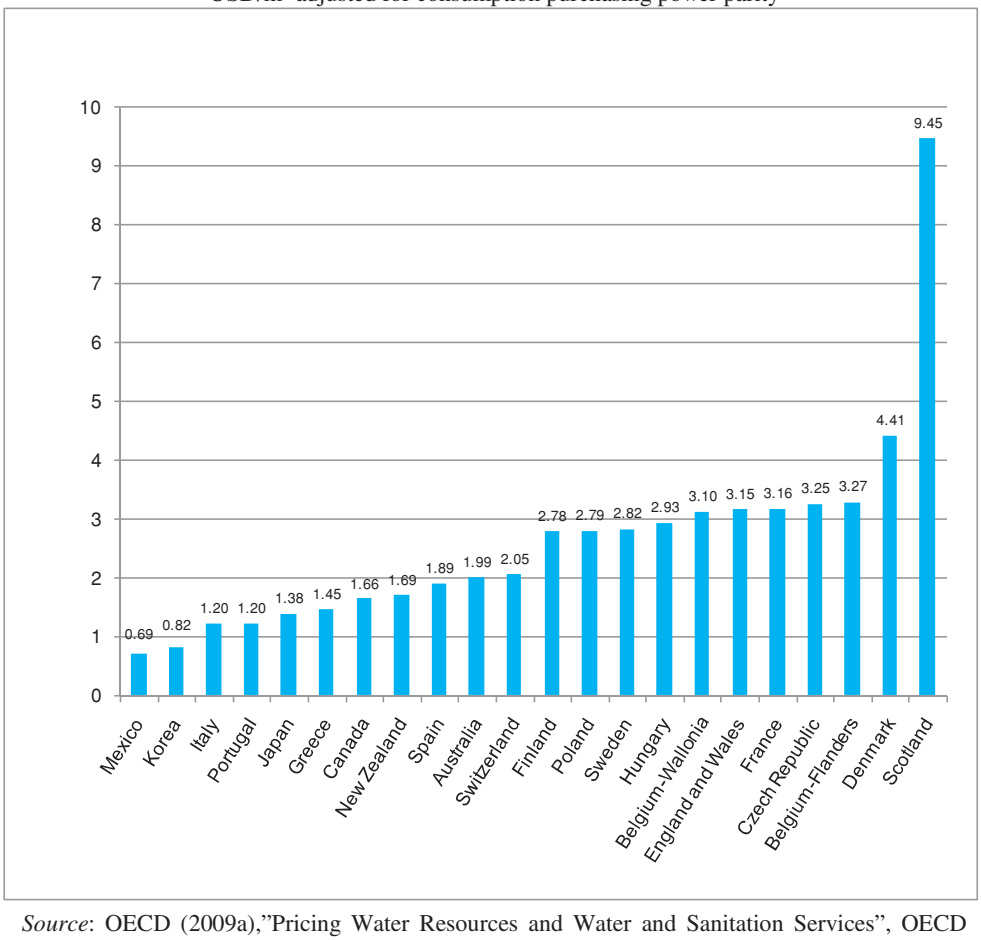
- evidence that the response of domestic consumers to marginal price changes may be small, while more significant – but possibly temporary – impacts on demand may follow changes in tariff structure, and especially a shift from flat to volumetric rates;
- continued attention to social concerns, addressed through innovative tariff structures or parallel income-support mechanisms.

Tariff level data and their interpretation

Figure 3.1 shows the price per cubic metre of water and wastewater services faced by a household consuming 15 m^3 per month in different OECD countries. [2] Data for selected non-OECD countries are presented in Annex 3.A1. As this indicator shows the "price of water" perceived by final (domestic) users, data were adjusted using purchasing power parities for private consumption. Its choice over other possible measurements of "average tariffs" was driven by the intention to ensure comparability across countries, given the extreme variability of tariff levels and structures not just across countries, but across different providers within each country.

Figure 3.1. **Domestic price of water and wastewater services, including taxes, in selected OECD countries**

USD/m^3 adjusted for consumption purchasing power parity



Source: OECD (2009a),"Pricing Water Resources and Water and Sanitation Services", OECD internal document, *www.oecd.org/water*.

Water and wastewater bills differ between OECD countries, although clusters of countries can be identified, with ten countries falling below USD 2/m^3 (two of which were below the USD 1 mark), nine anchored around USD 3/m^3, and Denmark and Scotland presenting much higher values. These two countries have made efforts to incorporate as much of the economic and other costs of WSS provision and use into their tariffs.

But one should refrain from going too far in drawing conclusions from comparisons of water pricing levels across countries, which may in fact be of little use, as averaging out local pricing levels can lead to a distorted picture of reality. Within and across countries, prices might differ widely because costs differ, depending on the quality of available natural resources and other circumstances, *e.g.* the possibility to use gravity instead of electricity to pump water in the pipes or the existence of different regimes of indirect taxation of services. Therefore, differences in prices cannot immediately be interpreted as a sign of poor cost recovery, of efficiency gaps, of a "predatory" provider or of an ineffective regulator.

If tariff levels tell us little about their capacity to cover costs, could the solution be to collect information directly on cost-recovery levels? In reality, this is precisely the issue on which it was harder to collect reliable information. In addition, even when such information was available, its interpretation proved arduous, reducing its usefulness in assessing the contribution of tariffs to the financial sustainability of the WSS sector. First, it is very difficult to properly aggregate cost-recovery levels at the national level. In addition, financial sustainability depends on how free cash flows compare with the free cash needs; in order to assess this, it is not advisable to rely on a water company's accounts, since it is almost always impossible to derive correct information on capital costs using these.[3]

The conclusion from this is that WSS pricing and its impacts should be assessed locally. National comparisons can help give a general idea of overall trends and orders of magnitude, but for future work, efforts initiated with the 2007-08 OECD survey should continue and data collection at the level of local providers should be encouraged, as well as a reflection on appropriate ways to aggregate such information so that comparability of meaningful indicators is possible.

Tariff structures: definitions and recent trends

Box 3.2. **Tariff structures: some definitions**

Water and wastewater bills generally contain the following components:

- a one-time connection fee, to gain access to the service;
- a recurrent fixed charge (sometimes known as a standing charge or flat fee) that can be uniform across customers or linked to some customer characteristic (*e.g.* size of supply pipe or meter flow capacity; property value; number of water-using appliances);
- if a metering system is in place, a volumetric rate, which when multiplied by the volume(s) of water consumed in a charging period gives rise to the volumetric charge for that period;
- in some circumstances, a minimum charge is paid for each period, regardless of consumption.

Different forms and combinations of the recurrent elements above (with or without a connection charge) give rise to the following tariff structures:

- **Uniform *vs.* differentiated flat rates**: In a non-metered environment, customers pay a flat rate regardless of their consumption. This can be uniform or differentiated based on customer characteristics, season, etc.
- **Single volumetric rates with/without uniform or differentiated fixed charges**: In a metered environment, a single rate per cubic metre is applied regardless of volume consumed. This can be charged with or without a recurrent fixed charge. The fixed charge can also be negative (a coupon). Fixed charges and coupons can be uniform or vary according to customer characteristics.
- **Increasing block tariffs (IBTs)**: The volumetric charge changes in steps with increasing volumes consumed.
- **Adjusted IBTs**: Either the volumetric rates applied at each block or the size of the blocks is adjusted based on specific customer characteristics (*e.g.* family size, income).
- **Decreasing block tariffs**: Volumetric rates decline with successive higher consumption blocks.

In OECD countries, with regard to household tariffs, on the sample of 184 utilities in the GWI survey: no flat fees were found; 90 used single volumetric tariffs, of which 60 coupled this with a fixed charge; 87 used increasing block tariff system, of which 2 also applied a fixed charge; while 7 still resorted to decreasing block tariffs (all of them in the United States). The use of flat fees, however, is still reported in Canada, Mexico, New Zealand, Norway and the United Kingdom.

In a number of OECD countries, the diversity of structures applied is extreme. In Canada and the United States, most tariff structures are represented, and in countries where IBTs prevail, there are often large variations in terms of the number and size of blocks, as is the case in Italy, Mexico (Box 3.3) and Portugal.

Box 3.3. Tariff structures: the case of Mexico

In Mexico, tariff structures are set by each municipality, according to the specific laws that apply to each of the federal states of the country. In most of the cases IBTs are used, usually with a fixed charge and a minimum consumption. level. The number of blocks varies, but it is usually high (more than five). In the case of Monterrey, one of the major cities in Mexico, the tariff structure is a parabola and the tariff is published for each cubic metre. In Mexico City (Distrito Federal), there are 14 blocks, in Tijuana, 12 blocks. Industrial tariffs are usually higher than household tariffs. According to a census of water utilities conducted in 2004 by the National Institute of Statistics and Geography (INEGI), 52% of the households connected to the network had a meter in 2003. There are still some cases where a flat rate is used. Usually the tariffs do not explicitly indicate the amount that corresponds to water supply and the amount that correspond to sanitation. A few years back some municipalities started charging a percentage of the tariff to cover sanitation costs. In the case of Monterrey, 25% of the tariff is for sanitation. But in Mexico City, sanitation is not considered.

Source: Mexico's *Comisión Nacional del Agua* (CONAGUA) response to the OECD Water Pricing Survey, October 2008.

In non-OECD countries, in the GWI sample of 94 utilities, only 3 practiced flat fees, while the majority (57) used single volumetric rates with no fixed charges; 2 added a fixed charge to that; and the remaining 31 were almost evenly split between increasing block tariffs with – *vs.* without – fixed charges.

Pricing "water": the challenge of multiple objectives

Pricing as a cornerstone of a sustainable cost recovery strategy …

Tariffs account for the lion's share of recurrent expenditure in both OECD and developing countries. In recent years, there have been considerable increases in revenues from tariffs, both in OECD and non-OECD countries, as shown in Table 3.1.

The capacity to increase revenues from users is paramount to ensuring the financial sustainability of WSS services. As discussed in Chapter 2, a service provider will have access to external sources of finance, such as loans, only if a sufficient and reliable stream of revenue is ensured. The role of tariffs is therefore especially important because they constitute the source of revenue that service providers should control better, compared with taxes and transfers.

The actual level of predictability of tariff levels, however, depends on the governance structure of service provision in a country, and especially on the independence from arbitrary political interference of the entities in charge of regulating tariffs and on their capacity to understand the values and costs that lie behind a tariff. Only such understanding will enable a tariff regulator to strike the right balance between protecting final users against excessive requests on the part of services providers and ensuring the financial viability of services. Of special importance is the way in which governance structures deal with the process of tariff adjustment over time. The flexibility of revenues to face unpredictable events (*e.g.* devaluation) is paramount. It is therefore important to define clear procedures for tariff revisions (including data requirements, agreed-upon formulas, administrative procedures, consultation processes, etc.).

Table 3.1. **Tariff changes in OECD and selected non-OECD countries**

Real average annual tariff changes (%)				
Country	Period	Water	Wastewater	Water and wastewater
Australia	2003-07	2.69	1.85	2.24
Belgium (Wallonia)	2005-06	1.98	17.42	5.37
Canada	1999-04	-0.32	5.58	2.18
Czech Republic	2000-07	3.31	1.33	3.41
Denmark	2000-06	..	1.67	1.67
Finland	2000-08	1.26	2.29	1.88
France	2000-05	0.07	4.29	2.12
Germany	2000-07	-0.63	..	..
Greece	2000-06	-0.96	-0.52	-0.82
Hungary	2000-05	2.65	5.82	4.10
Italy	2005-07	2.44	4.41	3.33
Korea	2000-06	1.23	7.39	2.79
Luxembourg	1994-99	0.34	..	..
Mexico	2006-07	..	..	3.43
Netherlands	2000-07	-1.33	..	..
New Zealand[1]	2003-07	-6.11	-6.52	-6.37
Portugal	2004-07	0.14	-0.36	0.00
Spain	2000-06	0.74	10.24	3.37
United Kingdom				
England and Wales	2001-06	2.73	2.98	2.87
Scotland	2004-07	1.33	1.28	1.31

Nominal average annual unit revenue changes (%)		
Country	Period	Water and wastewater
EECCA		
Armenia	2000-05	20.7
Azerbaijan	2000-02	12.4
Belarus	2002-06	24.6
Georgia	2000-05	13.3
Kazakhstan	2000-06	10.3
Kyrgyz Republic	2000-05	-7.8
Moldova	2000-06	7.2
Russian Federation	2003-05	26.8
Tajikistan	2000-05	2.9
Ukraine	2000-07	14.5
Uzbekistan	2003-07	0.3
BRIICS		
Brazil	2002-06	18.7
China	2003-07	11.7
India		n.a.
Indonesia	2001-04	22.1
Russian Federation	2000-04	38.7
South Africa	2002-06	17.1

1. OECD estimates based on data of the Metrowater Utility only (Auckland population: 420 000).

Source: OECD (2009a), "Pricing Water Resources and Water and Sanitation Services", OECD internal document, *www.oecd.org/water*.

However, full cost recovery through tariffs alone is far from the norm in most countries, even when considering supply costs alone. Even fewer are the cases where countries have attempted to cover full economic and environmental costs in water prices. The cost of "institutional" components, proposed by Cardone and Fonseca (2003), are also generally not covered through the tariff.

So what are the reasons for the difficulties policy makers have to use tariffs for cost recovery? And can tariffs be designed so as to resolve some of these difficulties? What follows discusses factors that policy makers need to consider **before** making a decision about tariff levels and tariff structures.

… but also so much more, and therein lies the challenge

Water pricing represents much more than a source of finance, both for policy makers and for public perception. One of the difficulties faced by decision makers in their design and implementation is reconciling the different policy objectives and dealing with the public's opposition to tariff increases. A clearer understanding of the potential conflicts between policy objectives, and appropriate communication with the public regarding these, can also help reduce opposition to reform.

The multiple objectives pursued by water policy can be structured around four dimensions:

- **Ecological sustainability**: *As a scarce and vulnerable natural resource*, water should be used so as to protect the basic ecological functions of natural capital and preserve it for future generations. Water savings are part of this objective, which requires avoiding wasteful uses that put unnecessary pressure on the resource *(use efficiency)*. But a reduction in water use is not an objective *per se*. What matters is the capacity of available resources to provide the desired ecological functions over time. It may be possible to do so even with declining water resources, so long as man-made capital (*e.g.* more efficient irrigation technologies, technologies for wastewater re-use) can compensate for a reduction in water availability.
- **Economic efficiency**: *As a valuable economic good*, water should be allocated to the uses that maximise overall benefits to society (*allocation efficiency*). In this context, uses to preserve ecological functions should be given the same status as other uses. Efficient allocation should apply to other economic resources as well. This means that unnecessary investment should be avoided if the value of the services or functions they provide is lower than their cost. There is a clear synergy between this objective and the ecological sustainability objective, as reducing the wasteful use of water will lead to lower requirements for investment in the expansion of water supply. This objective also supports financial sustainability of service provision. The role of regulation (both of resource allocation and of cost levels) is paramount in this area.
- **Financial sustainability**: *As activities requiring investment in costly infrastructures*, water resources management and WSS service provision should be kept viable over time and should be able to attract capital, skills and technology by adequately compensating them. What matters for financial sustainability is the level of tariffs, the reliability of their automatic adjustments (*e.g.* to inflation) and their flexibility in adjusting to changing circumstances (*e.g.* changes in cost structure). Thus, not only their *level* will matter, but also the transparency and stability of the tariff-setting *process*, which needs to be informed by reliable data on cost levels and dynamics at the local level. As discussed in Chapter 2, the minimisation of lifecycle costs of infrastructures (*cost efficiency*) is also key. Again, regulation is crucial to ensure that cost recovery is only for efficient costs.
- **Social concerns**: *As a public interest good*, acceptable levels of WSS services should be accessible and affordable to all, including to lower-income groups. The regulator will need to avoid that water pricing becomes a way for providers, which generally operate in a natural monopoly situation, to capture monopoly rents in terms of excess profits or reduced operational inefficiency. When dealing with social concerns, the focus is primarily on how to protect vulnerable groups and ensure that they have access to water services that remain affordable over time. In this context, it is not the average tariff level that matters, but the way in which costs are allocated across different groups through tariff *structures*.

Choices concerning policy objectives

Given the multidimensional nature of water values, the policy objectives described above may sometimes be in conflict with one another. These conflicts (or "trade-offs") need to be better understood, as some of them may not be as stark as they appear at first sight, while other "hidden" conflicts may go unnoticed. Striking a balance between different objectives then translates into specific challenges for the design of water-pricing policies (Massarutto, 2007). "Striking a balance" when designing tariffs does not mean that it may be possible or advisable to meet one objective at the detriment of the other, but rather that the tariff alone may not be able to achieve all objectives at the same time. Additional instruments may have to be used alongside tariffs.

An example of such conflicts is social demands and environmental sustainability. Available ecological functions of water resources are constrained by physical scarcity, depending on hydrologic factors and by the set of institutional rules, property rights and shared cultures that, in any given historical context, frame the spectrum of available alternatives. To a certain extent, availability can be incremented by adding manmade capital (*e.g.* by investing in building new reservoirs or reducing losses in the system). This has a cost and takes time to implement. A mismatch can arise in this context: *(i)* if the community expressing the demand is too poor to afford covering these costs, and other communities are unwilling to cross-subsidise the low-income community through higher taxes or higher water prices; or *(ii)* if these costs are higher than the value of the required environmental functions (contradicting the efficiency objective).

The trade-offs, and the capacity of institutional and physical systems to deal with them, evolve over time. Income improvements may enable a community to face the costs needed to obtain previously unaffordable services; technological improvements might render its provision cheaper; more effective governance institutions might emerge; social learning processes might generate new cultural frameworks enabling the community to accept previously unacceptable solutions.

But in the short run, water resources may face a carrying capacity limit imposing an upper limit to the societal water needs that can be met; the effectiveness of management systems is crucial in determining whether a solution can be found. The institutional setting imposes a constraint on which governance issues can be solved in the short-to-medium term (Saleth and Dinar, 2004). Resolving institutional failures, including the ability to implement appropriate water pricing, is therefore crucial and confirms the impact of improved governance on financing for the water sector.

Implications for water pricing

To define water-pricing strategies, policy makers need to: *(i)* have an informed and transparent debate on the synergies and possible conflicts between objectives; *(ii)* make a decision (based on a democratic and inclusive process) about the acceptable balance between them, taking into consideration specific local conditions; and *(iii)* decide which combination of policy instruments to use and the role played by pricing mechanisms in this "policy mix", as tariffs alone may not be able to achieve all objectives.

To reach different policy objectives, there is a need to consider three aspects of tariff setting: their average **level**, their **structure** and the **process** for setting and adjusting tariffs. The focus now is on the way in which each of them is relevant in achieving different objectives. The analysis is based on data and case studies collected from OECD and non-OECD countries, as well as on the most recent literature.

Tariff structures to address the policy trade-offs

Financial sustainability vs. *economic efficiency: the "hidden" trade-off*

One trade-off that is seldom recognised is the one between financial sustainability and economic efficiency. In situations of water scarcity or infrastructures nearing capacity, economic efficiency requires volumetric pricing based on the marginal cost (MC) of providing water. Neoclassical economics tells us that water prices should reflect the marginal cost of supplying an additional unit of water (including its scarcity value and the value of its negative *vs*. positive externalities, *e.g*. negative environmental impacts *vs*. the benefits to the community as a whole of improved sanitation for one household[4]). This would bring users to balance the benefits they perceive from each additional unit of consumption against its MC to society, and the resulting allocation would maximise societal economic benefits. The theory states that MC pricing would also provide incentives for optimal decision making regarding investment in infrastructure.

But there are numerous limitations with the use of MC pricing for retail WSS services:

- It requires volumetric pricing, which presupposes that consumption is metered (or measured by an indicator that is a close proxy to actual consumption), which is not always the case.
- It requires that each user faces a price that reflects the MC of providing that specific user – a difficult task, requesting considerable amounts of data, even if the calculation were limited to pure supply costs.
- MC pricing would require tariffs to change as the water scarcity changes (over time and space).
- Similarly, it would require tariffs to change based on how close water infrastructure is to being used to its maximum capacity. Water infrastructure is characterised by significant lump-sum investment. Its average cost is high, but generally declining due to economies of scale and, as long as it is working below capacity, its MC is low. MC pricing would thus generate extreme oscillations in tariffs, with significant increases as infrastructures approach capacity and large reductions after an additional, lump-sum investment has been made; and significant decreases when demand from a single major user drops. This is not only impractical, but also generates financial instability for service providers. Average incremental cost[5] has been proposed as an alternative pricing rule to address this concern.
- WSS services are characterised by high fixed recurrent costs (*e.g*. meter-reading). A pure variable tariff based on a MC pricing rule would not be able to cover for these, requiring the use of a two-part tariff to cover them through a fixed component of the bill. The fixed charge maybe so large as to trump the incentive effect of the volumetric, MC-based charge.
- Specific requirements of water systems make MC pricing even more complex, *e.g*. the need to design infrastructure to meet the peak output, or the requirement for fire fighting.

These points indicate how the best tariff-setting rule from the point of view of economic efficiency may be inconsistent with sustainable cost recovery.

Another aspect to take into consideration is the impact on financial sustainability of a change in tariff regime, meaning the introduction of a different tariff structure (*e.g.* from flat to volumetric rates) or the substantial change in some of its parameters (*e.g.* a significant increase in the marginal rate of an IBT structure). Such significant changes may lead to a large, but possibly temporary, reduction in consumption that may have negative effects on revenues. This has been observed in a number of cases, *e.g.* in east Berlin (see Naumann and Wissen, 2006), and in most EECCA countries. The most recent evidence of users' responses to price changes is summarised in Box 3.4.

Thus, while the objective of financial sustainability is compatible with many different tariff structures, the security and predictability of cash flows is higher the more tariff schedules are based on fixed charges rather than variable charges. This is particularly true in the initial phases of the introduction of volumetric charges or of a large increase in the marginal tariff rate.

Box 3.4. **Elasticity of water demand to marginal price changes *vs.* tariff regime**[1]

Price elasticity of demand measures the responsiveness of demand to price changes, defined as the percent change in demand that would be expected from a small percent increase in price.

Low price elasticity of drinking water demand by urban households: The estimates found in European research in the last 35 years consistently report a low responsiveness of demand to marginal price changes. Elasticity ranges of -0.1/-0.25 for yearly average demands prevail, *i.e.* for any 10% increase in price, a 1%-2.5% decrease in demand would be expected. Including Australia and United States, these would stretch the range to –0.1/-0.4 (Herrington, 2006).

Larger effects of tariff structure changes (Herrington, 2007, pp. 21-22): Evidence was found in the United States and the city of Barcelona, where shifts from simple volumetric rates to increasing block tariff (IBT) structures[2] (or the addition of an extra block to the structure) have been associated with average demand reductions of 10% to 14%. Interpretation of this data is difficult, however, since in most of the case studies either a seasonal tariff or a general water conservation campaign were being simultaneously introduced, while no attempts were made to disentangle the demand effects due to different "initiatives", which can be significant, as shown by US evidence on seasonal tariffs and surcharges. The National Metering Trials in the United Kingdom (1988-92) estimated the effect of introducing metering in areas where previously flat rates were charged. In the six summer months since the introduction of metering, demand declined by 20% in two trial areas with summer tariffs, 62% and 54% higher than winter rates, respectively. In seven other areas, reductions in summer demands were estimated at about 10%. Winter-month reductions were very similar.[3]

Please note that, when metering is voluntary, the data need to be interpreted carefully, as it may be that only households who know they are consuming less than assumed by the flat rate may volunteer to start metering their consumption.

1. For details, see OECD (2009a).

2. All IBTs in the case studies, save those of Barcelona, were of the traditional variety.

3. These results are also explained in Section 3 of Herrington (2007).

Financial sustainability and affordability: how to achieve both through tariffs and other measures

The potential conflict that most often sparks controversy is that between financial sustainability and social concerns. The "user pays" or "polluter pays" principles that are so often quoted as the guiding principles for water pricing (as enshrined in the EU Water Framework Directive of 2000, for instance) are seen by some, and may sometimes be, at odds with the need to protect social rights and manage water resources as a common good (Hoekstra, 1998). And yet, fulfilling the two objectives simultaneously may actually be easier than for other trade-offs.

In this context, not only the **levels** of average tariffs, but especially the tariff **structure** and the choice of cross-subsidisation mechanisms – as well as the use of other support measures – play a role. A major challenge is therefore to understand whether pricing strategies can be designed to achieve both objectives (to different degrees) and what issues other than price are relevant in achieving the desired level of both objectives.

The importance of objective measures of affordability

When addressing affordability concerns through tariffs, it is paramount to base the debate on the precise definition and actual measurement of affordability constraints. To determine whether an affordability constraint exists, it is necessary to: *(i)* collect reliable data on income distribution and current/projected water use in an area; and *(ii)* have an open debate and to decide what levels of income can be acceptably spent on WSS services in that area. In the absence of such objective bases, there is a risk that the process be driven by "political affordability".

Keeping tariffs artificially low for all customers may result in a vicious circle of underfunded service providers, insufficient investment, collapsing infrastructure and deteriorating services that further reduce the benefits that users receive from them and therefore their willingness to pay (see Figure 1.1 in Chapter 1). Collapsing water systems can hurt lower-income users the most, and especially those who currently do not have access to water services, as low tariffs (in the absence of reliable transfers that may make up for the missing revenues) may prevent extensions of networks to poorer communities, forcing them to continue paying much higher prices to obtain water that may be of inferior quality to piped water from other sources, including informal providers.

Affordability for society as a whole vs. *affordability for vulnerable groups*

To address affordability, policy makers need to answer two questions.

The first is what portion of the costs of providing the service should be covered through revenues from tariffs. The answer to this question should take into consideration the affordability of the (lifecycle) costs of providing services for society as a whole, and a first step is therefore to compare the bill resulting from proposed tariff levels with average household incomes. If the average bill represents an unacceptable burden for the population as a whole, either the amount of costs to be recovered through tariffs or the costs themselves need to be reassessed. This question is best addressed as part of a structured policy dialogue on strategic financial planning for the WSS sector (see Chapter 2), which also discusses cost drivers and complementary sources of finance. In practice, such a decision requires reliable data on costs at the local level. As previously mentioned, in many countries (including OECD countries, as revealed by the difficulty in

completing the OECD survey questions on these issues) such data are not easily available, making it difficult to come to any conclusion regarding the "appropriateness" of costs to be covered by tariffs. The answer to this question helps define the tariff **level** in a country or region.

The second question is how tariff revenues should be generated across different income groups, household types, etc. – *i.e.* "who should pay for what?" Once overall affordability for society is assessed, the attention should shift to access to services and affordability for lower-income groups. This is the concept of "micro-affordability", which measures affordability for vulnerable groups and may require specific measures to support them. Levels of cross-subsidisation across regions in a country and across user groups (*e.g.* different sectors, water use levels, or income levels) derive from the answer given to this question. The answer to this question will help define the appropriate tariff **structure** and possibly indicate the need for the creation of special non-tariff income-support mechanisms for the poorest populations.

Figures 3.2 and 3.3 show that in OECD countries, while average water and wastewater bills do not represent a considerable burden for the average household, they would represent a considerable share of disposable income for poorer families in numerous countries, particularly in Poland and Turkey.[6] This is why many countries have introduced "social tariffs".

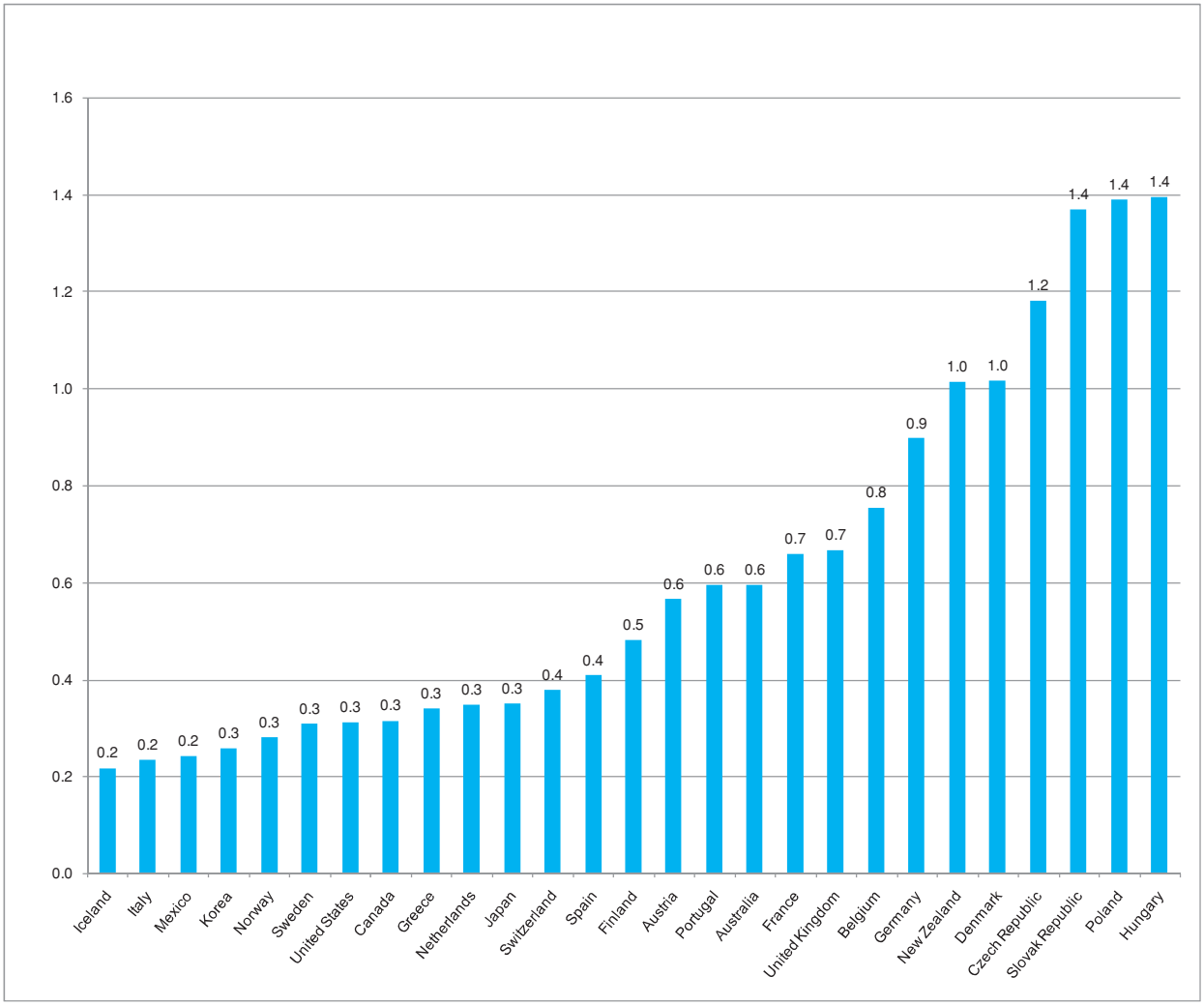
Affordability needs to be assessed locally

Affordability needs to be assessed locally for two reasons.

First, an assessment of the impacts on poorer households at the national level, as reflected in Figure 3.3, may conceal localised situations of vulnerability, which may require the design of appropriate, local solutions, as demonstrated in the case of Portugal (Box 3.5).

The other aspect of affordability that needs to be decided locally is the appropriate "threshold" beyond which households should receive support, rather than relying on international limits (3%-5% of household income is an often-quoted figure). The latter do not take account the current shares of income currently spent on water and sanitation by households, which could be much higher (*e.g.* when unserved households need to rely on informal vendors who often charge prices that are orders of magnitude higher than those for network services). In these cases, providing a service whose tariff generates a bill that is above international thresholds would still represent a substantial improvement. They also ignore actual willingness to pay for improved services of local populations. This may be higher than indicated by international affordability thresholds, particularly in developing countries where the poor may be willing to pay more than expected for better services even for sanitation services, as demonstrated by the Mumbai Slum Sanitation Project (see Box 3.6).

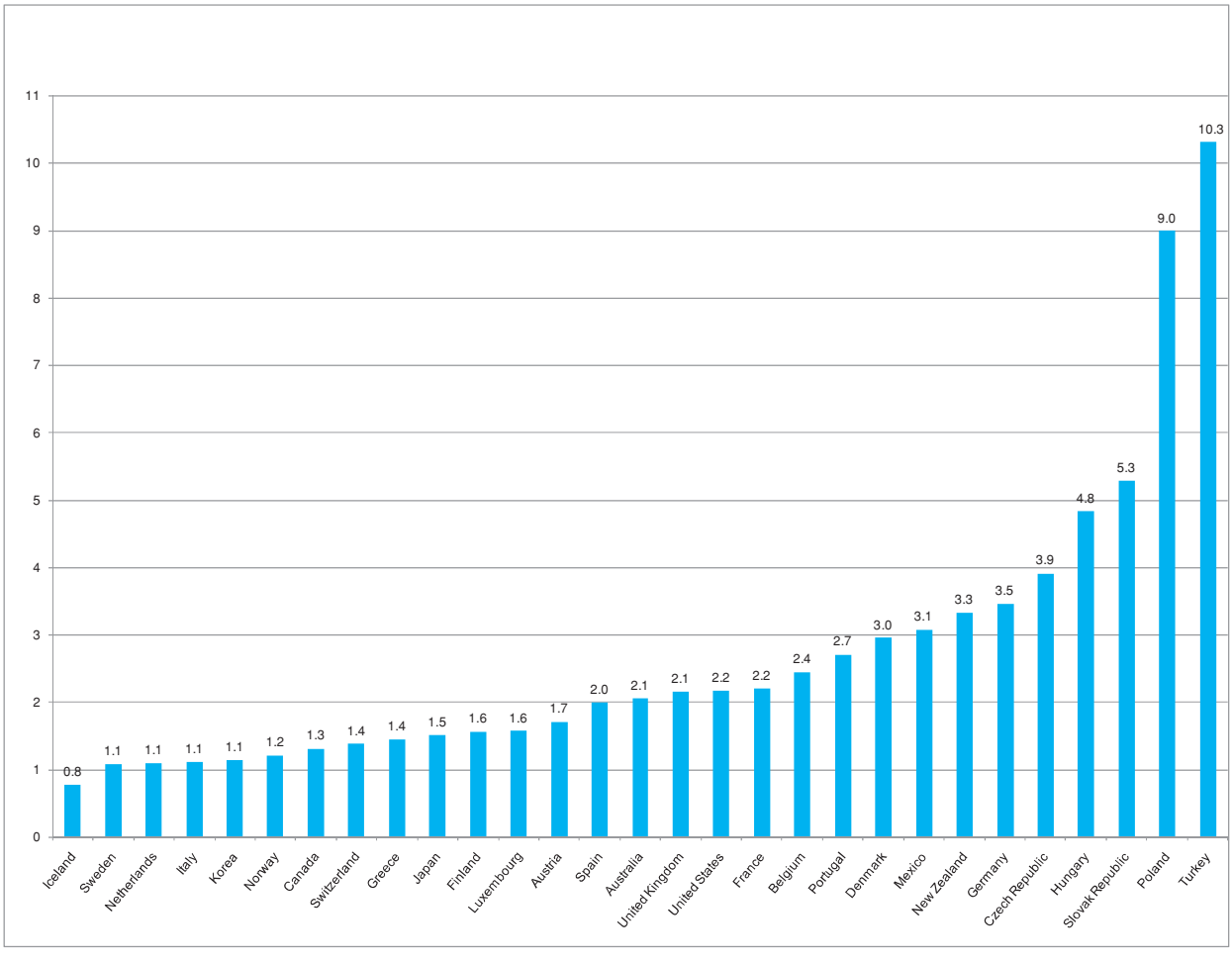
Figure 3.2. **Average water and wastewater bills as a share of average net disposable income (USD)**[1]



1. Data for water and wastewater bills are per capita figures based on a tariff that was computed by GWI for a household consuming 15 m^3/month; and a level of per capita consumption that assumes an average three-person household. Bills are in local currency for 2008 and were converted into USD using OECD's 2007 exchange rate adjusted for consumption purchasing power parity. Data for net disposable income per capita refer to 2006 and are expressed in USD using the OECD exchange rate adjusted for consumption purchasing power parity.

Source: OECD (2009a), "Pricing Water Resources and Water and Sanitation Services", OECD internal document, *www.oecd.org/water*.

Figure 3.3. **Average water and wastewater bills as a share of income of the lowest decile of the population (USD)**[1]



1. Data for water and wastewater bills as detailed in Note 1 of Figure 3.2. Income data is for 2005 and is in USD at the OECD exchange rates adjusted for purchasing power parity.

Source: OECD (2009a), "Pricing Water Resources and Water and Sanitation Services", OECD internal document, *www.oecd.org/water*.

Box 3.5. Tariff policy reforms based on affordability considerations: the case of Portugal

As part of the process leading to the design of its proposed tariff reform, the economic regulator of WSS services in Portugal, IRAR, carried out an affordability study. This identified geographically concentrated clusters of population that would fall below the affordability threshold, which had been set at 3% of household disposable income. While over 19% of Portuguese households fell below the income threshold of one minimum wage, only 10.5% faced bills in excess of the affordability criteria. These were concentrated in 60 out of 309 municipalities in the North and Tagus Valley regions, where 15-30% of households would face unaffordable bills. The affordability study, however, also showed that WSS services do not pose an affordability problem for society as a whole, as they represent a very small portion of overall expenditure by households on utility services (including electricity, gas, etc.) and are also much smaller than other expenditure categories (*e.g.* the yearly water bill is less than half the average annual expenditure on tobacco products).

The design of the tariff reform considered these results by: *(i)* allowing flexible solutions in different municipalities to address geographically localised affordability problems; *(ii)* including support from IRAR to local service providers on ways to manage the transition to financial sustainability; and *(iii)* structuring a communication plan to the public to clarify the real situation with regard to the weight of WSS costs for Portuguese households.

Source: Pires, J.S. (2007), "Consumer Tariffs in Practice: The Portuguese Experience", presented at the OECD Expert Meeting on Water Pricing and Financing, 14-15 November 2007, Paris, available at *www.oecd.org/water*.

Box 3.6. The Mumbai Slum Sanitation Project (Water and Sanitation Programme)

Challenges/opportunities

- 6.2 million out of 11.5 million of Mumbai's population live in approximately 2 000 slums, cramped in 8% of the city's area.
- Most slum households cannot have individual toilets; roughly two-thirds of community toilet blocks were in disrepair.
- Estimated 1 in 20 people compelled to defecate in the open.

The bases for the approach in designing the project

- **Extensive preparation**: Required by the use of a demand-responsive participatory approach based on community mobilisation – wherever possible through existing community-based organisations (CBOs).
- **Local participation in financing and management**: With incentives for private contractors, CBOs and non-governmental organisations (NGOs) to partner, and requiring household contributions for membership.
- **Professional service provision**: Operation and maintenance (O&M) managed by CBOs based on a Memorandum of Understanding with the municipality and high technical standards for construction/service: 24-hour water and electricity, design of disabled and children's toilets, etc.
- **Pricing and finance**: Users were required to contribute to capital cost, and O& M cost recovery was ensured through memberships and user fees.

Results

- 330 community toilet blocks constructed with more than 5 100 seats; estimated 400 000 beneficiaries.
- Mumbai now allocating USD 10 million/year from its own budget to scale up city-wide.
- Approach widely disseminated and incorporated in India's National Urban Sanitation Policy.

Source: Revels, C. (2007), "Implementing the OECD Water Project – Trends, Opportunities and Challenges: Lessons Learned from Three Projects", presented at the OECD Expert Meeting on Water Pricing and Financing, 14-15 November, Paris, available at *www.oecd.org/water*.

In developing countries, it is becoming ever clearer that the sustainability of any investment will depend on the capacity to tap local users for financing, including lower-income users. Evidence from numerous undertakings[7] indicates that for this to be possible, local users need to be extensively consulted in order to assess what solutions are viable and desirable for them.

For an assessment of affordability of solutions at local levels and the design of appropriate tariff structures, it is becoming more common to carry out beneficiary assessments to elicit final users' preferences, *e.g.* Uganda's district-level strategies and Mozambique's work in peri-urban areas around Maputo.[8] It is therefore paramount that sufficient funding (from donors if these finance projects/programmes directly, or from central budgets if support is provided on the basis of sector-wide approaches or budgetary support) be allocated to participatory project preparation activities, including affordability assessments.

Achieving both *financial sustainability and affordability: tariff structures and other measures*

In both OECD and non-OECD countries, a variety of approaches have been developed to mitigate or offset the impacts of tariff increases on the poorer sections of the community. A recent survey (Smets, 2008) showed that over 45 countries have put in place targeted measures to address affordability problems, while still trying to move towards tariff levels that improve cost recovery.

"Social" tariffs have two separate aspirations: *(i)* to help the poor deal with affordability constraints by charging "fair and affordable" tariffs; *(ii)* to ensure "equitable" access for all households to a minimum amount of drinking water at very low prices or free of charge. Their design need not be at odds with financial sustainability objectives, which can be pursued by resorting to cross-subsidisation across user groups. Different criteria can be used for this: large users subsidising small users, certain user categories subsidising others, certain areas of a city subsidising others, etc. Compared to income-support measures, they can be implemented by the utility and do not draw on the central government budget **if appropriately implemented**.

The effectiveness of tariff measures to target the poor can sometimes be questioned. Some tariff structures, such as increasing block tariffs, with a first "subsistence" block provided at zero or very low prices, have been seen as meeting both requirements and have been adopted by a large number of OECD and non-OECD countries alike. The assumption behind their adoption was that they would enable poor households to have access to a basic level of water services for free or at low cost, while at the same time contributing to cost recovery by providing a cross-subsidy from larger water users and providing an incentive to conserve water. But the actual experience with their implementation has shown that IBTs are regressive in countries with incomplete networks, where the poor are generally not connected and therefore do not benefit from the consumption subsidy by definition. Even with complete networks, a number of authors (see Boland and Whittington, 2000; Whittington, Boland and Foster, 2002; Komives *et al.*, 2005) found that IBTs are rarely better than neutral (*i.e.* than a situation where subsidies are randomly distributed with no regard for the needs of recipients). Part of this results from the flawed design of IBTs in a number of countries (*e.g.* the lack of attention given to their impact on large poor households), but adjustments in their design can improve their capacity to target the intended population, but cannot completely overcome the shortcomings.

To support policy makers in their choice of tariff structure, a matrix is available in Annex 3.A2 which relates a number of prevalent or innovative tariff structures to the four policy objectives identified previously. Two aspects are especially important in determining the success of tariff structures in addressing both financial sustainability and affordability considerations. First, for financial sustainability to be respected, a non-marginal number of users will have to pay more than the long-term average cost of service provision. In reality, sometimes the "cross-subsidisation" does not take place and too many users end up paying subsidised rates, thus eroding the utility's finances and equating with a subsidy paid by taxpayers (if taxes fill the financing gap) or by future generations if infrastructure is allowed to collapse (see Komives *et al.*, 2005).

A second key aspect is the capacity of tariff structures to appropriately target the poor. While perfect targeting (in terms of not excluding any user that would qualify to receive a subsidy and not providing subsidies to any user that does not quality for support) is too costly to achieve, there are a few basic considerations that can help.

As the annexed matrix shows, the targeting effectiveness of many tariff structures, including traditional IBTs, hinges on the assumption that lower-income households consume less water than higher-income ones, so that structures that subsidise low levels of consumption are considered to be progressive. But this is only true if income elasticity of residential water demand – *i.e.* the expected percent increase in water demand linked with a percent increase in income levels – is non-negligible. In this respect, the most recent evidence for OECD countries indicates that income elasticities may be rather low. From the analysis of various sources,[9] it emerges that a range of +0.2 to +0.3 is the most reliable in terms of income elasticity of demand for residential water. Komives *et al.* (2005) confirm that similarly low estimates are valid for developing countries as well. In this case, the poor may not necessarily consume less water than the rich.

In reality, poorer households are often larger households, so that they may end up consuming more than smaller, higher income units. In a number of countries (including Belgium in the Flanders region, Greece, Luxembourg, Portugal and Spain), tariff structures were adopted or are being considered that take account of the number of people in each household in order to avoid penalising larger families. The difficulty with this and other "adjustments" is the detailed information on occupancy or other household characteristics, which may not be available without additional costs for the administration or the utility, or which could be met with opposition. In addition, the "social stigma" attached by some households to the fact of having to declare themselves as destitute should be taken into consideration, as this may reduce the uptake of subsidised options by households who would otherwise be eligible.

A second factor may reduce the effectiveness of any tariff structure in delivering subsidies to the poor: the degree to which poor populations have access to network services whose consumption is subsidised. If access is systematically skewed against the poor, any tariff structure that provides negative incentives (or insufficient funds) for the extension of services to new areas will be regressive. In these cases, subsidising access has been demonstrated to be more effective than subsidising consumption. In areas where access is still low, it has been shown that the targeting performance of consumption-based subsidies is lower than that of connection subsidies (Komives *et al.*, 2005).

It follows that tariff structures can be designed to achieve both financial sustainability and access to affordable services. However, no single structure works in all situations. Different structures can respond to affordability considerations in specific contexts

(*i.e.* based on considerations of current/prospective access, social norms, infrastructure availability, etc.).

In addition to tariff-related measures, solutions include:

- **Income support**. Measures providing income support aim to compensate poor households for increases in the prices of services of public interest that are judged to be unacceptably burdensome. The support may be directly linked to water use, *e.g.* support may be provided if the water bill is above a certain percentage of household income, or may be calculated to maintain an absolute level of income after the utility bill is paid. It can be paid either directly by the government to the utility or through a voucher system. Alternatively, the support may not be linked to water consumption, but to income levels. The people receiving the support can choose how to spend it – on water or on other goods and services. The cost of income support measures can fall on the state budget or on the utility. If combined with appropriate water charges, it does not encourage over-consumption of water. What these instruments require, however, is the reliability of data on income distribution or the capacity by households to face the transaction costs that may be entailed by voluntary programmes (*e.g.* Chile, Spain). The data requirement and administration of such programmes also have a cost and may put strain on the capacity of public administrations.

  It is interesting to note that flat fees are far easier to integrate into social security systems than variable tariffs, *e.g.* they can be easily integrated into housing allowances (as was the case in the United Kingdom before the 1986 reform. Such mechanisms can radically change the burden of payment on recipients of social security payments.

- **Facilitating payments**. In many countries, householders are not disconnected from the water supply system even if they are unable to pay their water bills. In part this is because water is essential for life and dignity, but also because of the high reconnection costs. In such cases, utilities in many OECD countries work with consumers to make them aware of how to reduce water consumption, to manage their budgets by paying water bills at short intervals, and to provide other forms of advice and assistance to ensure that consumers have access to services.

Pricing sanitation and wastewater management: a special challenge

Chapter 1 pointed out that there are reasons that may justify a different approach to financing sanitation services – defined as the set of activities from basic sanitation to wastewater treatment, including both centralised and decentralised solutions.

In OECD countries, investment needs in wastewater management are still substantial, due to the need to extend or upgrade wastewater treatment facilities to meet more stringent wastewater treatment standards or to the need to renew and replace aging sewage networks (see Chapter 1). Under specific conditions, innovative approaches to the scale and scope of selected sanitation services (*e.g.* decentralised solutions coupled with the possibility of reusing treated wastewater for non-potable uses) may be explored as a cost-effective alternative. New payment mechanisms may be established in these cases, but their definition and regulation may not be easy. In some countries, regulations need to be adjusted for such solutions to become feasible and attractive (see OECD, 2009b).

In many developing countries, extending access to basic sanitation facilities is still a major challenge. The disposal of waste from diffuse solutions or of wastewater from network solutions is often inappropriate. Treatment of wastewater is often non-existent. On the other hand, urban sanitation projects that include wastewater treatment and sewerage have often focused on improving services to those already served, but usually failed to serve the slums and peri-urban areas. Serving the slums is difficult for utilities due to land tenure and planning issues and the need to use low-technology, intensive engagement approaches. Many wastewater treatment plants in developing countries are un- or under-utilised because they are oversized compared to sewerage flows; as investment in basic sanitation and wastewater collection investment have not kept up; use inappropriate technologies compared to the type of wastewater that reaches them; and are plagued by low cost recovery and high operating costs.

But there is hope. Examples from developing countries, including from lower-income peri-urban areas, show that users may be willing and able to contribute to sanitation solutions that are deemed appropriate, and in whose design and management they are involved (see Box 3.6 for an example).

Given the staggering needs for funds in the sanitation sub-sector, these challenges cannot be tackled all at once. A phased approach to investment in sanitation may be needed and different payment mechanisms may need to be devised to balance the financial sustainability of services, social sustainability in terms of access to adequate and affordable sanitation facilities, and environmental sustainability in terms of adequate protection of the water resources base.

There are three challenges that are common to most sanitation activities:

- Users' willingness to pay is generally lower than for drinking water, particularly for wastewater management services (while they may be comparable for basic sanitation, as demonstrated by the high private investments that some households undertake to build latrines), while investment requirements are often larger.
- The solidarity/fairness issue may include stakeholders other than the service users.
- Sanitation services can be provided by entities that are separate from the ones providing drinking water, and whose cost structure and basis for pricing calculations may be completely different. This is particularly true for basic sanitation, when diffuse solutions are chosen (from shared latrines to septic tanks). In this case, using a wastewater charge based on volumetric water consumption would not make sense, given that the main cost component is linked with the emptying of waste collection devices. A pricing structure linked with the number of emptying trips per year may be more appropriate.

With regard to the first two issues, in developing countries the high costs of hardware for diffuse solution or high connection charges for network solutions may discourage access to adequate sanitation. Authorities are faced with a conundrum. Onsite sanitation structures (*e.g.* latrines) are considered private goods, and often are legally defined as such, so that their costs should be borne by single households. However, if lack of financial support discouraged their construction or use, should subsidies be used to encourage a behaviour that would otherwise have negative health impacts on the community? Should connections or hardware be subsidised?

The fact that benefits of sanitation accrue not only to the household, but also to the community (or at the regional/national level for wastewater treatment) provides a rationale for public intervention in the financing of the sector, including through the use of subsidies to cover investment or other costs (so long as these do not distort investment decisions in favour of oversized or costlier solutions, are appropriately targeted and transparent).

They also open up new possibilities to share costs over a broader pool of "beneficiaries" that enjoy the positive externalities of the service – extending the "user pays principle" beyond the direct "users" of a service. For instance, specific "fees" can be set to apply to all residents whether they are connected to a wastewater treatment plant or not. In some OECD countries, however, this is not possible. In the case of Italy, for instance, the judicial system ruled that utilities cannot charge users for wastewater treatment services that they do not receive.[10] Another mechanism would be a payments scheme involving transfers from downstream to upstream communities, similar to payment for ecosystem services used in a number of countries to support land management in upper reaches of a watershed that protect water resources (also see Chapter 5).

Notes

1. In this chapter, "tariff" indicates in general terms the price users pay for water and sanitation services. This price can have different structures and include different components. "Charge" refers to specific components of this tariff. When discussing pricing instruments for water resources management, "charge" can be used to refer to the price paid for abstraction or pollution of water.

2. This includes the recurrent fixed charges and volumetric charges, as well as any indirect taxes imposed on the WSS bill. The estimates were based on replies by members to the OECD questionnaire concerning the water and wastewater bill faced by a household consuming 15 m3 per month. The choice of 15 m3 per month was driven by the fact that most OECD countries use this or amounts close to this as an indicative consumption level, and for comparability with GWI survey data. If no reply was obtained, the estimation was based on publicly available data submitted for validation to OECD members, sometimes based on different levels of average consumption.

3. In the literature, the most important differences are traced back to: *(i)* accounting practices, especially for defining asset values; and *(ii)* the remuneration of capital, which depends on how the risks are allocated. An attempt is being made, as part of this OECD programme, to develop a more useful methodology for assessing cost recovery and long-run financial viability. The method is being applied to a sample of utilities in Germany, Italy and the United States

4. Although threshold effects may exist, such that below a certain level of sanitation coverage in a community, no community benefits (*e.g.* reduced spreading of cholera

when enough households have adequate sanitation and hygiene practices) accrue beyond the private benefits to single households.

5. Incremental costs is defined as the discounted total unit cost of the next investment programme necessary to meet rising demand.

6. It is important to note that cross-country comparisons based on Figure 3.2 and Figure 3.3 may be difficult, as individual consumption can vary across countries. This may lead to an overestimation of the weight of bills in household incomes in those countries where household consumption is below 15 m3/month or where households have more than three members. This last point may be especially relevant for Figure 3.3, as low-income households may tend to be larger, at least in some countries.

7. For three examples from South Asia, see Revels (2007).

8. Carried out with the support of *Agence Française de Développement*, the European Investment Bank, the ACP-EU Water Facility and the Netherlands' Development Finance Company (FMO - *Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V*).

9. For details, see OECD (2009a). Sources include the most recent meta-analysis of variations in price and income elasticities of residential water demand, *i.e.* Dalhuisen *et al.* (2003), which considered over 100 estimates published in journals over 1963 to 2001.

10. The question is whether those who are not connected are receiving a service or not. If they are not, then this would be akin to creating a tax, which is instead a privilege of parliament. To resolve this issue the question is what is the reason for the payment of wastewater treatment services. The benefits from the service accrue to all users of the water that would otherwise receive untreated wastewater – whether they are connected to the wastewater treatment plant or not. The reason for paying a wastewater treatment fee when connected is not that the user is receiving an excludable private benefit, but rather that the user as a polluter needs to contribute to the costs of removing this externality of water use, *i.e.* the "polluter pays" principle. Thus, also those who are not connected, but: *(i)* pollute; and *(ii)* receive the benefit from the improved quality of resources resulting from the treatment of other users' wastewater could be seen as receiving the service provided by the existing wastewater treatment plant, as they also receive the benefit of the service. Downstream beneficiaries would not enter this category, as they do not pollute upstream waters. If this interpretation is not considered valid, an alternative is the creation of a tax on all properties that will benefit from the creation of a treatment plant.

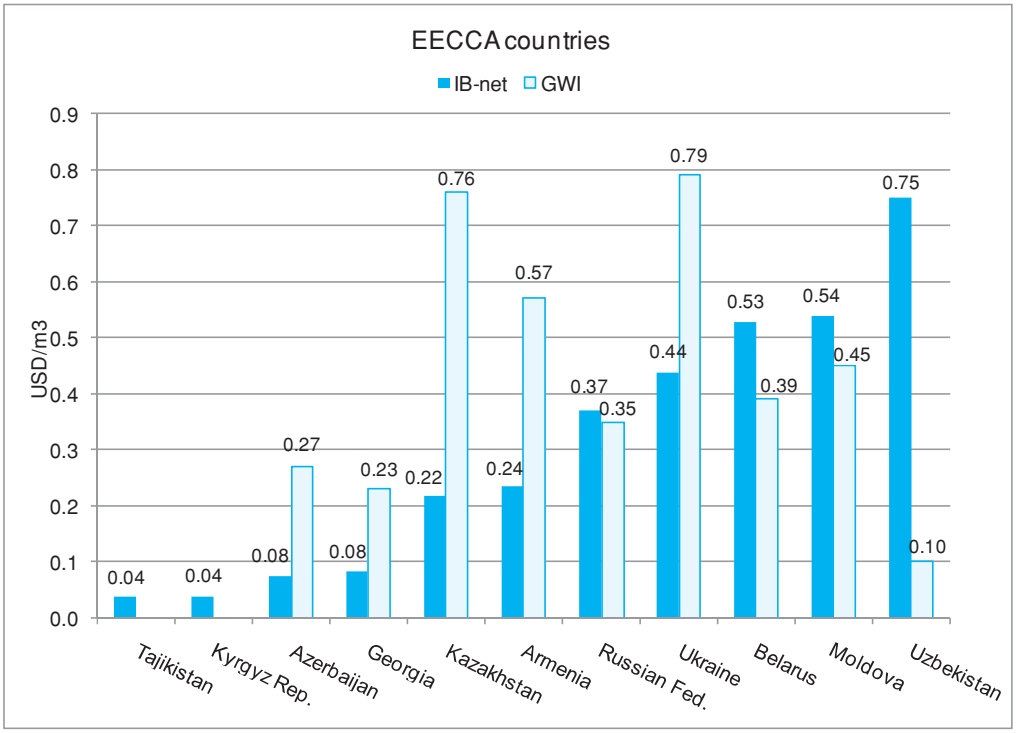
Annex 3.A1

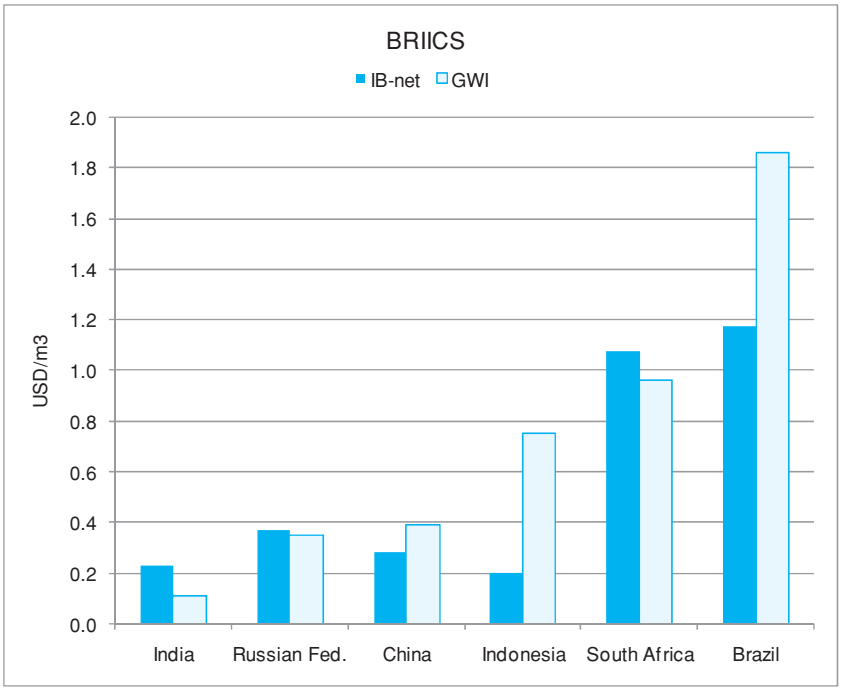
Comparison of Data from GWI Surveys and the World Bank IB-Net Database for EECCA Countries and BRIICS

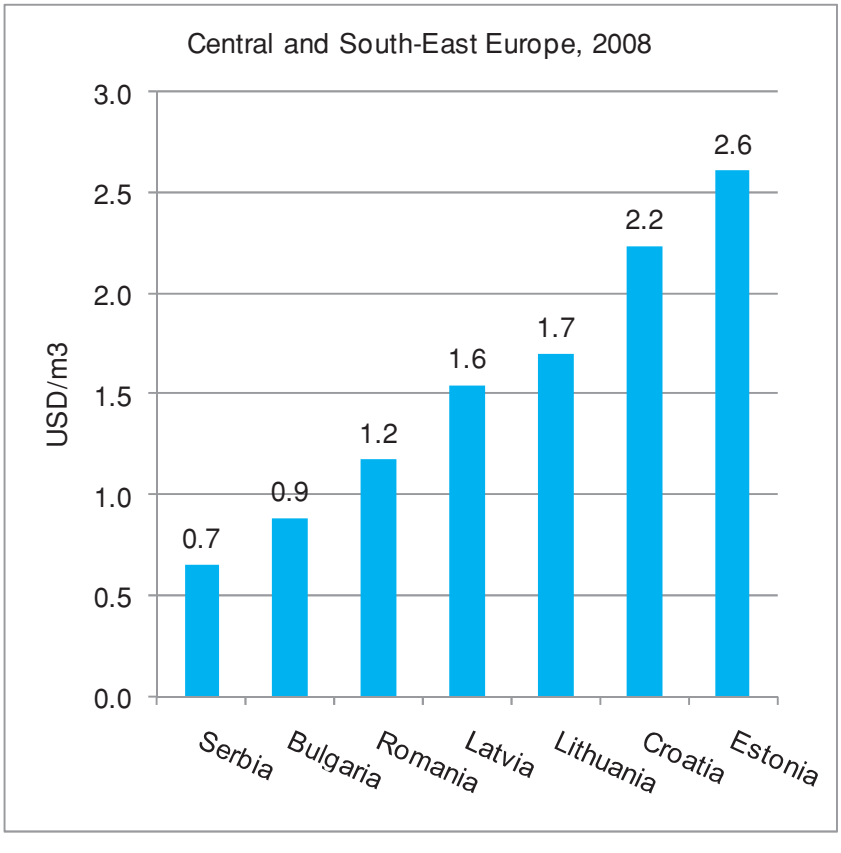
Data for non-OECD countries was available from two sources: the 2007 and 2008 GWI surveys covering over 100 cities in selected countries, and the World Bank IB-Net database. The figures below compare these data for Eastern Europe, Caucasus and Central Asia (EECCA) countries and Brazil, Russian Federation, India, Indonesia, China, South Africa (BRIICS) and show the typical discrepancies that can be found when different sources are compared. These can be explained by differences in methodology (GWI computes the water and wastewater bill based on an assumed national consumption of 15 m^3 per month per household and the data reported, while IB-Net data is estimated from information provided by utilities on average revenue per cubic metre, *i.e.* total annual revenue divided by the total volume of annual water sales) and in reference years.

Figure 3.A1.1. **Average total water and wastewater tariffs in selected non-OECD countries**

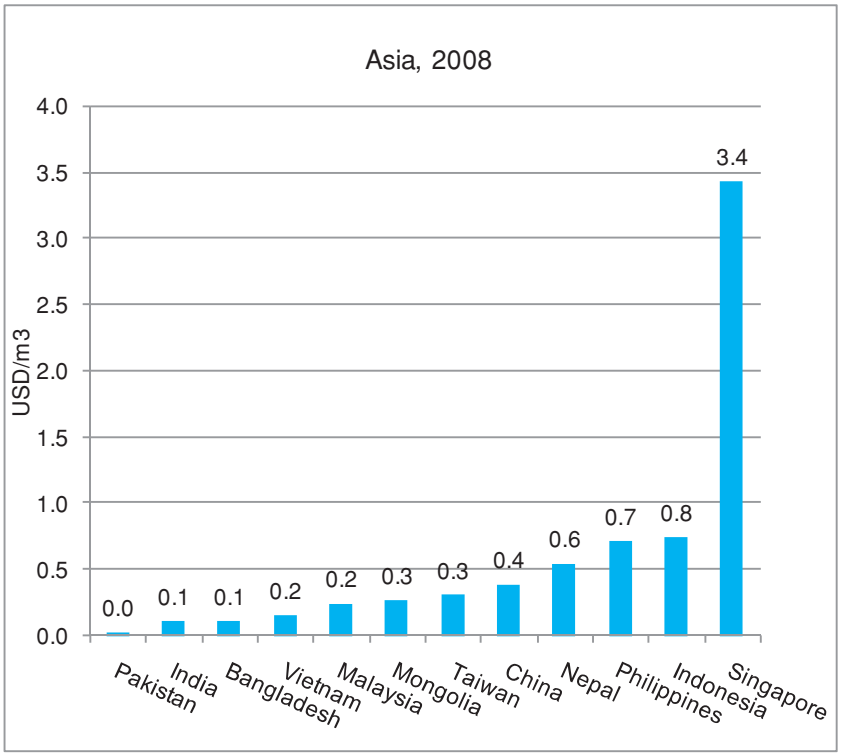
USD per cubic metre



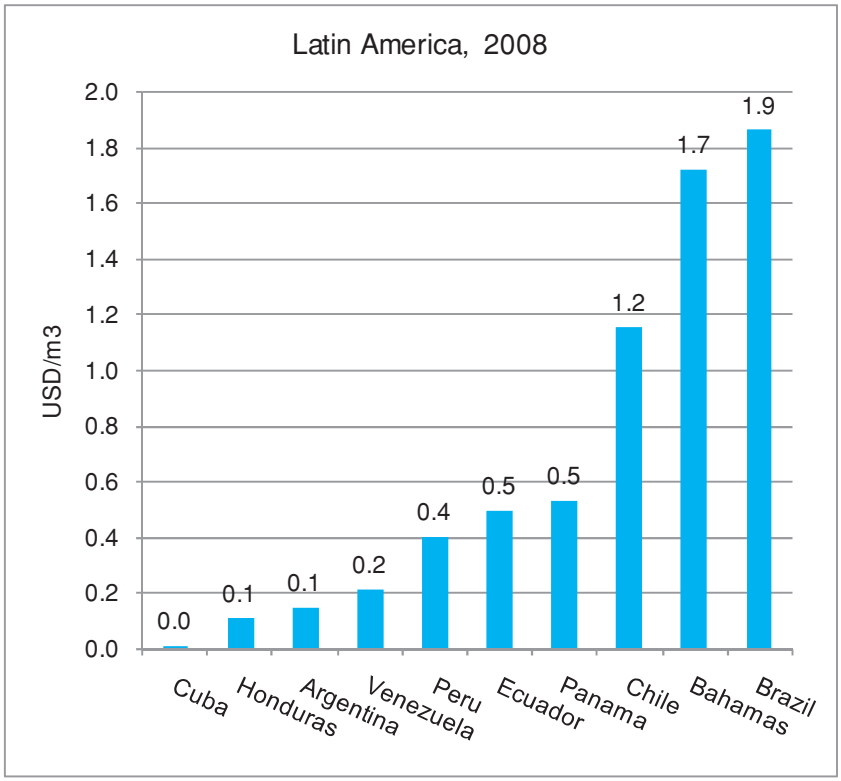




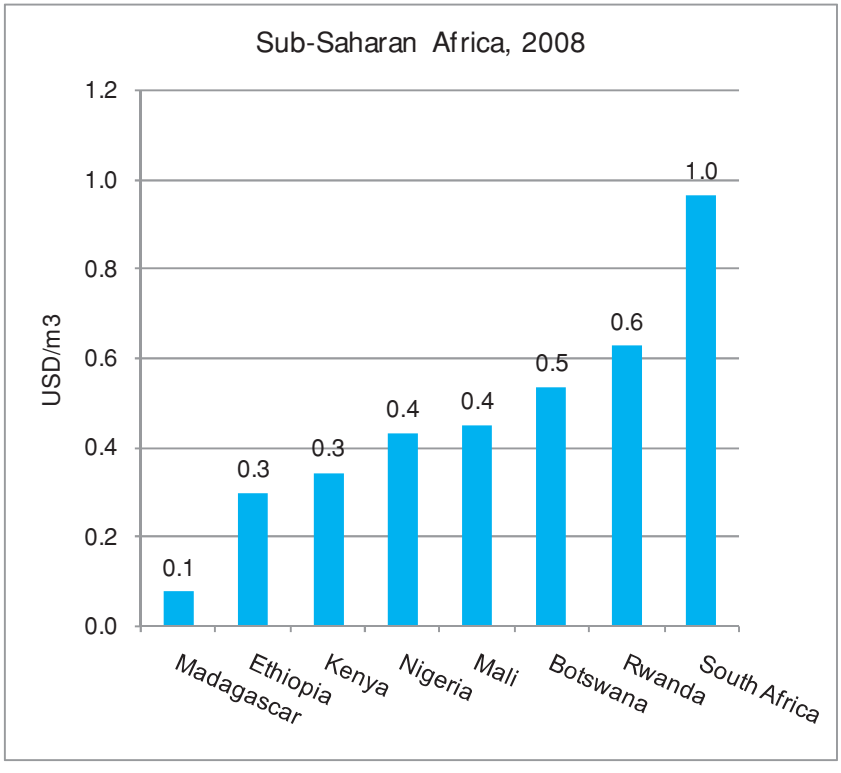
Source: GWI, 2008.



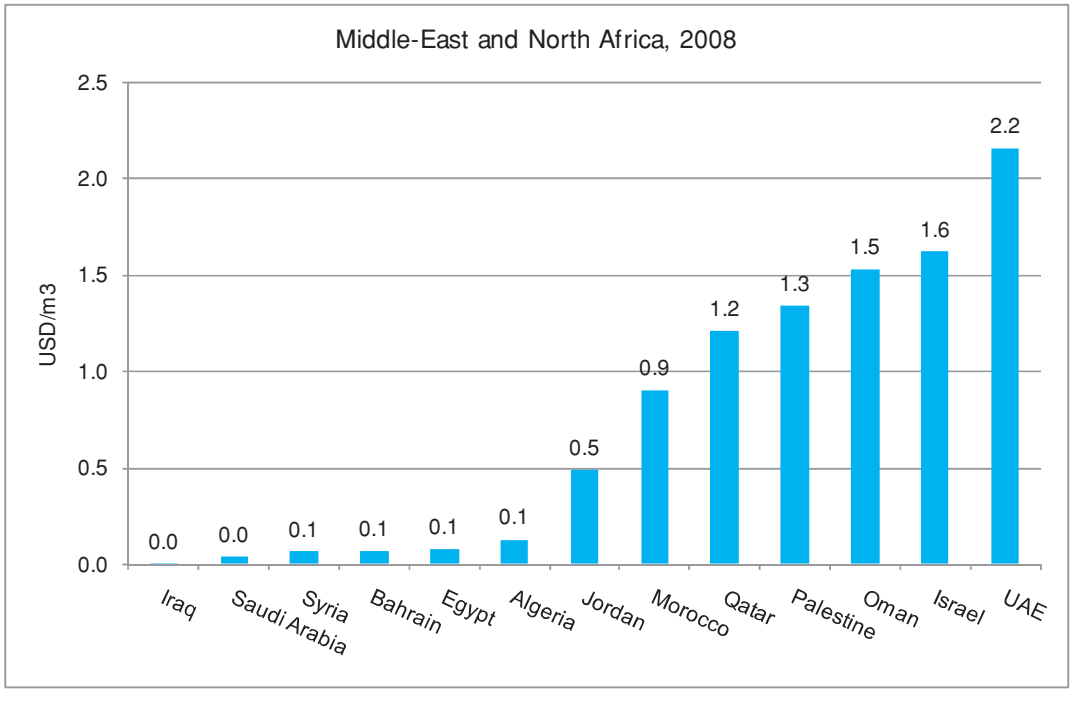
Source: GWI, 2008.



Source: GWI, 2008.



Source: GWI, 2008.



Source: GWI, 2008.

Annex 3.A2

Criteria Matrix for Assessment of Tariff Structures

Tariff structure	Examples	Ecological sustainability	Economic efficiency	Financial sustainability	Equity/affordability
Uniform flat fee	Sub-areas of two water supply companies in the United Kingdom. Still used by many sampled non-OECD utilities.	Very poor. No incentives to water saving nor to other aspects of sustainable water use.	Poor for drinking water (no linkage between fee structure and behaviour that may help minimise investment). OK for water-borne sanitation (costs do not depend on water consumption).	Potentially OK, but commitment to cost recovery is what really matters. Avoid political determination of fees.	Very regressive (unless properly integrated with other elements of a social security system).
Non-uniform flat rate linked with specific aspects of households, *e.g.*: *i)* property value or other income proxy, *ii)* dwelling characteristics linked with water use	Still used by 70% of UK households, common in the Former Soviet Union.	Poor if linked with income-related variable. Good if linked with dwelling characteristics linked with water use (*e.g.* use of water recycling devices, drip irrigation or water-saving sprinklers in gardens) or with specific behaviour that wants to be encouraged (*e.g.* rainwater harvesting, use of less pollutant detergents).	As above.	As above, provided that total revenues are guaranteed.	Potentially good effects, provided that criteria used correspond to personal wealth. Regressive otherwise (unless properly integrated with other elements of a social security system).
Uniform volumetric rate + 0 fixed charge	Still present in numerous OECD countries. Most recurrent in sample of non-OECD utilities.	As above; higher, since 0 fixed charge means a larger marginal rate (for the same revenue levels).	Efficient if water is scarce or infrastructure nearing capacity,(*i.e.* if there is rivalry in consumption) or if variable costs are high compared to fixed costs. Not very efficient if otherwise – it would discourage users but this would reduce societal benefits. Inefficiency depends on demand elasticity (the lower the elasticity, the lower the inefficiency).	Good potential for FCR. Can have (temporary) negative impact on revenue in case of a sudden move from flat charges due to impact on demand (*e.g.* Berlin experience).	Depends on income elasticity. If this is low, it can hit large poor households hard.

Tariff structure	Examples	Ecological sustainability	Economic efficiency	Financial sustainability	Equity/affordability
Uniform volumetric rate + fixed charge > 0	Classic, *e.g.* Germany (structure enshrined in law).	High, depending on the marginal rate (impact on demand only if it is high enough) + individual metering.	Optimal provided the following applies:, volumetric rate = SRMC (short-run marginal cost) and fixed charge = lump sum. Particularly suited in case SRMC is constant (*e.g.* electricity, reagents).	As above.	Depends on size of fixed charge, but tends to be regressive (not so only if marginal cost is high and income elasticity is high – which is rare). **But** note: size of fixed charge can be differentiated based on income or proxies.
Uniform volumetric rate + rebate (fixed charge < 0)	No known application. May have been applied in municipalities in the United States.	As above. Highest if rebates take into account specific circumstances (*e.g.* use of water recycling devices, drip irrigation or water-saving sprinklers in gardens) or with specific behaviour that wants to be encouraged (*e.g.* rainwater harvesting, use of less pollutant detergents).	As above. In turn, could be efficient in combination with a positive fixed fee (idea: r = SRMC; fixed cost redistributed including a rebate for the poor).	As above.	Progressive and useful for reducing impact on poor. **But only if** rebate is targeted; otherwise, distributive effect depending on income elasticity, just like with IBTs.
Traditional IBT (both block widths and prices fixed) + fixed charge	Italy Increasing number of developing countries.	Highest, provided that metering is individual and marginal rates in the upper blocks are high.	Potentially the best solution provided r = SRMC and fixed charge = lump sum. Particularly suited in case SRMC is increasing (*e.g.* costly extra supply to be purchased).	As above.	Can be very regressive if: *i)* low demand elasticity to income; *ii)* resulting average tariff is below cost recovery levels and this discourages extension of network, *iii*) many households sharing the same tap.
IBT + fixed charge + exact occupancy amendment	Flanders, Brussels Malta, some communes in Luxembourg	As above, but reduced incentives for large families.	Depends on how closely the resulting average volumetric charge reflects SRMC. Rest as above.	As above.	Reduces impact on large families (best if accompanied by reduction of leaks and improved efficiency of appliances). Depends on correlation of size and income of households. Problem (ii) above remains.
IBT + fixed charge + low-income households may apply for extension	Proposed Social Tariff Plan in Portugal	As above, but reduced incentives for low-income households that apply for extension of blocks.	Good for reducing demand in peak periods and optimising capacity use.	Uncertainty about number of households applying (may be reduced over time).	Very successful, if all eligible claim and block width reflect consumption patterns of the poor. Problem (ii) above remains.
IBT + fixed charge + larger households (*e.g.* N>4) may apply for extension	Many Spanish cities . Greek DEYA, cities . Proposed option in Portugal.	As above, but reduced incentives for large families that apply for extension of blocks.	Depends on whether there is a fixed charge or not.	As above.	Depends on correlation of size and income of households. Problem (ii) above remains.
IBT + fixed charge + targeted subsidies to low income	Chile	Highest, provided that metering is individual and marginal rates in the upper blocks are high.	As above.	As above.	Depends on the capacity to target the poor. Problem (ii) above remains.

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Chapter 4

Beyond Money: The Roles of Governments and Private Actors in Water Services

Many developing countries have sought the involvement of the private sector to upgrade and develop their water and sanitation infrastructure and improve the efficiency of water systems. However, high capital intensity, large initial outlays, long payback periods, immobility and invisibility of assets, and low rates of return generate high risks. These factors, when combined with poor initial information and weak investment environments, constitute important constraints on private sector participation in water and sanitation infrastructure.

Recognising this, the OECD has developed practical guidance, building on the OECD Principles for Private Sector Participation in Infrastructure, to help governments and other stakeholders to assess and manage the implications of involving private actors in the development and management of water and sanitation infrastructure. The resulting OECD Checklist for Public Action provides a coherent catalogue of policy directions for consideration by governments. The Checklist addresses the double challenge of enhancing the enabling regulatory environment for water infrastructure investment, and making public-private co-operation work.

As indicated in Chapter 1, external finance for water supply and sanitation (WSS) will not be mobilised unless the balance between risks and returns of the sector is deemed appropriate by lenders and investors (including private entities). Therefore, achieving sustainable financing for the WSS sector will require a focus on aspects that go "beyond money", and particularly on improvements in the governance of the sector, the allocation of risks and the management of service providers.

Many developing and emerging countries have sought to involve the private sector, either as a source of funds to meet the tremendous needs to expand their infrastructure in a context of tight budgetary constraints, and/or in an attempt to improve the efficiency of water systems. Most of the time, however, the responsible public authorities (defined as the public partner of a public/private partnership contract) remain the owner of the assets and is responsible for the bulk of investment. Also, the government **always** remains the enabler and the guarantor of public interest.

Recognising this, the OECD Council approved in March 2007 the OECD Principles for Private Sector Participation in Infrastructure (OECD, 2007) and launched a specific application of the principles to the drinking water and sanitation sector. The resulting OECD Checklist for Public Action (the "Checklist") (OECD, 2009a) offers a coherent catalogue of policy directions and practices to help governments properly assess and manage the implications of involving private actors in water infrastructure development, and harness more effectively the capacities of all stakeholders.[1] The Checklist does not provide a detailed approach of the steps necessary to engineer a specific partnership, but aims to offer governments a clearer picture of the multiple policy areas in which decisions have to be made when private sector participation is considered. While the Checklist focuses on partnerships with the private sector, most of its observations are equally applicable to relationships between public authorities and public partners.

This chapter is based on the analysis and the country practices developed in the Checklist.[2] It explores what role the private sector could play in contributing to closing the financing gap of the sector, either as a financier/investor, or by helping improve the "fundamentals" of the sector as a source of increased efficiency in service provision or of innovative, more cost-effective technologies and processes for service provision. It aims to capture the nature of private sector participation in water and sanitation infrastructure, acknowledging: *(i)* opening water infrastructure and sector provision to the private sector is one option that policy makers can choose to adopt among others; and *(ii)* the sheer diversity of the actors involved, their activities and the contractual arrangements used to regulate their activity. The chapter highlights the responsibilities of private entities involved in providing a public service and addresses the framework conditions and key principles of good governance and partnership-building necessary to improve the effectiveness of the involvement of the private sector in achieving societal goals, and attracting additional external finance to the sector.

More importantly, the chapter aims to move beyond the public *vs.* private debate and emphasise the aspects of sector governance that need to be improved **regardless** of the private or public nature of asset ownership or service provision, so as to create an environment that is conducive to the provision of sustainable services.

Trends in private sector involvement in water supply and sanitation: new actors, new responsibilities

The emerging diversity of the private sector

The drinking water and sanitation sector is fragmented and accommodates a large variety of private actors along the different segments of provision:[3] international investors, local and regional actors, private sector whose core activity is not water but is an important player (*e.g.* financier) or user of water (such as beverage, mining and construction companies), joint ventures between public and private companies as well as public companies operating abroad as private participants in competitive bidding. In addition, in most developing countries where the progress of conventional public service provision has barely kept pace with rapid population growth and migration to urban areas, small-scale local actors have usually made up for the deficiencies in public service provision and provide water and sanitation services to large sections of the population (notably to the poorest and most isolated).

Even among the traditional international private operators, the landscape of service provision has diversified over the last ten years. During 1990-97, five operators accounted for 53% of contracts awarded (Agbar, Saur, Suez, Thames and Veolia). Five years later, their share had dropped to 23%. As shown in Table 4.1, new players have emerged from diverse backgrounds. According to World Bank (2009), the population served by private water operators in developing and emerging countries has increased steadily, from 96 million in 2000 to some 160 million by the end of 2007, among which 40% was receiving services from developing countries' operators.

Concerns over water resource scarcity and the consequences of climate change in some areas are also supporting the development of opportunities in new technologies such as wastewater reclamation and re-use, desalination and the use of advanced filtration membranes for water treatment. While these technologies can be adopted by public or private operators, they are currently attracting the bulk of private investments in the water sector. Global Water Intelligence (2008) foresees a tripling of water re-use capacity between 2008 and 2016 (from 20 million to 60 million cubic metres per day) and a doubling of desalinisation capacity (52 million to 107 million cubic metres per day). It is expected to translate into respectively some USD 64 billion and USD 47.5 billion worth of transactions in desalinisation plants and water re-use projects.

Namibia presents an example where the private sector has been involved in the development of innovative technology for water provision. Its capital city, Windhoek, is the only city in the world that introduced direct recycling of effluent for drinking purposes. In order to attract technical and operating know-how, the City of Windhoek signed a performance-based operation and maintenance contract with Windhoek Goreangab Operating Company (WINGOC: VeoliaWater, Berlinwasser International and WABAG) in 2002 for 20 years.

A number of opportunities also potentially accrue from innovative approaches to providing water supply and sanitation (Box 4.1). They should however be considered with caution as they raise important challenges – such as the cost of regulating decentralised activities – and their use carefully assessed against the loss of economies of scale they may induce. As such, their use might be seen complementarily to more traditional approaches.

Table 4.1. **The diverse nature of the private sector: recent market entrants**

Categories of recent market entrants		Examples
Diversification into water of companies with core business elsewhere.	Firm moving into water as a business opportunity. Boosted by dynamism of build, operate, transfer (BOT) in wastewater treatment plants, and by concerns over resource scarcity that drive innovations in desalinisation and re-use technologies.	Wastewater treatment plants: China. Desalinisation projects in arid, coastal countries (GE, Siemens). Trading companies offering water treatment systems, developing integrated services (Hyflux).
	Multi-utility spreading to water to enjoy economies of scale and cross-subsidisation across different parts of their business.	RUS & CES (Russian Federation), NWS Holdings (China), JUSCO (India), Ranhill & YTL (Malaysia), Davao Light & Power (Philippines).
	Increased involvement by construction firms, notably through the development of housing estates. Decentralised service provision by property developers.	In Asia and Latin America. Minimal water extraction and discharge in the case of the Payne Rd residential subdivision (The Gap, Brisbane).
	Big users such as beverage and mining companies increasingly concerned about water supply, costs and their acceptance by local communities in a context of competition across uses.	*Nestlé*, Coke. *Penoles* (Mexico).
Financial and investment companies including water services in their portfolio.	Growing worldwide interest of banks and financial groups, including institutional investors, in buying water service companies.	*Consortio Financiero* (Chile), CITIC[1] (China).
Expansion by established water operators.	Local private operators taking over other projects internally or externally.	*Latin Aguas* (Argentina), *Aguas Nevas* (Chile), Tianjin Capital[1] (China), ILFS and IVRCL (India), Ranhill (Malaysia).
	Public companies acting in a commercial fashion and venturing into the market.	Management contract won by *Vitens Evides International*[1] (Netherlands) and Rand Water[1] (South Africa) in Ghana. Affermage contract in Cameroon won by ONEP[1] (*Office National Eau Potable*, Morocco).
	Privatisation of former public utilities.	Divestiture of EMOS (Chile). Partial privatisation of SABESP[1] (Brazil) through share trading on the New York and São Paulo stock exchanges.
Joint ventures with foreign operators.	To benefit from foreign investors know-how, while mitigating the foreign exchange risk and facilitating local insertion. Various combinations exist: local private actor and foreign private operator; local public authority and foreign private operator; local private actor with foreign public operator.	Combining public and private capacities: *Saltillo* (Mexico) - SIMAS is a mixed company constituted by the municipality and Agbar. Combining local and international private actors: Manila Water - consortium of Ayala Corporation (Philippines), United Utilities Pacific Holdings, (subsidiary of United Utilities PLC, United Kingdom), Mitsubishi Corporation (Japan), IFC (World Bank Group), BPI Capital Corporation (Philippines)
Graduation of small-scale water operators.	Official recognition of the role of small-scale operators through their insertion in the institutional and policy framework.	Mauritania delegated management model in small towns.
	Association of local operators to have their voice heard and share information and practices.	APWO (Uganda)

1. These companies are publicly controlled. That they have started competing in the market shows that the frontier between public and private operators has become increasingly blurred.

Source: OECD (2009a), *Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action*, OECD, Paris, *www.oecd.org/daf/investment/water*.

Box 4.1. **Alternative models of water and sanitation provision**

The traditional economies of scale attached to piped water supply and water-borne sewage treatment in centralised systems are being questioned. On the one hand, regionalisation of water services has improved efficiency, cost-effectiveness and watershed management in key areas in Canada, Chile, England, France, Portugal, the United States and Wales: expanding the scope of service can improve a water system's ability to finance needed investments. On the other hand, there are diseconomies of scale attached to large municipal systems, in particular in megacities where high costs are attached to water transport and network maintenance, including work on roads to repair underground infrastructure. Central infrastructures have rigidities which may be problematic in contexts where the new challenges raised by climate change require adaptation, resilience and flexibility.

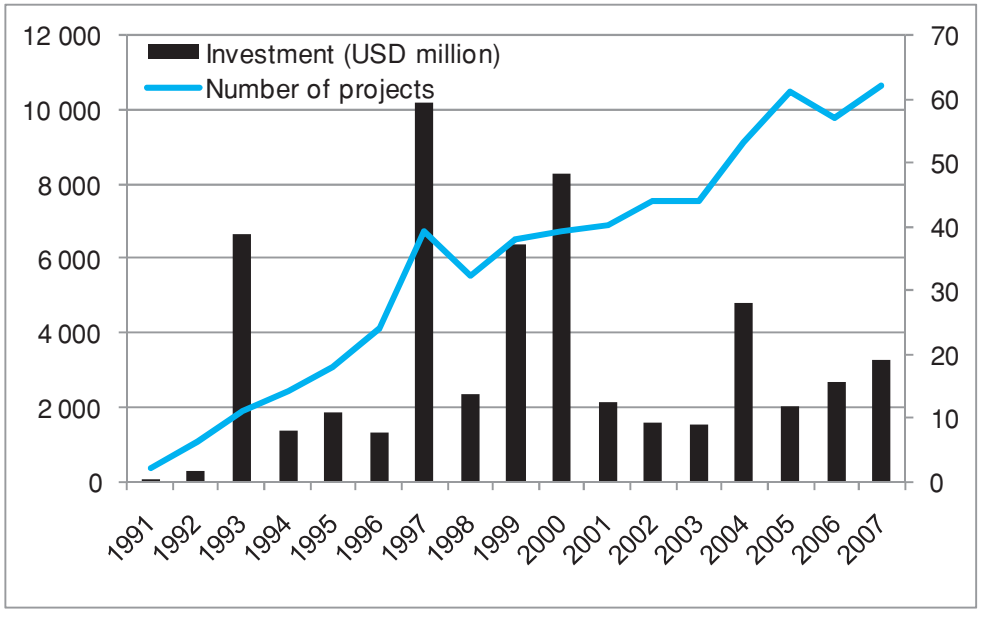
In most cases, the optimal scale for potable water and complex water treatment may be different from the one that fits non-potable water uses and storm-water management. It may therefore be relevant to unbundle and recombine water services in ways that make optimal use of scale and scope effects. Some governments already explore these directions. Markets for water re-use and decentralised water and sanitation are booming in emerging economies. Some OECD countries (Australia, Spain, some states in the United States) are pioneering these approaches, spurred by serious water stress. They have adjusted water-related institutions and regulations, so that they are not technology driven. Decentralised systems notably include home and land owners financing and building onsite systems for public buildings, and single- or multi-family complexes.

Source: OECD (2009b), "Alternative Ways of Providing Water and Sanitation: Emerging Options and their Policy Implications", OECD internal document, *www.oecd.org/water*.

Poor risk management reduces sector financing

A number of experiences involving the international private sector as an investor (typically under concession contracts) in the 1990s fell short of expectations for all parties involved. This contributed to a restructuring of the private sector landscape and to rapid changes in the forms of private sector involvement, and notably a trend among "traditional" international players towards shorter, less risky arrangements (Greenfield, ring-fenced projects) and projects involving lower or no investment obligations (such as management contracts). Consequently, although the number of projects involving the private sector has increased continuously since the early 1990s, the expected surge in investment flows did not materialise, as indicated in Figure 4.1.

Figure 4.1. **Evolution of investment involved in public private partnership projects in developing countries, 1991-2007**



Source: World Bank Private Participation in Infrastructure (PPI) Database: *http://ppi.worldbank.org*.

Suez, the most active international company in concessions during the first phase of private sector involvement in developing countries, is today largely reducing its exposure to risk and withdrawing (except from China). By contrast, Veolia has become the most active international operator as of 2005, mostly through development of local partnerships. Agbar is also developing a strategy of local partnerships, through joint ownership with local governments (see the example of *Saltillo* in Mexico in Table 4.1). Other international players, such as Severn Trent, are concentrating on management and service contracts, with no capital expenditure obligations. These developments were not paralleled by an uptake of investments from local private actors, which were either unwilling or unable to take the risks of investing in the water sector and borrow from private financiers. This also reflected the limited development of local financial markets and of the financial tools that could contribute to leverage private investment.

The causes behind the difficulties that were encountered by the contracts launched in the early 1990s were often linked with a poor understanding of the opportunities and risks involved by private sector participation in a complex sector as well as inadequate institutional framework conditions. As mentioned in Chapter 1, private investment can help bridge, as opposed to fill, the financing gap. Private investment needs ultimately to be repaid through revenues and efficiency gains. Its availability will depend on the existence of stable revenue flows (tariffs play a key role in ensuring the financial sustainability of water operators as demonstrated in previous chapters), as well as on the balance between risks and returns perceived by the investors. As defined by the United Nations Environment Programme Finance Initiative (UNEP FI), there are mainly four kinds of water-related risks (Table 4.2).

Table 4.2. **Typology of risks**

Water-related risks	
Commercial	Tariff affordability and resistance / Project cash-flow profile Credit risk / Contractual risk Performance risk / Demand and markets / Inappropriate technology Information gaps / Hidden costs / Costs of inputs (including energy)
Political	Expropriation Political interference Sub-sovereign agencies / Local stakeholder actions Foreign exchange risk
Regulatory, legal and contractual	Weak or arbitrary regulator Weak legal framework / New standards and directives Contract enforcement
Reputational	Local sensitivities and needs Compliance and disclosure pressures

Source: UNEP FI (2006), *Financing Water: Risks and Opportunities*, *www.unepfi.org/publications/water /index.html*.

Owing to the characteristics of the water sector, the following components appear particularly relevant and have thus attracted special attention: the commercial risk (mainly the risk related to revenue), contractual risk, foreign exchange risk, sub-sovereign risk and arbitrary political interference. If these risks exist in all infrastructure sectors, the water and sanitation sector differs in that it cumulates most of the constraints that usually apply to infrastructure, a combination that in effect tends to deter commercial financing, as was stressed by the Camdessus Panel (Winpenny, 2003). On the other hand, if these and other governance conditions were addressed, WSS could potentially turn into a relatively safe sector to invest in, characterised by slow technological change, long life span of infrastructures and stable revenue streams.

Water and sanitation projects are usually capital intensive. They involve high initial investment, long payback periods and low rates of return.[4] The resulting infrastructure is very specific, largely invisible and cannot be used for other purposes or removed from the country. This profile generates high contractual and regulatory risk especially in a context of poor initial information (notably on asset conditions and customer base) and weak regulatory environment. It may also expose the partners to a risk of capture by vested interests.

The revenues come mainly from user fees or government subsidies in the local currency, exposing investors and lenders to foreign exchange risk if funding is in foreign currency, a true constraint for international investors, but also for national operators in a context of poorly developed local financial markets. The foreign exchange risk is compounded by the difficulty to index tariffs to foreign exchange variations, owing to the political difficulty of implementing tariff increases.

The commercial risk is essentially related to the variations in demand and revenues from the sales of water and sanitation services. This risk is serious in some OECD countries, where water consumption tends to decline. It is also serious in developing countries where tariff affordability and bill collection rates are lower and the revenue flows not easily ring-fenced.

Finally, as a basic need, water has important social and political repercussions. On one hand, this justifies public involvement in the form of regulation aimed at protecting users from possible abuse of a monopolistic position on the part of service providers. On the other hand, such public involvement has often taken the form of political interference.

As discussed in Chapters 1 and 2, this has often materialised in incapacity to adjust tariffs even when justified by the evolution of costs, often leading to a deterioration of service quality. In addition, as the management and supervision of contractual arrangements are generally carried out by local entities, it exposes the investors to sub-sovereign risk, in the form of weak management and financial capacities of the sub-sovereign entities.

A wide range of risk-sharing arrangements is available to policy makers (Table 4.3). The appropriate allocation of risk across partners constitutes a key element of the success of private sector participation and should be driven by an assessment of the party best able to manage it (*i.e.* best able to influence the probability of its occurrence or to deal with its consequences) so as to ensure value for money and sustainability of the partnership (see OECD, 2008a). Simply allocating risks is, however, not enough to ensure that the parties will effectively bear their responsibilities *ex post*. This implies that the relevant incentives and monitoring mechanisms are in place. Note that the success of a model can only be assessed in the long run when sustainability and adaptation to changes can be proved.

Table 4.3. **Typology of contractual arrangements between governments (G) and private sector (P)**

	Service contract	Management contract	Affermage / lease	Concession	Build, operate, transfer (BOT)	Joint venture	Divestiture
Asset ownership	G	G	G	G	P/G	G/P	P
Capital investment	G	G	G	P	P	G/P	P
Commercial risk	G	G	Shared	P	P	G/P	P
Operations / maintenance[1]	G/P	P	P	P	P	G/P	P
Contract duration	1-2 yrs	3-5 yrs	8-15 yrs	25-30 yrs	20-30 yrs	Infinite	Infinite
Source of remuneration of operator	Municipality	Municipality: fee is fixed or based on performance	Operator collects user fees. *Lease*: fee paid by municipality *Affermage*: revenue shared	Users	Municipality	Users	Users
Occurrence 1991-2007, based on World Bank PPI data	Not part of scope	Together: 135 of 608 projects		236 of 608 projects	209 of 608 projects	Not a separate category	28 of 608 projects
Examples	Mexico city Chennai	Johannesburg Amman	Cartagena Côte d'Ivoire Senegal	Gabon Jakarta Manilla	China India Malaysia Mexico Morocco	Cartagena Netherlands Chongqing Sino French Water Supply	England Chile

1. Maintenance investment can lead to significant amounts of finance investments on the part of the responsible partner.

Source: OECD (2009a), *Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action*, OECD, Paris, *www.oecd.org/daf/investment/water*.

Government responsibilities: the need for clarity

Whatever the ownership of assets or nature of the service providers, the government remains the "sector enabler": it remains in charge of defining and establishing the institutional framework, of overseeing its functioning and ultimately bears the responsibility of meeting its people's basic needs. In many countries, private participation in the water and sanitation sector has triggered important shifts in the focus of policies, by attracting stronger attention to: *(i)* the need to measure and monitor efficiency of service provision and quality of service; *(ii)* the importance of sector organisation and regulation; and *(iii)* the need for greater involvement of communities in planning and definition of objectives.

Public sector as the enabler: commitment, consistency of policy and capacities at all levels

Strong political commitment is critical, notably in the fight against corruption, and to address lack of access to water and sanitation and service affordability. A major lesson from past experience, though, is the need to clarify and separate the different roles for the public sector: political function, administration, regulation and operation of service delivery.

The need to clarify roles is especially acute in the water and sanitation sector, due to the segmented nature of its governance. Oversight responsibilities for water resource management and service provision are often split horizontally across different ministries, and vertically across national, regional and local authorities. This may generate overlaps in functions and/or loopholes on key responsibilities. In addition, the responsibility for water service provision often rests with local authorities, generally municipalities, whose capacity in terms of human and financial resources may be limited. Their involvement may also generate inconsistencies between the national and local legal and regulatory frameworks.

In particular, the sector is often regulated at both national and local levels. It is therefore important to specify the respective responsibilities of each level of government, *e.g.* where the national level may set the regulatory framework, while the local level defines contractual arrangements and monitors performance at the project level. It is also important to note that there may be different aspects of the sector that fall under the purview of different regulators (*e.g.* in the United Kingdom, there is one regulator for the economic aspects of the sector and one for public health and one for environmental issues. This is even more complex in France: *Conseil de la Concurrence et DGCCRF* for competition issues, *Cour des Comptes* for public finance and accounting practices, *DGS* for quality standards and health-related issues and *DRASS* for local inspections), calling for a need to ensure co-ordination across such entities to reduce the complexity of regulatory requirements.

Preserving consistency across government policies also involves effort at strengthening co-ordination mechanisms across government levels and building common understanding on the objectives, means and resources for water provision. This could be achieved through the involvement of the different levels of government dealing with water issues in structured negotiations during the planning process (including strategic financial planning as developed in Chapter 2), implementation and monitoring. In addition, provided that water and sanitation infrastructure development is closely related

to other policies such as urban development, energy policy, etc., very often it has to be addressed as part of an integrated planning that tackles housing, property right tenure and relocation (where relevant).

In parallel, governments can encourage training – from central government to sub-national entities, across municipalities – in order to build local capacities over the longer run.[5] A call for greater capacity to support regulators and governments by professionalising technical capacities was clearly made at the Asian Development Bank (ADB)-OECD regional expert meeting that took place in March 2008 in Manila (see Box 4.2). Regular monitoring and performance assessment can help better define the capacity building needs and contribute to a better consistency of government policies. The establishment of a public database in Norway (Kostra[6]) facilitating the exchange of information across municipalities on public services participated in this effort.

Box 4.2. **Summary of the ADB-OECD regional expert meeting: call for greater capacity building**

In March 2008, at the occasion of the ADB-OECD regional expert meeting entitled, "For a Beneficial Private Sector Participation in the Water and Sanitation Sector, Lessons Learnt from Asian Country Experience", participants made a strong call for greater capacity building in the following specific areas:

- to develop understanding of the key elements of a public private partnership and the roles and responsibilities of parties throughout the private sector participation process;
- to develop an informed involvement of civil society, communities and consumer associations;
- to support regulators and governments by professionalising technical capacities to avoid politicisation of tariff setting and adjustments;
- to facilitate access to funding.

Source: OECD (2009a), *Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action,* OECD, Paris, *www.oecd.org/daf/investment/water*.

Developing high-quality regulation

The regulatory framework plays a pivotal role in the success of the co-operation of governments with the private sector and, more generally, for improved governance in the sector. Regulation is a key issue in monopolistic sectors, where competitive pressures are limited; contracts cannot be fully comprehensive (owing to the complexities involved in long-term agreements); the partnership is multi-stakeholder (with distinct incentives and requirements across stakeholders); and the relationships are long-term and thus need to adapt to changes. It is also all the more necessary given the need to preserve the wellbeing of users and environmental sustainability, from water extraction to wastewater discharge. It is also widely acknowledged today that high-quality regulation is equally critical to enhance transparency, efficiency and equity of publicly managed water services, especially in a context of increased corporatisation of water operators.

As strongly highlighted during the *Instituto Mexicano de Tecnologia del Agua* (IMTA)-OECD regional expert meeting organised in March 2008 in Mexico (see Box 4.3), establishing a high-quality regulatory framework requires great technical skills and the establishment of appropriate institutions, including competent and well-resourced regulatory bodies that are able to balance different interests and make the necessary decisions on a professional basis. When badly designed or captured by specific interests, regulation may have unintended consequences on the provision of water and sanitation services (notably for the poor), by, for instance, limiting technological options or strengthening the monopoly power of the incumbent utility.

Box 4.3. **The IMTA-OECD regional expert meeting: setting a high-quality regulatory framework**

As recognised by the experts in the IMTA-OECD expert meeting, the water and sanitation regulatory framework remains poor in most Latin American countries. It is often complex and imported from abroad without adaptation to local needs. It also often lacks technical basis and does not clearly specify the incentives and sanctions mechanisms. Establishing a high-quality regulatory framework requires political will and great technical skills – involving engineers, lawyers and economists. This necessitates time and progressive improvements. Developing the appropriate institutions also requires establishing a good information system that notably corrects the information asymmetries between the provider and the regulator.

Source: OECD (2009a), *Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action*, OECD, Paris, *www.oecd.org/daf/investment/water*.

Good regulation, as defined by OECD (1995), should: *(i)* serve clearly identified policy goals, and be effective in achieving those goals; *(ii)* have a sound legal and empirical basis; *(iii)* produce benefits that justify costs, considering the distribution of effects across society and taking economic, environmental and social effects into account; *(iv)* minimise costs and market distortions; *(v)* promote innovation through market incentives and goal-based approaches; *(vi)* be clear, simple, and practical for users; *(vii)* be consistent with other regulations and policies; and *(viii)* be compatible as far as possible with competition, trade and investment-facilitating principles at domestic and international levels.

In the area of drinking water and sanitation, the main activities of regulation pertain to regulation of water quality, environmental regulation, economic regulation to oversee monopolistic markets, monitoring of the sector and consumer protection. Setting the right incentives for private sector and preventing rent-seeking behaviour are the key elements of economic regulation in a sector where competition is limited. As shown by the experience of Chile (Box 4.4), it is done through appropriate risk sharing across stakeholders, the establishment of mechanisms to ensure that the risks are effectively borne and a tariff setting that contributes to balancing the incentives for efficiency, investments, rent extraction and fairness.

Box 4.4. **The Chilean experience of involving the private sector**

The success of Chile in involving the private sector can be attributed to three main factors: the condition of the water sector before the incorporation of the private sector; stability of water and sanitation policy; and a high-quality regulatory framework. This involved:

- clear separation of roles across the different bodies in charge of regulation and supervision, and from the activities of service provision of water operators;
- a regulation geared towards ensuring efficiency of operation and investment, including through an appropriate definition of level-of-service provision, at regional rather than municipal level to take into account economies of scale and scope;
- a strong focus on sustainable access (notably through a pro-poor subsidy scheme);
- a monitoring process that includes inspection of operators and considerable penalties in case of default;
- an innovative mechanism to deal with disputes arising between the regulatory authority and the operators (notably on tariffs adjustment) involving expert panels.

As a result, private capital poured into the sector, wastewater coverage increased from 12% to 82% in ten years and efficiency of water and sanitation systems were improved. This, in turn, led to positive externalities for irrigation, health and tourism.

Source: Magaly Espinosa, *Superintendenta de Servicios Sanitarios* (Superintendent of Sanitation Services), OECD Global Forum on Sustainable Development, December 2008.

In the past 15 years, many developing countries have increased their efforts to develop high-quality regulation for the water sector as demonstrated by the establishment of separate regulatory bodies. According to the information base that underpins the analysis in the Checklist (see OECD, 2009a), most Latin American countries and 7 of the 13 African countries under review have established regulatory bodies since the 1990s.

This development in turn raises important challenges, such as: *(i)* how to increase transparency and accountability of the regulatory authorities and ensure their credibility, especially in a context of recent structural reforms, low institutional capacity and important information gaps; *(ii)* how to define the space for regulation, its interface with contractual arrangements and policy making in order to adequately manage the flexibility required to sustain long-term commitments in a constantly changing environment; *(iii)* how to extend effective oversight and regulatory functions to a fragmented sector, notably how to reach out to small-scale providers (Box 4.5) and the big users when national regulatory tools are often ill-suited to decentralised activities; and *(iv)* how to build capacity for monitoring and enforcement, particularly for decentralised regulation.

Box 4.5. **Regulation and small-scale providers**

Traditional regulatory tools are ill-suited to reach out to small-scale, often informal, private operators. Nevertheless, while small-scale providers show very good understanding and flexibility to adapt to low-income customers' circumstances, there is a need to monitor the quality of the water they provide and to oversee their monopolistic behaviour – and the consequences of their disparate activities on the environment. Most importantly, providing legal recognition and protection for small-scale private operators would contribute to improving the quality of service and reducing the risk profile, and potentially improve the access to finance of operators (ultimately enabling them to charge lower tariffs).

In that context, Mauritania and Mozambique present two different situations calling for different approaches. In Mauritania, small-scale private actors operate in small towns where low densities and limited economies of scale prevent the involvement of larger operators. The country pioneered the delegation of water service delivery in municipalities below 20 000 inhabitants in the early 1990s. Consequently, 365 small cities today delegate the management of the provision of water services to independent private providers. In the case of Mozambique, small-scale providers operate on the fringes of the activity area of a bigger provider, in the peri-urban areas of Maputo. While, in the first case, the issue is one of professionalising the private actors – notably through capacity building – the second case raises the main challenge of regulating the interface between formal and informal providers.

In any case, economic regulation of alternative providers rarely extends beyond abstraction licensing and tanker truck registration. Very often, when regulatory rules exist (such as price limits), they are largely ignored due a lack of enforcement and opacity in the regulatory framework. Setting regulation for alternative providers faces a trade-off between the adoption of rules, their enforceability and the flexibility of the market. For instance the banning of a specific technology may lead to the bankruptcy of small providers and deprive the users of access in a context where the main utility may not be in a position to fill the gap in the short term.

Source: OECD (2009a), *Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action*, OECD, Paris, *www.oecd.org/daf/investment/water*.

Beyond public and private roles: the key elements for successful private sector participation

Contractual arrangements with the private sector are typically long term and as such not likely to cover all aspects of the complex relationship between the private sector and the responsible public authority. Moreover, developing countries are particularly prone to shocks – such as currency devaluation – that are difficult to foresee in the contract. Many past difficulties have also arisen from dispute over the actual state of water systems and the quality of baseline data. Given the impossibility of eliminating the asymmetry of information that can lead to such disputes, no contract can be comprehensive enough to eradicate all elements of uncertainty.

To work in the public interest, co-operation between public and private partners should be rooted in: *(i)* a clear understanding of the ultimate objectives for service provision and of the contributions that the private sector can make; *(ii)* strong accountability mechanisms, including clear and consistent contractual arrangements; and *(iii)* their relations based on information sharing and on consultation with stakeholders.

Co-operation between the public and private sectors

Mechanisms exist that may help reduce the uncertainty that comes with long-term incomplete contracts and/or deal with its consequences. They include adopting performance-based contractual arrangements with performance targets specified in terms of verifiable infrastructure services to be provided to the public; updating the baseline data used to develop the business plan before the contract starts; regular reviews of performance and providing for clauses and mechanisms to frame the discussions on future issues, as well as formal dispute resolution mechanisms (see the experience of Yerevan in implementing a performance-based contract in Box 4.6).

Box 4.6. **The Armenian experience of implementing a performance-based contract**

The performance-based lease signed in December 2005 with Veolia for the water services in Yerevan (Armenia) is generally considered a well-designed and balanced contract that meets most international standards. It however raised a certain number of challenges that are typical of the difficulties that might be encountered in the water sector. First, there were changes in baseline information between the tender and the starting date of the contract, such as the increase by 35% of local employees' salaries between the tender and the start of the contract. Then a clear definition of the base year data for performance indicators was lacking, which resulted in a disagreement between the operator and the Public Services Regulatory Commission over which data and what methodology should be used to measure the indicator of continuity of service. Finally, there were difficulties with measuring performance indicators. This led the OECD to offer the following two main recommendations:

- All the data collected during the tender process and used for calculating key indicators in the business plan should be updated before the contract starting date, particularly if time has elapsed between the starting date and the tender preparation.
- In case of uncertainties or difficulties in obtaining reliable data at the start of the contract, it is preferable to set annual performance targets as a percentage of improvement (calculated on the basis of a baseline to be defined) rather than as fixed numbers (in order to avoid recalculating a fixed figure each year) (this is particularly relevant for the indicator on the continuity of service).

Source: OECD (2008b), "Promoting the Use of Performance-Based Contracts between Water Utilities and Municipalities in EECCA - Case Study No. 1: Yerevan Water Supply Company Lease Contract", *www.oecd.org/dataoecd/25/22/40572658.pdf.*

The legal and institutional framework should facilitate the enforcement of a contract. But good faith and goodwill of the parties to co-operate and find solutions remains crucial. In that context, starting the discussion early when difficulties arise, and before conflicts escalate, will help diffuse tension. The case of the affermage contract in Senegal shows the importance of a financial model based on consensus and of mechanisms that constitute solid grounds for a continuous dialogue between stakeholders (Box 4.7).

Box 4.7. The affermage contract for urban drinking water in Senegal

The reform of the water sector in Senegal led to the development of a tripartite partnership in 1995 between the State, SONES and SDE. SONES is a public company in charge of asset management, investment and debt servicing linked to the State by a 30-year concession contract. SDE is a private company, selected by tender, under an affermage and performance contract with SONES. The state defines the efficiency objectives (*e.g.* unaccounted-for water, with associated penalties) and specifies the investment obligations of the two parties.

The success of the Senegalese model, which led to an increase in coverage from 2.8 million people in 1995 to 5 million today, can be attributed to several factors, including appropriate risk sharing across the partners; great commitment on the part of public authorities; autonomy of SONES; performance of SDE; and regular dialogue between the stakeholders. In addition, transparency and accountability were ensured through several mechanisms:

- Regulation through a financial model of the sector shared by all parties involved.
- SDE is under a performance contract based on 18 criteria. Progress is reviewed every six months and failures incur fines.
- All technical and financial information of the sector are available to all stakeholders.
- Civil society is involved in the regulation of the sector.

Source: *Agence Française de Développement* and Mouhamed Fadel Ndaw, PEPAM Co-ordinator, OECD Global Forum on Sustainable Development, December 2008.

Direct competition, potentially a strong driver for efficiency, cost reduction and an effective allocation of risks across partners, is limited in the water sector owing to important economies of scale and significant sunk costs. Competition for the market, through competitive bidding, can also be undermined by a limited number of bidders, renegotiations[7] and competitive advantage acquired from inside knowledge of the infrastructure by incumbents. Competitive pressures and incentives to improve performance can however be developed through benchmarking[8] – defined as the process of comparing performance between organisations (Rouse, 2007). It involves identifying and focussing on a small number of key indicators (clear, easy to measure) to lower the cost of information provision and working on improving data availability and reliability over time. Benchmarking is however more effective for comparison across operational efficiency measures (provided the parties agree on a shared methodology), rather than costs, which include some important site-specific components that may be difficult to measure.

Governments can also take steps to strengthen competition for the market, especially at times of contract renegotiations by limiting restrictions on entry – *e.g.* through discrimination on size and ownership for instance – ensuring a level playing field for international and domestic companies, state-owned and private businesses, and small/larger scale actors; and by limiting the competitive advantage acquired through inside knowledge through better information flow. Specific issues arise in frontier areas, where the network is little or not developed and the gap is filled by small-scale providers or community-based organisations. There, governments are tempted to grant monopoly in areas of activity to ensure enough revenue to the operator. A restricted number of

suppliers will also help lower the cost of regulation and oversight. However, these exclusivity clauses need to be assessed against the efforts to extend the network to the unconnected, as they may in effect provide a strong monopoly power to the incumbent, while depriving the population living in frontier areas of formal alternatives.

Responsiveness to needs and leveraging public participation

Past experiences have shown that effective partnerships in practice are tripartite relationships between public authorities, operators (public or private) and consumers/communities. Promoting informed involvement of civil society (non-governmental organisations [NGOs], consumer groups) may contribute to improving population ownership, better protecting consumer rights, monitoring service provision and determining model-of-utility management. It may facilitate regulation and strengthen accountability mechanisms by permitting better information flows and greater adequacy of services to needs. Different levels of engagement exist (OECD, 2001), from a low level of citizen influence on policy making through information to consultation and active participation. However, public involvement should be developed according to the principles of clear focus, representation and transparency. It requires time and resources and should therefore be organised strategically at important stages of policy making, and preferably start at projects' early stages. It may also require providing adequate training.

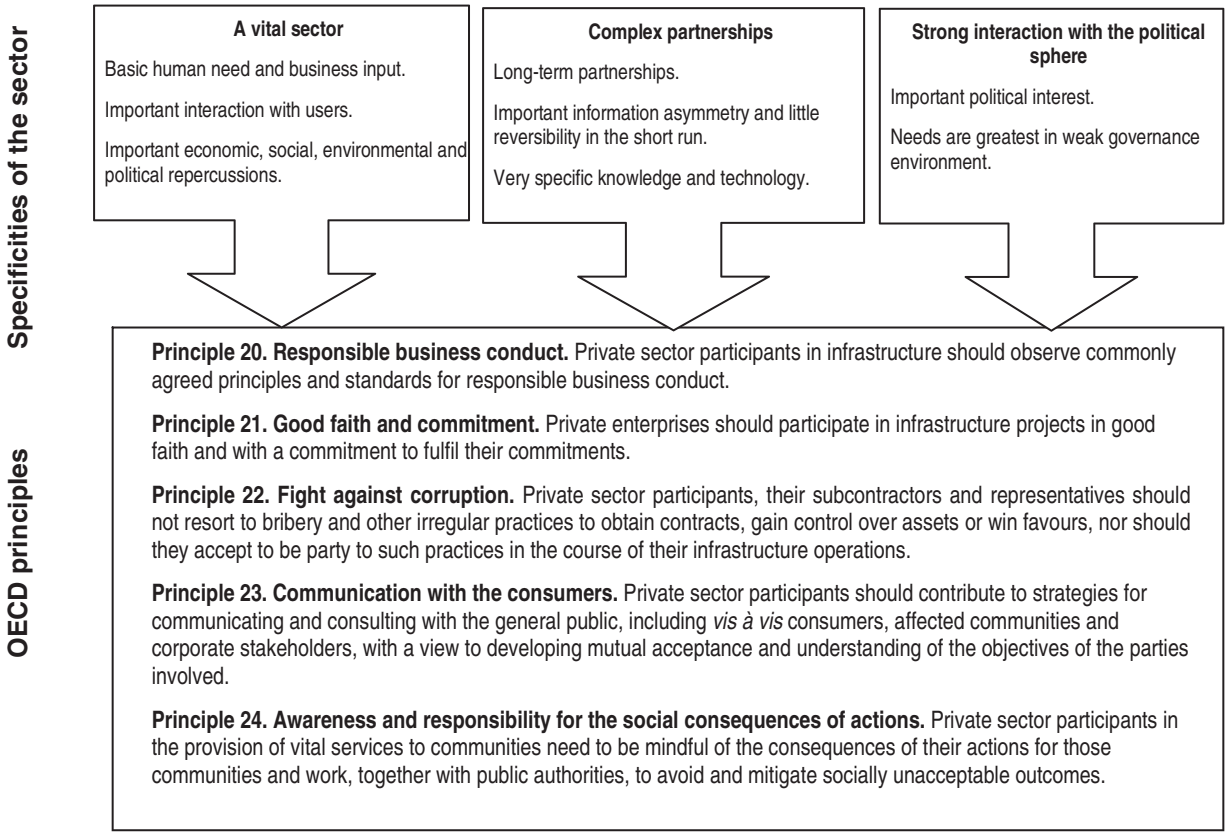
Countries have had different ways of engaging consumers in the water sector. In Senegal, citizens are members of the administrative board of the water company. In Zambia, consumers are involved through Water Watch Groups established by NWASCO, the national regulatory agency, to represent their interest, inform and make them aware of their rights and obligations, and collect information on operator performance.[9] The United Kingdom has developed consumer consultative committees, and Mexico has established State-Citizen Water Councils. In Bangalore, the use of citizen report cards was developed to provide agencies with qualitative and quantitative information about gaps in service delivery, but also to measure the level of awareness about citizens' rights and responsibilities.

However, effective engagement of consumers remains a great challenge in many countries. It requires that consumers are able to have an informed opinion – implying availability of information and capacity to treat that information – and that they have a voice and the capacity to influence decision making. Strengthening government-citizen relations also requires embedding it in a framework that provides for the setting in which the relations evolve – legal rights, institutions and their responsibilities, evaluation mechanisms and capacities.

Private responsibilities: the elements of responsible business conduct

In parallel to public authority responsibility to users and operators, private actors have specific responsibilities, when involved in the development and management of water systems, in ensuring sustainable co-operation in the public interest. Water is a vital good involving important economic, social, environmental and political repercussion. This requires strong commitment on the part of private partners to "responsible business conduct",[10] good faith, fight against corruption, communication with consumers, and an awareness of and responsibility for the social consequences of their actions. The Checklist deals with these issues in Principles 20-24 (Figure 4.2).

Figure 4.2. **The OECD Checklist for Public Action: encouraging responsible business conduct**



Source: OECD (2009a), *Private Sector Participation in Water Infrastructure: OECD Checklist for Public Action*, OECD, Paris, *www.oecd.org/daf/investment/water*.

Businesses have a critical role to play in promoting integrity by engaging in timely, reliable and relevant information disclosure on activities, structure, financial situation and performance (including participating with good faith and commitment to due diligence processes) and avoiding undue involvement in local politics while supporting the development of high-quality regulatory frameworks. Showing strong anti-corruption commitment may also involve going beyond communication on anti-corruption policies and internal management systems to the staff, to create a new corporate culture and provide incentives to stop corrupt practices. Colombia[11] and Argentina[12] present two examples where groups of water-pipe manufacturers signed anti-corruption agreements in April and December 2005, respectively, based on Transparency International Business Principles for Countering Bribery.[13]

Companies have an important role to play in evaluating the social and environmental impacts of their activities, mitigating the potential negative impacts and contributing to the country development goals. They can notably contribute to assessing and discussing the consequences for the poor of their technology choices, tariff setting policy and investment planning. They can also evaluate the impacts of activities on the environment and continuously seek to improve environmental performance. The difficulty lies with the set of indicators that are chosen to support the evaluation. Following internationally agreed guidelines such as the Global Reporting Initiative,[14] as Manila Water does in its

four annual sustainability reports,[15] can facilitate the monitoring and comparison across companies.

Finally, being responsive to clients' claims and providing transparent and effective procedures to address complaints can contribute to building mutual understanding and improving service provision. In that perspective, several companies, such as the SDE in Senegal, have launched surveys to assess consumers' satisfaction and/or provide free phone numbers for consumer information.

There are many examples of well-run public and privately operated utilities. They include the Phnom Penh Water Supply Authority and the Public Utility Board of Singapore, both public companies, that managed to fight corruption and turn around a non-performing utility providing poor services (in the case of Cambodia) through strong commitment to change from the top.[16] These examples clearly show the potential that exists in sharing and transmitting good practices across operators. This is precisely the role of the recently launched Water Operator Partnerships (WOPs)[17] to promote horizontal co-operation and sharing of knowledge across operators.

The set of responsibilities of different actors and their interactions are complex. Solutions for a successful (tripartite) partnership will often be location- and people-specific, as the human factor remains paramount in determining the success of such transactions, particularly when difficulties arise. The OECD Checklist for Public Action attempts to systematise the approach that policy makers can take to this complex issue. The objective of this analysis and of the use of the Checklist is ultimately to: ensure improvement in service quality; ensure their efficient and sustainable provision; and improve the institutional and regulatory setting in which this takes place. Improvements on this front will diminish the risk perception that private investors and financiers have of the sector in some countries, and may therefore contribute to increasing the flow of finance to the sector. This, and improvement in the creditworthiness of water utilities, addressed in the preceding chapters, can significantly contribute to sustainable financing for water and sanitation for all.

Notes

1. The Checklist covers five main areas: *(i)* deciding on the nature and modalities of potential private sector involvement; *(ii)* providing a sound institutional and regulatory environment for infrastructure investment; *(iii)* ensuring public and institutional support; *(iv)* making the co-operation between the public and private sectors work; *(v)* encouraging responsible business conduct.

2. Regional consultations were organised to discuss and validate the Checklist: in Africa, through the New Partnership for Africa's Development (NEPAD)-OECD Africa Investment Initiative Roundtable organised in Lusaka (Zambia) in November 2007; in Asia, through the joint OECD/Asian Development Bank expert meeting organised in Manila (Philippines) in March 2008; and in Latin America, through the

joint OECD/Mexican Institute of Water Technology meeting organised in Cuernavaca (Mexico) in September 2008.

3. For the purpose of this discussion, water and sanitation infrastructures include all water delivery systems from upstream facilities, to distribution and sewerage networks. It involves capture of the natural resource, treatment, transportation (primary network: aqueducts and mains), delivery to users (secondary network: pipelines and taps), wastewater capture and treatment.

4. Estimated by the African Development Bank (2006) between 5% and 10% (compared to 17-25% in the power sector and 25-30% in telecommunications).

5. In the United Kingdom and Australia, this has notably taken the form of web interfaces providing tools to assist local governments in developing infrastructure projects: Partnership UK (*www.partnershipuk.org.uk*) and the Public Private Partnerships Programme of Local Government Association (*www.4ps.gov.uk*) in the United Kingdom and Partnerships Victoria (*www.partnerships.vic.gov.au*) in Australia.

6. *www.ssb.no/kostra.*

7. According to Guasch (2004), in Latin America, renegotiations affected 75% of water contracts (against 10% in electricity), after 1.7 years (compared to 2.3 years in electricity).

8. Countries have adopted different benchmarking options. In England and Wales, competition is organised across companies serving different areas and involves reward. In Chile, competition involves a (theoretical) model company. In the Philippines and Indonesia, the capital cities (Manila, Jakarta) were split in two service areas to allow for within city competition. In Senegal, a performance contract involves benchmark performance to which the company has to compare. In addition, in Senegal, both the asset-holding company and the private company share investment obligations, allowing direct comparison of reported costs.

9. *www.nwasco.org.zm.*

10. The principles of responsible business conduct are embodied in the OECD Guidelines for Multinational Enterprises (OECD, 2000) and the ILO Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy (ILO, 1977).

11. *www.waterintegritynetwork.net/page/238.*

12. *www.transparency.org/news_room/latest_news/press_releases/2005/05_12_15_argentina_water_ sector.*

13. *www.transparency.org/global_priorities/private_sector/business_principles.*

14. *www.globalreporting.org.*

15. *www.manilawater.com/files/MWCSusDev07.pdf.*

16. Which translated into the development of codes of conduct (see the online Singapore Public Utility Board Code of Conduct: www.pub.gov.sg) and staff training.

17. Stated in the Hashimoto Action Plan of the United Nation Secretary General's Advisory Board on Water and Sanitation (UNSGAB): *www.unsgab.org/docs/HAP_en.pdf.*

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Chapter 5

Managing Water Resources in the Agricultural Sector

As agriculture consumes about 40% of OECD countries and 70% of the world's freshwater consumption, it is a key area for water resources management (WRM) policies to achieve greater water use efficiency, while meeting environmental and social needs.

WRM in agriculture is complex, covering a diverse range of farming systems, climatic conditions, sources of water, property rights, institutional arrangements, cultural and social contexts. Future policies and actions will be influenced by increases in population, food demand and climate change.

To address these challenges it will be important for OECD policy makers to: recognise the complexity and diversity of WRM in agriculture; reform institutional systems for water management in agriculture; ensure charges for water supplied to agriculture cover delivery costs; enhance agriculture's resilience to climate change and variability impacts; improve policy integration between agriculture, water, energy and environment policies; and address knowledge and information deficiencies to better guide water resource management.

Water supply and sanitation need to be addressed along with water resource management (WRM), both at the sectoral and environmental level. As agriculture consumes about 70% of the world's freshwater consumption and over 40% in OECD countries, it is a prime target for WRM policies to achieve greater efficiency in water resource use. This chapter focuses on agricultural water uses as an essential component of water resource management.[1]

WRM in agriculture is complex, covering a wide range of farming systems, climatic conditions, and sources of water – surface water, groundwater and rainwater harvesting (IWMI, 2007). Diverse systems of property rights, institutional arrangements, cultural and social contexts exist across and within countries. WRM is also influenced by many different policies, in particular, related to agriculture, water, environment and energy, as well as economic, fiscal, regional and social policies.

In agriculture WRM mainly concerns irrigation to smooth water supply across the production season. But it also involves water management in rainfed agriculture; management of floods, droughts, and drainage; and restoration and conservation of ecosystems and cultural and recreational values. The links between agriculture, WRM and water quality are not directly addressed in this chapter, although variations in water quantities and its management in agriculture can affect water quality.[2]

All OECD countries have policy strategies to address broad water management issues – water resources, quality and ecosystems, as discussed in other chapters of this report. With respect to agriculture, OECD countries share a common strategic vision to manage water resources through establishing a long-term plan for the sustainable management of water resources in agriculture, including improving agriculture's resilience to climate change and variability impacts; contributing to agricultural incomes and achieving broader rural development goals; protecting ecosystems on agricultural land or affected by farming activities; balancing consumptive water uses across the economy, including for the environment; and improving water resource use efficiency, management and technologies on-farm, including adequate financing to maintain and upgrade the infrastructure supplying water to farms.

Until the 1980s, WRM in the agricultural sectors across most OECD countries focused on the physical supply of water, with emphasis on infrastructure "supply-side" technical solutions and harvesting the maximum amount from the resource, within a command and control institutional structure. This technical-based path to WRM is now being complemented by more emphasis on sustainable-based WRM, with greater reliance on "demand-side" economic solutions (Molle and Berkoff, 2007). The emerging emphasis is thus on meeting the diverse demands for water (economic, environmental and social); embracing participatory decision making and institutional structures; and encouraging a greater role for market-based allocation mechanisms.

Policies addressing WRM in agriculture in the future will be influenced by increases in population and climate change and variability. The anticipated growth in world population to 9 billion by 2050 will involve a major expansion in demand for food, which will impact on water use in agriculture. Climate-change projections suggest that crop yields could improve in some regions as a result of changes in temperature and precipitation, but in other regions, stress on scarce water resources

could increase (IPPC, 2008; OECD, 2008b). Heightened climate variability in some areas may lead to a greater incidence and severity of flood and drought events, leading to higher economic and human costs on agriculture and the wider economy, and in the case of droughts the increased use of irrigation to overcome water shortfalls.

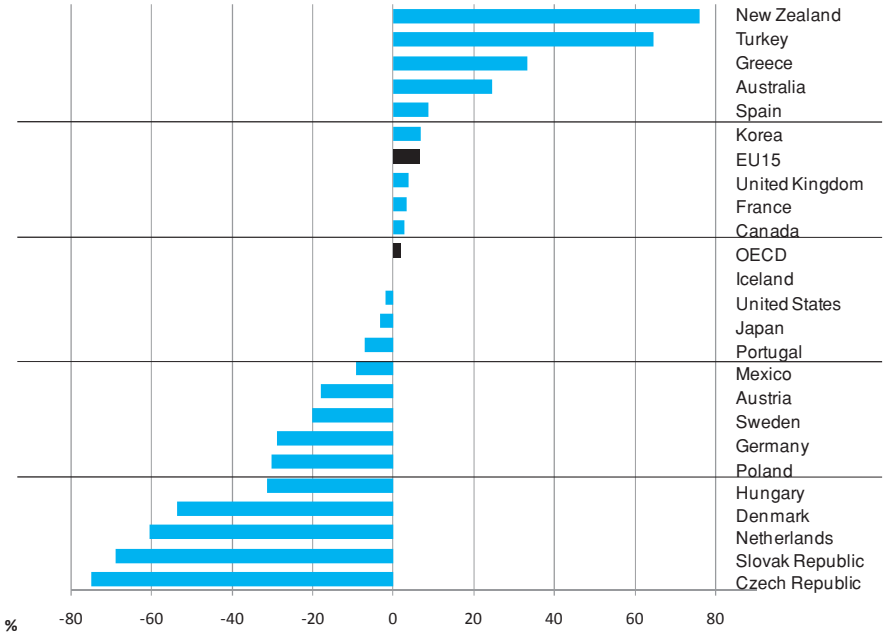
Recent trends and outlook

Taking into account the complexity and diversity in hydrology and farming systems across the OECD, the key trends in OECD countries' agricultural use of water resources since 1990 include (see Figures 5.1, 5.2 and 5.3; Tables 5.1 and 5.2):

- Agricultural water use grew by 2% over the period between 1990-92 and 2002-04, mainly driven by an increase in the area irrigated, compared to a 1% increase for all water uses; however, for some countries in more recent years this trend is reversing with agricultural water use diminishing compared to stronger growth in other water-consuming sectors.
- Agriculture accounted for 44% of total water use overall in 2002-04, although for a number of countries the share is over 60%, but farm water withdrawals are invariably larger than the fraction consumed, as water is both recycled and lost through evapotranspiration (*i.e.* the return of moisture to the air through both evaporation from the soil and transpiration by plants).
- The area irrigated rose by 8% compared to a reduction of 3% in the total agricultural area between 1990-92 and 2002-04, although recently in a number of countries the area irrigated has been decreasing. Moreover, the area that is potentially irrigable is normally greater than the actual area irrigated in any given year.
- Agriculture abstracts an increasing share of its water supplies from groundwater, and the sector's share in total groundwater utilisation, although data are limited, was above 30% in one-third of OECD member countries in 2002.

Figure 5.1. **Agricultural water use**

% change in total agriculture water use, 1990-92 to 2002-04[1]



1. For the data and notes concerning this figure, see the OECD database at *www.oecd.org/tad/env/indicators*.

Source: OECD (2008a), *Environmental Performance of Agriculture in OECD Countries since 1990*, OECD, Paris, *www.oecd.org/tad/env/indicators*, and national sources.

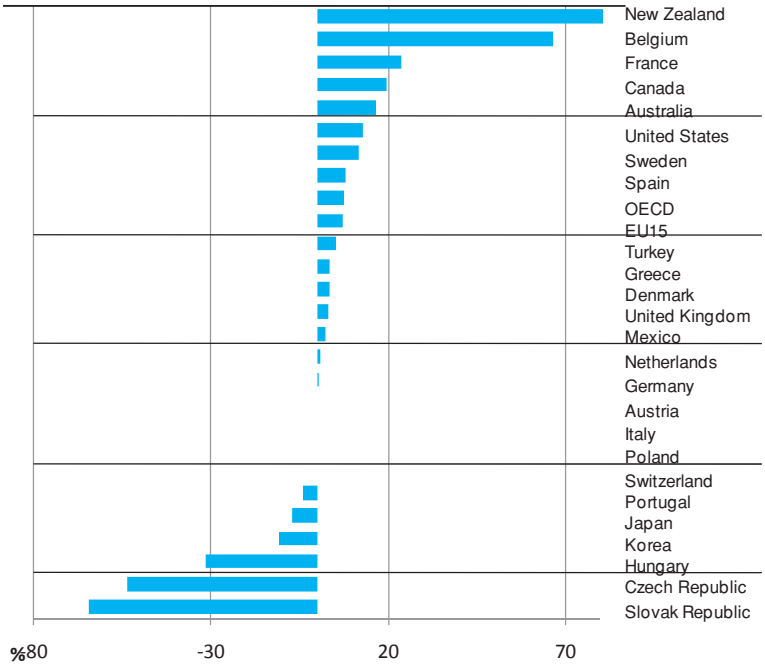
Table 5.1. **Agricultural water use**[1]

	Total agriculture water use		Change in total agriculture water use	Change in total water use	Share of agriculture in total water use
	1990-92	2002-04	1990-92 to 2002-04	1990-92 to 2002-04	2002-04
	(million m^3)	(million m^3)	%	%	%
New Zealand	1 281	2 254	76	56	57
Turkey	18 812	31 000	65	43	70
Greece	5 694	7 600	33	24	87
Australia	13 384	16 660	24	9	77
Spain	19 667	21 407	9	4	60
Korea	14 700	15 800	7	33	48
EU15	39 638	42 263	7	-6	27
United Kingdom	1 347	1 402	4	14	10
France	4 901	5 067	3	-12	15
Canada	3 991	4 104	3	-6	10
OECD	411 046	419 214	2	1	44
Iceland	70	70	0	-1	42
United States	195 200	191 555	-2	2	40
Japan	58 630	56 840	-3	-3	66
Portugal	5 547	5 162	-7	-2	61
Mexico	62 500	56 811	-9	1	77
Austria	100	82	-18	-50	5
Sweden	169	135	-20	-10	5
Germany	1 600	1 140	-29	-21	3
Poland	1 527	1 065	-30	-18	9
Hungary	1 032	709	-31	-18	13
Denmark	383	177	-54	-39	27
Netherlands	230	91	-60	49	1
Slovak Republic	188	59	-69	-42	6
Czech Republic	93	24	-75	-43	1
Italy	..	20 140	..	0	36

1. For the data and notes concerning this table, see the OECD database at *www.oecd.org/tad/env/indicators*.

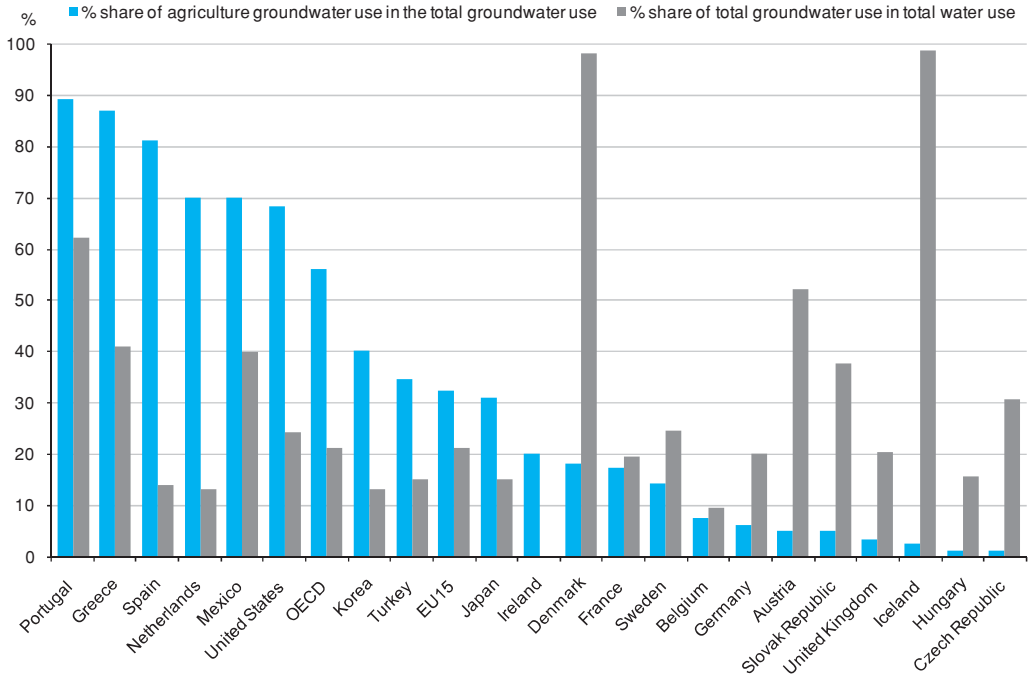
Source: OECD (2008a), *Environmental Performance of Agriculture in OECD Countries since 1990*, OECD, Paris, *www.oecd.org/tad/env/indicators*, and national sources.

Figure 5.2. **Irrigated area, irrigation water use and irrigation water application rates**[1]



1. For the data and notes concerning this figure, see the OECD database at *www.oecd.org/tad/env/indicators*.
Source: OECD (2008a), *Environmental Performance of Agriculture in OECD Countries since 1990*, OECD, Paris, *www.oecd.org/tad/env/indicators*, and national sources.

Figure 5.3. **Share of agricultural groundwater use in total groundwater use, and total groundwater use in total water use**[1]



1. For the data concerning this figure, see the OECD database at *www.oecd.org/tad/env/indicators*.
Source: OECD (2008a), *Environmental Performance of Agriculture in OECD Countries since 1990*, OECD, Paris, *www.oecd.org/tad/env/indicators*, and national sources.

Table 5.2. **Irrigated area, irrigation water use and irrigation water application rates**[1]

	Change in total agricultural area	Share of irrigated area in total agricultural area	Share of irrigation water use in total agricultural water use	Irrigation water application rates		
	%	%	%	Megaliters per hectare of irrigated land		
	1990-92 to 2002-04	2002-04	2002-04	1990-92	2002-04	% change
New Zealand	-3	4	..	..	..	..
Belgium	2	3	100	0.5	1.0	83
France	-3	9	100	2.3	1.9	-17
Canada	1	2	94	3.5	3.6	1
Australia	-4	1	100	8.7	4.3	-50
United States	-3	5	99	9.4	8.4	-10
Sweden	-6	2	70	2.1	1.7	-19
Spain	-3	9	100	7.4	7.0	-5
OECD	-3	4	..	8.8	8.1	-9
EU15	-3	10	..	4.9	5.1	5
Turkey	1	9	..	5.7	9.5	69
Greece	-1	17	100	5.5	5.9	7
Denmark	-5	17	96	0.7	0.4	-48
United Kingdom	-10	1	7	1.0	0.6	-46
Mexico	1	6	97	9.9	8.7	-12
Netherlands	-3	29	100	0.4	0.2	-61
Germany	-1	3	..	3.3	0.3	-91
Austria	-3	0	5	12.5	2.5	-80
Italy	-1	17	100	..	7.7	..
Poland	-12	0.6	8	3.7	0.9	-77
Switzerland	-3	2	..	..	..	..
Portugal	-3	15	100	8.9	8.6	-3
Japan	-8	55	99	20.4	21.3	5
Korea	-13	46	..	14.3	..	..
Hungary	-8	2	24	2.1	1.3	-36
Czech Republic	0	0	98	0.7	1.0	36
Slovak Republic	0	4	80	0.5	0.4	-14

.. = not available

1. For the data and notes concerning this table, see the OECD database at *www.oecd.org/tad/env/indicators*.

Source: OECD (2008a), *Environmental Performance of Agriculture in OECD Countries since 1990*, OECD, Paris, *www.oecd.org/tad/env/indicators*, and national sources.

There have been mixed and diverse developments associated with the use of water resources by agriculture in OECD countries in recent years. On the positive side, these include:

- Irrigated agriculture has outperformed dryland farming in terms of higher crop yields, and provides a growing share of the value of farm production and exports for some OECD countries, as well as supporting rural employment in a number of regions.

- Increases in physical water productivity by agriculture, through better management and uptake of more efficient technologies, such as drip irrigation and adoption of water-saving farm practices, has contributed to higher farm production. Overall the OECD average water application rate per hectare irrigated declined by 9% between 1990-92 and 2002-04, while in most cases the volume of agricultural production increased.
- The adoption of drip irrigation, low pressure irrigation systems, and other water-saving technologies and practices, are becoming more widespread, while there are also some improvements in flood irrigation systems (*e.g.* laser levelling of fields, neutron probes for soil moisture measurement, scheduling of irrigation to plant needs, and faster flow regimes) and irrigation canal networks (*e.g.* replacing earth with concrete linings for irrigation canals).
- Pollutant discharges from agricultural land into surface water have been declining in recent years in many OECD regions, but information on the trends in pollutants from irrigated land is patchy.

But on the negative side, these include:

- Pressure on water supplies through increased competition for water resources between farmers and other water consumers, as well as for water for environmental purposes and associated recreational, fishing and cultural activities. Increased competition for water resources, however, could generate positive outcomes if it leads to resource allocation adjustments and higher economic growth.
- Groundwater use for irrigation above recharge rates in some regions, which is also undermining the economic viability of farming in affected areas and leading to harmful environmental impacts, such as reduced flows of connected surface waters.
- Farming is a major and growing source of groundwater pollution in some countries and regions, mainly from nutrients, pesticides and salinity. This is of particular concern where groundwater provides a major share of drinking water supplies for both human consumption and farming.
- Over-exploitation of surface water resources in certain areas is damaging ecosystems by reducing water flows below minimum flow levels in rivers and lakes and for wetlands, which is also detrimental to recreational, fishing and cultural uses of these aquatic ecosystems.
- Agriculture is at risk from the growing incidence and severity of floods and droughts in many OECD countries, leading to higher financial costs both through loss of production and damage to farm infrastructure, and the wider economy in terms of loss of life and damage to property.

While many of these developments are likely to continue into the future, OECD (2008b) projections of agriculture's use of water resources up to 2030 (see Chapter 1), and the Intergovernmental Panel on Climate Change (IPCC, 2008) projections on climate change and water, highlight a number of new developments that will need to be addressed:

- Global food and non-food demand will continue to increase with the growth in incomes, population and urbanisation. This will chiefly be driven by developing countries, but agricultural production in many of these countries will be much more constrained by pressures on the natural resource base, including land and water, notably in China and India.
- With improvements in the physical efficiency of water use, agricultural water consumption is expected to gradually decline as a share of total water consumption in both OECD and non-OECD countries, but the decline is projected to be faster in developing countries due to competition from rapidly increasing non-agricultural water demands.
- OECD agricultural exporting countries are expected to be a continuing source of increased food and non-food agricultural commodity exports, mainly to Asian, Sub-Saharan African, and Middle Eastern countries. Such an expansion in OECD agricultural production and exports will necessitate improving water use efficiency in agriculture if the overall use and pressures on water resources in agriculture are to be reduced.
- The IPCC (2008) report on climate change and water concludes that "observational records and climate projections provide abundant evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by climate change, with wide-ranging consequences for human societies." Specifically concerning agriculture the IPCC projects that changes in water quantity and quality due to climate change are expected to affect food availability, stability, access and utilisation. Climate change is also expected to affect the function and operation of existing water infrastructure – including hydropower, structural flood defences, drainage and irrigation systems – as well as water management practices. Moreover, current water management practices may not be robust enough to cope with the impacts of climate change on water supply reliability, flood risk, health, agriculture, energy and ecosystems.

OECD policy experiences and options for sustainable water resource management in agriculture

Policies that can contribute to sustainable WRM in agriculture need to emphasise the following six principles.

1. Recognising the complexity and diversity of water resource management in agriculture

Recognition of the complexity and diversity of WRM in agriculture is important from a policy perspective, as it means there is no one-size-fits-all policy solution to improving WRM. Policies addressing WRM need to be tailored and

targeted to both specific country situations and also regions within countries, taking into account local climatic conditions and available water resources.

The scope of WRM complexity and diversity in agriculture includes the following issues (Hanemann, 2006; Thompson, 2006):

- **Hydrology**: mobility of water, in that it flows, leaches, evaporates, and has the opportunity to be re-used, makes it distinctive as a commodity compared to land, for example. Moreover, agriculture can contribute positively to the hydrological cycle, for example, through groundwater recharge and water purification functions; it can, however, also contribute to groundwater pollution and through excessive extraction lead to diversion of water from supporting ecosystems.
- **Sources**: agricultural water sources are varied and not, in general, as reliable as piped supply networks, depending on rainfall and "stored" sources, mainly surface water (rivers and lakes) and groundwater (shallow and deep aquifers). For those regions where competition for scarce water resources is more intense, there is growing interest in using recycled water, mainly from processed drainage or sewage, and also desalinated water, but these options currently provide only a very small and highly localised supply of water for agriculture.
- **Uses**: heterogeneity of water in terms of space, quality and variability over time (seasonal and annual) presents challenges in matching supply and demand. A given quantity of water is not the same as another available at a different location, point in time, quality and probability of occurrence. The heterogeneity extends to structuring legal and institutional arrangements. Commonly, irrigation systems are a mix of publicly or collectively owned systems, and private systems where farmers have their own access to groundwater and/or invest in on-farm dams, reservoirs and irrigation infrastructure. Depending on how these different systems are managed, they can have varying consequences for the environment. It should also be emphasised that in periods of severe drought, the agricultural sector will frequently be the first sector to have to release water to meet other user needs, especially for urban water consumers.
- **Economics**: private (extraction) and public good (stewardship) characteristics of water imply different allocation mechanisms. When water is used on a farm it is a private good, but when left *in situ*, such as an aquatic habitat, it is a public good for which private markets are absent. Moreover, water is largely used by the private sector (farms, households, industry) but its ownership and delivery is normally in the public domain.
- **Institutions**: water resources are managed through complex and multilayered institutional and governance arrangements, often through national institutions and governance and, in some cases, cross national borders. Water institutions are also embedded in sub-national regional and local governments (water user associations), while the governance of surface water and groundwater are often separated.

2. Reforming institutional systems for water management in agriculture

The shift in policies with a greater accent on demand rather than supply management policies has brought reforms to the institutional and governance structure managing water resources. But the progress and path of water policy reforms has been mixed across OECD countries. Some countries have already undertaken major changes in water policies or are in the early stages of reform programmes, but for a few countries the progress toward reform has been limited.

Water policy reforms need to be developed as an integrated part of a broader reform framework, encompassing institutional changes to the way water services are delivered; defining water property (access) rights and entitlements; recovering costs for the delivery of water to agriculture; and providing a solid base for the financing of water delivery infrastructure so that the capital stock is not degraded. Also water policy reform processes should be seen in a longer term perspective as an integral part of the policy functions of government. This is becoming more important as climate change impacts on agriculture, taking the industry into uncharted territory in terms of water available to farmers, and the impact of flood and drought events on their businesses and surrounding areas.

Policy frameworks need to incorporate a high level of intra-government ministerial co-operation and coherence. Fiscal incentives for those governing water at the state/provincial or water basin level may be needed – at least in a transitional phase – to facilitate adjustment by farmers. Where farmers and other users own water distribution infrastructure they may be more likely to accept an increase in water charges and higher rates of cost recovery for water delivered to their properties than when they are imposed externally (Parker and Speed, forthcoming).

Water property rights in most OECD countries involve a complex set of rules, where water is often allocated in terms of quantities rather than prices, between users and for environmental needs. As pressures build up to reallocate water between users, this underlines the need for water access rights to become more flexible and supporting institutions more robust to ensure an economically efficient and environmentally effective allocation of water. But it also emphasises the need to explore innovative water-market solutions as allocative mechanisms.

Simplification of institutional arrangements, water-pricing rules and trading arrangements for agricultural water use, would improve transparency and accountability. There are frequently a plethora of institutions involved in managing, allocating and regulating water resources at all levels of government from local to national. These complexities can result in differing practices and regulations at the river basin level that create inefficiencies in allocation or trading of water resources to the highest value uses.

Progress has been made, however, towards decentralisation of institutional arrangements concerning water governance, from national/regional government levels to a water-basin level, favouring greater local engagement and involvement of water users in resource management. Some caution is necessary with the process decentralisation, however, as on occasions basin level management may require national involvement to avoid upstream players in a basin securing most of the water.

Developing stakeholder involvement is crucial to improve water and watershed management, but this takes time. Targeting communities, rather than individuals,

may be a preferred solution to water governance issues. But transaction costs for stakeholder involvement can be high, especially in the initial phase of pilot programmes, which points to the need to translate these pilots to a broader adoption or implementation at a larger scale so as to streamline the stakeholder engagement process. In this context, governments also need to monitor the equity and distributional effects of water reform policies on different stakeholders, and introduce appropriate safeguards and mechanisms to address these effects where they may be detrimental to both the farmer and wider community welfare.

Water planning and management in agriculture requires funding. The specification of water entitlements and developing water markets is often a pre-condition to a well-functioning water planning and management system. The operation of irrigation schemes, management of entitlements within them, and the delivery and pricing of the water under those entitlements occur within frameworks administered by water-resource agencies, often in the public domain, and which need to be adequately resourced. But to the extent that farmers are beneficiaries of public water-delivery systems, then the associated costs should be reflected in their water charges.

3. Ensuring charges for water supplied to agriculture cover delivery costs[3]

Rates of cost recovery, mainly operation and maintenance costs, for irrigation water delivered to farmers are increasing across most OECD countries, due to a combination of (which varies in importance regionally): changes in public preferences regarding water allocation among competing uses including environmental needs; greater budget scrutiny by national and sub-national governments; high energy prices; and increasing awareness and impact of climate variability and climate change with the implications for rainfall and the availability of water resources.

These issues will likely, in most cases, continue to encourage policy makers to further extend water pricing and other market-based incentives to improve cost-recovery rates for water supplies and motivate further improvements in water use efficiency in agriculture. Inevitably farm-level costs will increase (although the share of water in total farm costs may not in many cases be very significant), but innovative management and wise use of technology will enable farmers to adjust to generate greater value from limited water resources.

While water-market formation and the use of water-pricing instruments can bring benefits in improving water use efficiency in agriculture, expectations that these approaches alone can adequately address economic, environmental and social issues related to water are often over-optimistic. This is because there remain many impediments to water-market formation related to, for example, issues of equity, incomplete science, specific quantity-related property rights, high transaction costs in creating water markets, and the historical allocation of water.

There are still many farmers in some countries, and regions within countries, who benefit from policies that allow them to forego repaying capital expenditures for irrigation infrastructure, or to schedule repayment over many years with zero interest. But the number and proportion of such arrangements is beginning to decline with water-policy reforms. Increasingly governments seem inclined to require cost recovery for any future irrigation projects and to improve the rate of

cost recovery, as much as possible, from existing projects. There is also an effort to shift from pricing for irrigation water based on the area covered to the volume of water used in many countries.

The possibilities of using water markets and pricing as a policy tool to achieve environmental objectives in agriculture seems, however, to be more limited. In addressing these issues a different mix of policies may be appropriate, such as the use of well-targeted payments where farmers provide a clearly defined and verifiable public good or service, such as wetland conservation areas. Regulatory and planning instruments might be most applicable in the case of addressing sustainable use of groundwater resources, although these policy instruments are also essential for setting the management frameworks for surface water. For a few countries, however, they are using water markets to meet environmental objectives, such as purchasing water entitlements to rebalance water consumer and environmental needs, and public sector water purchases to supplement water supplies to wetlands.

Defining, securing and agreeing among stakeholders the quantity of water needed in a water basin to sustain environmental outcomes is a key issue for many OECD countries. This will necessitate enhancing the knowledge and monitoring of water flows and interconnections between surface and groundwater flows, and re-examining the concept of "minimum flows" as the sole measure to assess environmental needs in rivers and lakes. This is also linked to the need to improve methods for identifying natural water bodies and aquatic biodiversity that are considered to be under threat.

Water policies in many countries also need to address the imbalance between the current focus on surface water and pay greater attention to the overuse and pollution of groundwater and the full water cycle. In addition, policy makers have to consider a range of mechanisms, including market approaches that can be used to allocate water between different uses, as over-allocation of water to title holders can lead to economic and environmental damage.

The costs of pumping groundwater can be expected to increase with the anticipated higher levels of energy prices and declining water table levels. OECD governments will likely increase their efforts to manage groundwater as scarcity increases in many areas, and as the public becomes more concerned about the regional economic implications of groundwater overdraft.

Recent increases in public awareness of the potential implications of climate change and public concerns regarding sustainability will further encourage policy makers to intensify their management of groundwater resources, while also enhancing the need for new regulatory measures that might include charges that reflect scarcity values. But achieving cost recovery for groundwater supplies is complex, as is the development of a market for groundwater. The property rights issue is central in this respect.

Many irrigation areas in OECD countries face the problem of aging infrastructures and a declining revenue base from which to fund maintenance and repair activities. The drive toward cost recovery for storage and delivery services arising from water reform policies means that both water suppliers and irrigators are beginning to consider the strategic evaluation of infrastructure renewal to remain viable. This raises questions as to future sources of finance and asset

management. The transfer of financial control and investment management may require water user groups to seek public private partnerships to raise capital and develop skills in long-term asset management for infrastructure renewal.

4. Enhancing agriculture's resilience to climate change and climate variability impacts

Farming systems and water resources have been increasingly vulnerable to climate change and climate variability, although there is significant regional variation within and across OECD countries. The most recent IPCC (IPCC, 2008) assessment and OECD government reports confirm that this trend is expected to continue.[4]

Changes in water availability and temperature, as well as the growing incidence and severity of floods and droughts, will require high levels of adaptive responses to address these issues so as to enhance the resilience of agricultural systems to produce enough food, fibre and fuel in light of these events. However, it should be stressed that in some countries (that are constrained at present in terms of expanding agriculture) climate change may lead to benefits and positive opportunities for agriculture.

Climate change can also have a dual effect on irrigated agriculture. This may occur through both higher water demand by agriculture and an expansion of the area irrigated These developments are due to both general climate change (higher temperatures and lower precipitation) and climate variability leading to an increase in extreme events, especially the frequency of droughts, necessitating the restructuring of irrigation systems.

As the frequency and severity of drought and flood events is increasing, this is leading to rising budgetary costs for governments in supporting affected farmers and the rural community, and higher costs for private insurers (OECD, 2006). The rising cost of flood and drought relief, for agriculture and society as a whole, is exacerbated in some cases by the fragmentation of responsibility and the lack of policy coherence in agricultural, environmental, land and water policies to address these problems.

Where farmers are guaranteed government support in times of flood and drought disasters (moral hazard), this does not always signal the incentives to improve farmer self-reliance and risk management for adverse events. Hence, greater policy attention and investment will be required in water control (for floods), water retention (droughts) and farm practices that can reduce economic losses and lead to better management of water flows and stocks on farmland.

Given the prospect for increasing **flood events** associated with climate change, farmland is likely to play an important role in mitigation and adaptation strategies for flood risk management. Policies that are able to combine flood risk management with other objectives, such as for nature conservation, the protection of natural resources and agricultural production, are likely to offer the best long-term solutions.

Where particular agricultural land management practices are known to result in serious flood risk, there may be a call for regulation and compliance with "good practice". Moreover, in cases where farmers purposefully manage land to retain and

store potential floodwater to reduce flood risk for the benefit of others, there can be scope for policies to reward them accordingly, although this may be highly localised (Morris, Hess and Posthumus, forthcoming).

In many OECD countries the incidence and severity of **drought events** has also been increasing over recent decades, with the resulting decrease in agricultural production, as has been the case for floods. The expectation is that such events will occur more frequently in the future due to climate change and climate variability, so improving the resilience of agriculture to drought will also be important.

It is essential in drought-prone areas for agriculture to improve its water use efficiency, in part, to free water for other users and environmental purposes. This might be achieved through: reducing leakages in delivery systems; developing on-farm rain harvesting practices and systems (*e.g.* conservation tillage, fallow rotations); greater use of recycled sewage/drainage water and desalinated water, where appropriate; improving soil moisture measurement; increasing adoption of more efficient water application technologies, such as use of nanotechnologies; encouraging greater adoption of drought resistant cultivars; and harnessing water banks by recharging groundwater during times of low seasonal demand for water.

But whether these higher water use efficient systems and practices actually reduce water demand will depend on the hydrologic conditions of the site or water basin and the legal provisions that curb farm/basin consumptive use. Moreover, in many cases the technologies to make water savings are already known, but it is the barriers to their adoption that are an important challenge for policy makers.

5. Improving policy integration between agriculture, water, energy and environment policies

For many OECD countries policies across agriculture, water, energy and environment are formulated without explicitly considering their interrelationship in any comprehensive manner or their unintended consequences. Recognition (and practical implementation) of policy integration across different scales of decision making – from the farm through to water catchment, national and international levels – is a gap in many countries. Policy coherence and integration also relates to broader national questions of what institutions make decisions to allocate water across sectors and for environmental needs.

Some progress, however, is being made toward greater policy coherence and integration, in particular, in relation to flood plain management, land use and water policies, and also concerning decoupling of agricultural policies and water use efficiency. In the case of links between the support for energy in agriculture and the production of biofuels from agricultural feedstocks, however, further progress is required to develop policy coherence in the context of improving WRM in agriculture.

More integrated and coherent policy approaches are beginning to take shape as countries address climate change, such as between previously separated policy domains of climate change, water policy, flood and drought control policies, and agri-environmental policies. For example, the restoration of land in flood plains by planting trees has helped to reduce impacts of floods, improved water quality, and led to co-benefits such as restoring biodiversity and sequestering greenhouse gases.

Agricultural and agri-environmental support policies across OECD countries act to provide an intricate mix of incentives and disincentives toward sustainable WRM. The use of crop and livestock market price support provides incentives to intensify agricultural production, while support for farm inputs, especially water (lowering water charges and for on-farm irrigation infrastructure costs) and energy (for water pumping) misalign farmer incentives and can aggravate overuse and create pollution and other environmental damage to water resources, especially where water stress is a serious issue and the value of water is high.

But isolating and quantifying the overall economic efficiency and environmental effectiveness of agricultural and agri-environmental support on water resources is difficult, and further analysis on causation is needed. This is because farmers are usually responding to a very complex set of signals in making water-management decisions, including institutional constraints (*e.g.* regulations on water allocations), or because the change in relative prices associated with reduced output-linked payments may cause farmers to switch to previously non-supported crops that are more water intensive than those that benefited from coupled support payments.

Water use efficiency increases that might derive from shifting to decoupled support may also not benefit the environment. Whether and to what extent the environment benefits may depend, in part, on the use of the "saved" water. If it is used to expand irrigated land, or to shift to crops that are more water intensive, the environment will not necessarily benefit from efficiency improvements. Again, the complicated set of water-allocation institutions and property rights will drive this relationship. Moreover, some environmental policies have affected the supply of water for agriculture, by increasing quantities available for the environment. Even so, preliminary studies of the EU Common Agricultural Policy reforms, for example, suggest that the shift to decoupled payments has led to a reduction of irrigation (especially maize, a water-intensive crop) in areas where water stress is an issue (Garrido and Calatrava, forthcoming).

Agricultural policy reforms across most OECD countries, however, has led to an overall reduction in support levels (as measured by the OECD's Producer Support Estimates) and decrease in the share of support most linked to commodity production and unconstrained use of inputs (such as water and energy) (OECD, 2008c). The shift to decoupled agricultural policy measures is likely to lead to a positive outcome for water resources and the environment, especially in water-stressed environments. Hence, the increasing adoption of agri-environmental measures by OECD countries has both a direct (*e.g.* wetland conservation) and indirect (*e.g.* conservation tillage helping to retain soil moisture) effect on improving WRM and environmental outcomes.

As long as market support for commodity production remains and water and energy support to farmers persists, however, this will work against the gains from decoupled support measures. But decoupling support from production and inputs does provide a basis for improving water efficiency and enhancing environmental benefits in agriculture, especially where there is a cross compliance condition attached to a decoupled payment (*e.g.* authorisation of water abstractions rights as a precondition for implementing "good" agri-environmental practices).

The continued use of support for energy in agriculture, both directly through support for diesel and electricity, and indirectly for feedstocks to produce biofuels

and bioenergy, can increase pressure on water resources. This is most evident where support for energy, by reducing pumping costs, is leading in some countries to excessive extraction of groundwater, and removal of this form of support may contribute to more sustainable water use in agriculture (OECD, 2008a).

The overall impacts on water balances of supporting agricultural feedstocks to produce biofuels and bioenergy, however, is complex and remains unclear.[5] It is a largely empirical question and needs to be assessed in a way that compares the effects of alternative uses of resources. However, research suggests that the quantity of water needed to produce each unit of energy from second generation biofuel feedstocks (*e.g.* lignocellulosic harvest residues and forestry) is three to seven times lower than the water required to produce ethanol from first generation feedstocks (such as from maize, sugar cane and rapeseed), although this can vary according to the location and practices adopted (Berndes and Borjesson, 2001).

6. Addressing knowledge and information deficiencies to better guide water resource management

Improving the effectiveness and efficiency of policies to achieve societal goals related to water requires better information at many levels. This is especially important because water reforms are tending to become more decentralised and complex, while management of water in agriculture is highly diverse. Achieving cost recovery targets, developing water pricing and trading mechanisms, clarifying water entitlements and changing institutional arrangements, need to be underpinned by more and reliable information.

A substantial effort is underway across many OECD countries to address information deficiencies to better guide policy making. Encouraging examples are the monitoring of minimum water flow rates in rivers as part of environmental planning. Moreover, comprehensive river basin assessments are being undertaken, for example, in the EU under the Water Framework Directive and in Australia under the National Water Initiative. However, considerable information and knowledge gaps still remain.

In five key areas improvements in knowledge, science and monitoring of water resources in agriculture could help better inform policy makers, stakeholders and the wider public:

- Improving the **knowledge and science** of the inter-relationships between agriculture and water availability, and between surface water and groundwater flows.
- Establishing robust **databases on trends** in water resource availability and use, including use by agriculture. This includes data on the sources of water used; improved calculations of the physical and economic efficiency of water use in agriculture; and a better understanding of the links between on-farm water use and off-farm environmental impacts.

- Increasing the quantity and quality of information on **cost recovery rates** for water supplied to agriculture. Considerable caution is required in using and comparing data on cost recovery rates and agricultural water charges, both within and between countries, because of the (Garrido and Calatrava, forthcoming; Nickum and Ogura, forthcoming):
  - Lack of transparency in data related to the financial costs for supplying water, especially capital costs. Simplification of water pricing and cost-sharing mechanisms on a system-wide basis would improve transparency and make it possible to establish more precise estimates of how much of total irrigation capital costs are covered by central and local governments, co-operatives and private businesses, including farm enterprises.
  - Many water distribution networks and storage facilities are often shared with multiple users, including agriculture, so allocating financial costs to different water users is complex, while knowing how much water is actually supplied to agriculture undermines efforts to improve cost recovery rates.
  - Major publicly funded irrigation projects are often undertaken over many decades in a piecemeal fashion, making accountancy of the projects difficult.
  - Evaluation of replacement costs over the lifecycle of a dam or reservoir is complex.
- Developing **information systems and tools** to better inform water management allocation decisions. This applies at the: strategic planning level in order to optimise the planning of irrigation infrastructures, such as information systems to assist planning decisions in the face of increasing climatic variability; tactical level, to identify the optimal allocation of water for a given period (season, year); and at the operational decision-making level, to optimise water distribution at the farm level. The latter also requires improvements in the tools to manage water systems, such as providing technical information and advice, and offering farmers educational programmes on best practices to adopt, especially as climate-related change impacting on water may require changes to current farm practices.
- Greater **evaluation** of the impacts of policies on environmental and economic outcomes in the context of agricultural water resource management. This would provide a contribution to broader based agri-environmental policy evaluation, such as the need to better understand the link between agricultural policies and water use efficiency. Aside from academic research on these linkages, there is little evaluation by governments of the environmental effectiveness and economic efficiency of agricultural water resource management policies. Quantifying the net costs and benefits of water resource use by agriculture in a sustainable development framework is a necessary component.

As water policies become more sophisticated when applied to agriculture, the analysis and evaluation needs to be underpinned by relevant information and sound administration. Hence, policy implementation and evaluation requires attention to the "soft" infrastructure – meters, stream gauging networks, hydrologic and scientific support, water reporting systems, farm surveys, and benchmarking of irrigation businesses (Parker and Speed, forthcoming).

Water entitlements and trading, moreover, require real-time management of flows in rivers and detailed monitoring of extractions. In the longer term, a sustainable water entitlement system implies a sound understanding of the (technical) science related to river health and hydrologic performance, and (economic) assessments of the efficiencies of monopoly water businesses and the consequences of reforming monopoly structures for agricultural production (Parker and Speed, forthcoming).

None of this information is obtained cheaply or easily, but without it policy reforms will be at a disadvantage and effective water policy decision making, planning and management could be impeded.

Notes

1. This chapter is based on a forthcoming OECD (late 2009) publication, *Sustainable Management of Water Resources in Agriculture*, OECD, Paris, *www.oecd.org/tad/env*.

2. The linkages between agriculture and water quality are partly examined in OECD (2008a), but this issue will also form part of a forthcoming OECD project commencing in 2009.

3. Delivery costs include operation and maintenance costs and capital costs, covering both renewal of existing infrastructure and new capital investment costs. This section draws on five forthcoming OECD consultant reports included in OECD (forthcoming) as follows: Cakamak, forthcoming; Garrido and Calatrava, forthcoming, Nickum and Ogura, forthcoming; Parker and Speed, forthcoming; Wichelns, forthcoming.

4. For a selection of recent OECD country reports on climate change, agriculture and water, see for example: CSIRO, 2008 (Australia); Lemmen, *et al,* 2007 (Canada); European Parliament, 2008 and Portuguese Ministry of Environment, 2007 (European Union); USEPA, 2008 (United States).

5. There is a growing research literature on the relationship between agricultural cultivation of feedstocks for biofuel and bioenergy production and its impact on water resources and pollution; see for example: Berndes (2008); Berndes and Borjesson (2001); EEA (2008); de Fraiture, Giordano and Liao (2008); Hellegers, Perry and Berkoff (2008); Liao, Giordano and de Fraiture (2007); National Research Council (2008); Varis (2007).

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Managing Water for All

AN OECD PERSPECTIVE ON PRICING AND FINANCING

Water is a key prerequisite for human and economic development, and for maintaining ecosystems. However, billions of people lack access to water and sanitation services, mainly due to poor governance and inadequate investment and maintenance. The situation is becoming more urgent due to increasing pressure, competition and even conflict over the use of water resources.

The OECD has been working for many years to address these challenges. The results of recent work are summarised in this report, which emphasises the economic and financial aspects of water resources management and water service provision, the need for an integrated approach (including governance considerations) to address these complex policy challenges, and the importance of establishing a firm evidence base to support policy development and implementation.

This report examines: strategic financial planning for water supply and sanitation that balances the key sources of revenues for the water sector – the "3Ts" of taxes, tariffs and transfers; the design and implementation of water pricing strategies that balance financial sustainability with other policy objectives; recent developments in private sector participation in the water sector; and trends and the future outlook of water use in agriculture. It considers both developing and OECD countries and offers concrete recommendations and checklists for action. The report is an invaluable resource for policy makers, academics, NGOs and all others interested in the challenges facing the water sector today.

The full text of this book is available on line via this link:
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