Pricing water resources to finance their sustainable management

A think-piece for the EUWI Finance Working Group

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Formed in 2003, the European Union Water Initiative Finance Working Group (EUWI-FWG) is focused on helping to shape the financial strategy of the EUWI. The FWG encourages innovation, the development of institutional and regulatory frameworks and capacity building. It also encourages the use of development funding as a catalyst to leverage other forms of finance, including national budgets, donors, user and private finance, to improve access by the poor to water and sanitation services. The EUWI FWG is hosted by the Global Water Partnership, which provides secretariat and administrative support.

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Contents

Acronyms **1**

1. Introduction **2**

About this document 3

2. The role of water pricing in water policy and financing **3**

Water policy objectives and water pricing 3

Water financing and water pricing 5

Water resources management and water pricing 6

3. Water pricing mechanisms **7**

The menu of options 7

Water levies in practice – regional overview 10

Water levies – examples from selected countries 12

Payments for watershed services as sources of revenue 16

Payments for water-related tradable rights 18

4. Key issues around water pricing **19**

5. Opening the debate on pricing for WRM **20**

References **22**

Acronyms

3Ts	Tariffs and other user charges, tax-payer funded subsidies, and external transfers
AfDB	African Development Bank
AMCOW	African Minister's Council on Water
EECCA	Eastern Europe, Caucasus and Central Asia
EUWI	European Union Water Initiative
EUWI-FWG	European Union Water Initiative – Finance Working Group
GWP	Global Water Partnership
OECD	Organisation for Economic Co-operation and Development
PES	Payments for ecosystem services
PWS	Payments for watershed services
SFP	Strategic financial planning
WRM	Water resources management
WSS	Water supply and sanitation
WWAP	World Water Assessment Programme

1. Introduction

Financing the sustainable management of water resources is a major and increasing challenge. Global expenditures for water resources management (WRM) are in the order of USD 70-90 billion (2030 Water Resources Group, 2009). Actual expenditures often fall short of financing needs -- just in Africa, the financing gap for water resources management has been estimated at USD 2.4 billion per year (Foster and Briceno-Garmendia, 2010). And the cost of managing water resources to reach social, economic and environmental goals is increasing due to population and economic growth as well as to climate change. For example, the cost of water-based measures to adapt to climate change have been estimated at USD 13-17 billion per year for developing countries alone (WWAP, 2012).

What is the role of water pricing in meeting the financing challenge? Traditionally, water resources management has been largely financed by public budgets (tax-payers). In developing country contexts, external transfers have often played an important role in financing water management – in particular transboundary water management. The combination of increasing needs and a tightening of public budgets (both domestic water budgets and donor budgets for water) suggest the need to explore to what extent and how water users could be a significant source of funding for the future through water pricing mechanisms. Here the term 'water user' refers to any entity that has use of the water, not just individuals and households, but also private companies and public institutions.

The financing challenge and the role of water pricing need to be considered in the context of three key trends:

1. The looming "water crisis", which is essentially a water management crisis. Recent projections indicate that global water demand will increase by 53% between 2000 and 2050 (OECD, 2012a). This will increase the pressures on water-related ecosystems and exacerbate tensions between economic sectors. Meeting the demands that society places on the water sector will require both major investments and widespread reforms – in terms of governance, policy coherence and financing (OECD, 2012b).

2. The emerging "green growth/green economy" paradigm. This should facilitate the implementation of good water resources management in at least three aspects: (a) increasing recognition of the need to protect water resources and water-related ecosystems as economic assets, (b) better allocation of water resources (in terms of economic productivity), and (c) increasing attention to investments in nature-based/green infrastructure (such as upper watershed forested lands, wetlands, aquifers and floodplains) as more efficient alternatives to hard infrastructure[1].

3. The evolving discourse on "financing water for all". Water financing discussions were traditionally focused on advocating increased financial resources centred on drinking

[1] For a fuller discussion on water and green growth see for instance Government of Korea and WWC (2012).

water supply and sanitation. In recent years, more attention is being paid to sustainable financing (bringing realism and a strategic view to balance the requests for financial resources with the likely revenues of the sector from users, tax-payers, and external transfers). Only very recently has a discussion started on financing water resources management (both its governance and infrastructure dimensions).

About this document

The **aim** of this document is to stimulate discussion among water policy-makers and water managers in developing countries, as well as water officials in development cooperation agencies, about the options for water pricing to contribute more substantively to the sustainable financing of water resource management functions.

The document is **structured** in four sections: (i) introduction, (ii) water pricing as part of water policy and financing, (iii) water pricing mechanisms, and (iv) key issues around water pricing. The document illustrates water pricing options with examples from OECD countries (where pricing mechanisms have been implemented more extensively) and to the extent possible from developing countries from the EUWI focus regions. The paper concludes with a call for more study and debate on pricing for WRM.

The immediate **audience** of this document is constituted by the members of the EUWI Finance Working Group, the members of the EUWI regional working groups, the UN and international organisations and policy advocacy stakeholders (such as the GWP regional and country partnerships).

2. The role of water pricing in water policy and financing

Water policy objectives and water pricing

Water policy aims to achieve multiple objectives. Traditional water policy objectives have been mostly related to economic and social issues: protecting populations and economic assets from floods, providing the population with safe drinking water as well as sewage collection transport and disposal, and providing economic activities (agriculture, mining, hydropower generation, industry and commerce) with water as an input for production. More recently, environmental policy objectives were added to the water policy agenda: protecting water-related ecosystems. While all these objectives can be grouped under a macro-objective such as “achieving water security”, the underlying multiplicity of objectives means that trade-offs between individual water policy objectives may emerge and that multiple policy instrument are required.

Water pricing is a family of instruments within a broad water policymaker toolbox. There are many water policy instruments – table 1 provides a classification of policy instruments with some examples. One remarkable aspect of water pricing instruments is that they have both revenue and incentive effects. For example, in the area of raw water availability, water pricing generates incentives to reduce water consumption and it raises revenue to fund

water management and development functions (such as hydro-meteorological information, allocation of permits or building storage dams). In contrast, other economic instruments have incentive effects but no revenue effects for public authorities (e.g. tradable permits) or they represent expenses rather than revenues (e.g. subsidies).

Table 1. Examples of water policy instruments

Economic instruments	Regulatory instruments	Information-based instruments	Direct provision
• Water pricing • Tradable water quantity or quality permits • Subsidies	• Permits to discharge effluents in water bodies • Environmental impact assessment	• Eco-labelling • Disclosure of water polluters ratings • Environmental education	• Flood control infrastructure • Public rescue and emergency services • Wastewater treatment plants

Water pricing can be a very powerful instrument in pursuing the different water policy objectives. Water pricing is often promoted by economist for its **incentive** effects. For example, if the price of bulk water increases to a relatively high level, there will be a strong incentive for an industrial facility to invest in water-saving technologies. This will have two positive consequences: it will lead to **resource efficiency** (e.g. less water is used as an input to produce the same level of output) and it will also lead to **allocative efficiency** (e.g. water will move from activities where it represents low value to those where it represents high value). Thus, water pricing can simultaneously promote economic growth and environmental sustainability objectives.

In addition, water policymakers are often attracted to water pricing for its **revenue effects**. The revenue raised by water pricing instruments can then be used to fund the variety of water resource management functions needed to achieve the water policy objectives. This helps to explain why water and wastewater charges are among the most widely used economic instruments for environmental policy in OECD countries (see OECD, 1998).

The use of water pricing needs to take into account its impact on the trade-offs between different water policy objectives. For example, water can be allocated to productive uses or to ecological flows. In this case, water pricing may help to ease the trade-off by reducing the demand of water for productive uses. In the area of Water Supply and Sanitation (WSS) services, water pricing is at the heart of a trade-off between financial sustainability of service providers on one side and economic efficiency and environmental protection on the other side[2], but this trade-off is likely to be less prominent for WRM functions. Water policymakers are often also concerned about the affordability impacts of water pricing – in the area of water resources management these concerns tend to focus on the impact on small farmers.

[2] At a certain level, increases in volumetric charges will encourage substantial reductions in water consumption and thus reductions in revenues for the water operators. The associated reductions in costs of production are likely to be lower than the reduction in revenues because the brunt of water services provision costs are fixed. This would create a financial loss for the water operator.

OECD (2010) offers a fuller discussion of trade-offs between water policy objectives in the context of water pricing.

Water financing and water pricing

This document focuses on the contribution of water pricing to financing water resources management. Discussions on water financing have traditionally focused on water services – mostly on drinking water supply and sanitation services and to a lesser extent on irrigation services. Nevertheless, increasing attention is being paid to the financing of water resources management[3]. Indeed, another output of the EUWI-FWG (2012) explores the African experience with financing water resources management.

Current international water financing discussions evolve around the concept of sustainable financing. This is an improvement over the traditional focus on advocating for more public resources (both domestic and international). The new consensus is that water policy needs to identify what objectives are financially realistic, taking into account that there are only three sources of revenue from the sector – the 3Ts (user charges such as water tariffs, public expenditures financed by domestic taxes, and external transfers financed by tax-payers in donor countries as well as by charities). An iterative and participatory process of strategic financial planning (SFP) for the water sector can be put in place (at national or sub-national level) to identify water policy objectives, cost them, explore options to minimize those costs, assess the current revenue streams, assess the potential of each of the 3Ts to bring additional revenues to close the financing gap, and adjust policy objectives to fit into the financial realities of the sector[4]. The revenues and expenses do not need to be brought into balance every year – the planning horizon for such exercise is typically 20 years and commercial finance (such as bonds, loans or equity investments) could be attracted to bridge the financing needs in the early years, knowing that those could be repaid over the planning period thanks to the revenues from the 3Ts.

Water pricing is a key element of sustainable financing. Within the WSS sub-sector, it is recognized that water tariffs should become over time the main source of finance among the 3Ts. This is both because water supply and sanitation are services that need to become more customer-oriented, and because customers are generally willing to pay the cost of good quality and efficient services that are affordable and respond to their needs. For WRM, the role of water pricing has been much less discussed and there is no such a clear consensus. The traditional view has been that WRM functions are public goods and thus public funding would be justified. There are at least two flaws with this view. First, from an

[3] The Global Water Partnership published in 2008 a report on financing the governance aspects of water resources management (Rees et al, 2008) and in 2009 a policy brief on financing water resources infrastructure as part of the integrated water resources management approach (GWP, 2009). The OECD organized in 2010 a workshop on financing water resources management and is about to complete a report on this topic. In 2012, the finance theme discussions at the 6th World Water Forum featured a session on financing water resources management led by the Asian Development Bank. Also at the Africa Water Weeks and the 6th World Water Forum, session on water financing in Africa led by the African Development Bank and AMCOW included discussions of financing mechanisms for water resources management.

[4] See OECD (2009) for more information about the SFP approach, and Winpenny (2010) for a discussion on the application of SFP in African contexts.

economic theory perspective some WRM functions display public goods characteristics[5], but others do not. Second, from a practical point of view, the argument has not worked with ministries of finance (and donors) and as a result water resources management in many countries is grossly underfunded[6]. This does not mean that public funding should not be used to pay for WRM functions – rather, the intention is to show that water pricing is also an option and that the potential of water pricing as a key element for the sustainable financing of water resources management merits a harder look.

Water resources management and water pricing

Water resources management encompasses multiple functions. There is no universally accepted definition of water resources management. For example, in developing countries flood control or bulk water provision are seen as part of water resources management while in advanced European countries those functions tend to be labelled as water services. A classification of WRM functions can be found in Rees et al (2008). It is useful to distinguish between functions related to water governance (such as water planning, policymaking, stakeholder involvement, allocation of water permits) and infrastructure-heavy programmes, whether to protect the resource (such as wastewater treatment) or to serve productive uses (such as bulk water supply). For the purpose of this paper, WRM includes both overall water governance, water resources administration as well as *some* water services (such as flood protection, bulk water supply, and wastewater treatment) while it excludes some other services (such as retail water supply, sewage collection, or on-farm irrigation).

Due to the nature of WRM functions, WRM pricing is less straightforward than pricing of WSS services. Retail WSS services tend to deliver relatively clear and well understood benefits, the beneficiaries are generally easy to identify, they tend to be willing to pay for the services[7], and strategies to address affordability concerns are well developed. That does not mean that there are not a number of important challenges regarding its implementation (see for instance OECD, 2009). WRM functions, on the other hand, are a mix between private and public goods (see table 2).

[5] In economic theory, public goods display two characteristics: they are non-rival (the consumption by one agent does not affect the consumption by another agent) and they are non-excludable (an agent cannot be excluded from consuming the good)

[6] Another EUWI-FWG publication (2012) explores the issues around financing water resources management with special attention to the experience in Sub-Saharan Africa.

[7] It is worth noting that basic sanitation is different from water supply because while retail water and sanitation services are private goods, the health benefits of individual access to basic sanitation are not always well understood by the users (private benefit component) and basic sanitation also generates positive externalities at community level in terms of health impacts (public benefit component). An additional rationale for policy interventions to favor the provision of basic sanitation is that it is often considered a “merit good” – meaning that there is a social consensus that everybody should be able to have access to basic sanitation (in the case of sanitation, for its dignity and private health benefits).

Table 2. Are water resources management functions public goods?

		EXCLUDABILITY Can an agent be excluded from consuming the good?	
		YES	NO
RIVALRY Does the consumption by one agent mean that there are fewer goods to be consumed by other agents?	YES	**Private goods** e.g. bulk water supply, water abstraction licenses, point-source effluent discharge	**Common-pool resources** e.g. unregulated groundwater abstraction, unregulated fishing
	NO	**Club goods** e.g. regulated non-consumptive uses of water (recreation, river transport, hydropower)	**Public goods** e.g. water policy-making, water monitoring, flood control, wastewater treatment

Source: author

Nevertheless, WRM pricing can play a more fundamental role that is currently the case. There are a significant number of WRM functions that display 'private goods' and 'club goods' characteristics and are thus amenable to charging. Common-pool resources need to be regulated; whether by an external authority such as the State or by the community of users of those resources, and that process would also enable water charges to be applied. Finally, while user charges cannot be applied directly to public goods, in some cases (such as local flood protection schemes) taxes can be designed to approximate charges for the benefits derived by the beneficiaries of the WRM function.

3. Water pricing mechanisms

The menu of options

Water pricing encompasses a wide variety of instruments. There are two major families of water pricing mechanisms, which could be labelled respectively as "water levies" and "negotiated payments".

In this document, the term **"water levies"** refers to prices that have been determined by administrative procedures. The term groups together water-related **taxes** and water-related charges[8]. Both are compulsory (as opposed to voluntary) payments, the difference is that **charges** are in exchange for a service and taxes are not. Accordingly, the amount of a charge should be in relation with the service provided. While there are many borderline cases, the distinction (and the naming) may become important in practice because ministries of finance (following public finance principles) are generally opposed to earmarking taxes. Water levies can be further classified according to their rationale. Accordingly, table 3 distinguishes five types of water levies: regulatory levies, water use levies, water pollution levies, water service levies, and fines and damage compensation penalties.

[8] Charges are sometimes called fees, but they represent the same type of instrument

In this document, **"negotiated payments"** are payments determined by negotiation between a limited number of parties[9]. They represent a relatively novel category of pricing instruments, compared with water levies. The two major sub-categories are: **payments for watershed services**[10], and **payments for tradable water-related rights**: such as water abstraction rights, water pollution rights, or wetland development rights. In the case of negotiated payments, water authorities do not receive revenues to fund WRM actions, while the private actors that receive the revenues generally use them (in total or in part) to fund WRM actions. For example, in the case of payments for watershed services, upstream farmers will incur expenses to manage their land in a way that generates the watershed services. In the case of tradable water-related rights, the original owner of the rights (such as a farmer for water abstraction rights, or an industrial facility for pollution discharge rights) may decide to reduce its level of economic activity (to use less water or to generate less wastewater) or it may decide to fund WRM actions (such as water-saving equipment or wastewater treatment equipment) to be able to continue with its previous level of economic activity after having sold part of its rights.

[9] Those parties may be private or public, but public parties take part in negotiations in the same role as any other economic agent (such as paying for a service that another party provides) and not as an authority that exerts regulatory powers

[10] Given that the terms payments for ecosystem services (PES) can refer to a broad range of ecosystem services (such as carbon sequestration), this document uses the term "payments for watershed services", which is often used when discussing their use in a water context.

Table 3. A classification of water pricing instruments

	Pricing instrument	Who pays	Rationale	Use of revenues
WATER LEVIES	Regulatory levies	Regulated parties that demand regulatory services	The processing of certain regulatory services (such as the issuing of water abstraction or fishing licenses) entails costs while the benefits accrue exclusively to the regulated party	Revenues can be used to fund the cost of processing of licenses and other regulatory services.
	Water use levies	Water users	Users derive a benefit from the consumptive (e.g. water abstracted for irrigation) or non-consumptive use of water (e.g. hydropower, river transport, fishing) as well as riverbed materials.	Revenues can be used by water authorities to fund the water governance functions and infrastructure required to manage water resources and ecosystems
	Water pollution levies	Water polluters	To encourage reductions in pollution and to apply the polluter pays principle	Revenues generated by these levies (e.g. effluent charges and pesticide taxes) can fund actions to compensate for the damage produced
	Water service levies	The users and beneficiaries of water-related services	Users and beneficiaries derive a benefit from water-related services (e.g., flood control, bulk water provision, wastewater treatment)	The revenues generated by water-related service charges and taxes can be used to fund the provision of those services
	Fines and damage compensation penalties	Regulated parties that do not comply with regulations	The primary rationale is to encourage compliance with water regulations, but these levies can be also be used to apply the polluter pays principle	Revenues can be used by water authorities to fund the cost of remediation of the damages caused by the illegal behavior. Revenues generated by fines can also be used to cover the costs of compliance promotion and enforcement (but care must be taken to ensure that water authorities' behavior is not affected)
NEGOTIATED PAYMENTS	Payments for watershed services	Downstream beneficiaries of upstream land use changes	Changes in practices by upstream land managers generate benefits for downstream users that will exceed the costs of the changes for land managers	The revenues generated accrue to the upstream land managers that will partly use them to fund the change in management practices
	Payments for tradable water-related rights	Buyers of water-related rights	Prices emerge from the exchange of water-related rights (such as water abstraction, water pollution and wetland development permits) between two parties to mutual benefit	The revenues generated accrue to the original holder of the water-related rights – which may partly use them to fund e.g. investments in water-saving, wastewater treatment equipment, or wetland restoration

Source: author

Water levies in practice – regional overview

The use of water levies varies across regions of the world. The use of water abstraction and water pollution levies is extensive in OECD countries. In Eastern Europe, Caucasus and Central Asia (EECCA), water pricing is often in place but there is potential to increase revenues from increasing rates and introducing automatic price adjustments. In Africa, some countries are introducing water pricing beyond WSS tariffs, but there remains great potential to increase revenues from users and beneficiaries. As discussed later, Latin America is a leader in payments for watershed services but there is no recent survey of water resources pricing in the region.

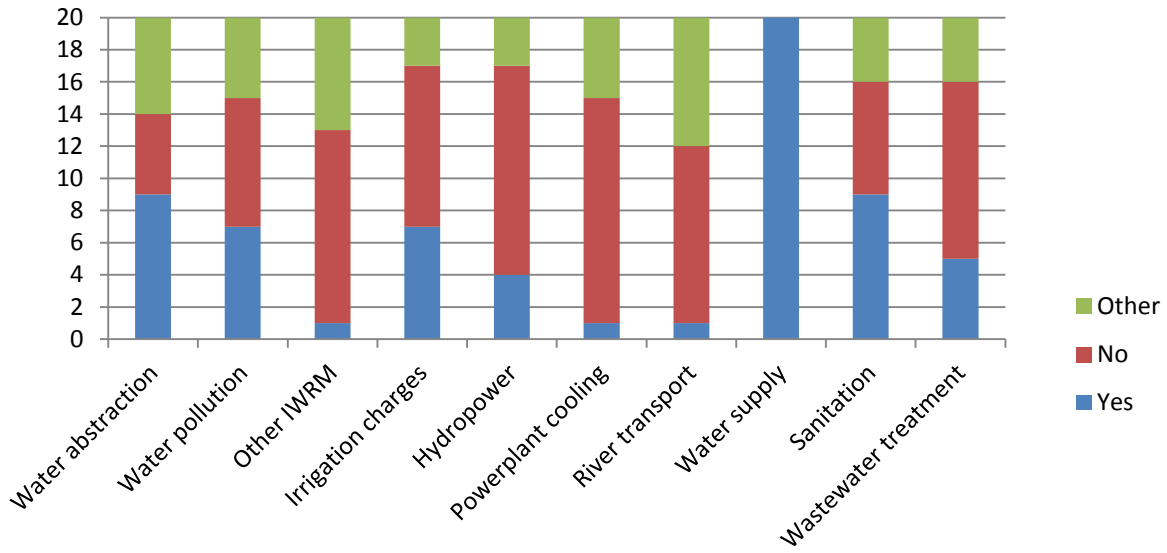
Water pricing in OECD countries[11]**.** Most OECD countries charge for direct water abstraction. The basis for charging is in some cases capacity to use, in other cases actual use, and in some cases a combination of both. Despite the fact that in most OECD countries abstraction charges are designed with the objective of providing funding for WRM or for watershed protection activities, abstraction charges tend to be relatively low. Higher charges tend to be imposed on groundwater than on surface water, and in about half of OECD countries the abstraction charges are differentiated by user type. The rate of abstraction charges varies widely -- two orders of magnitude between Hungary and the Netherlands – but for a sample of European OECD countries they seem to cluster around 5-15 US cents/m^3. Those charges are generally reflected in retail WSS tariffs. A majority of OECD countries apply pollution levies – in fact more than abstraction charges. In most cases they are based on pollution content and are collected at local level to finance environmental activities. They can represent a significant share of the total water bill for end users.

Water pricing in the EECCA region[12]**.** Progress in water pricing is uneven, at best. Water prices were heavily subsidized before 1990, yet in some EECCA countries there has been a marked increase in water prices during transition, resulting in lower water use. In 2007, Georgia and Turkmenistan effectively had “zero tariffs” (less than USD 0.001/m3) for all water users. In addition, Kazakhstan, the Russian Federation and Uzbekistan charge “zero tariffs” for irrigation. Even for countries that charge for water, tariffs are not always revised annually and so are eroded by inflation – this has been the case in the Kyrgyz Republic and Tajikistan.

[11] This sub-section is based on OECD (2010)
[12] This sub-section is based on OECD (2007)

Water pricing in Africa[13]**.** Water tariffs on drinking supply and sanitation services are by far the most common mechanism to mobilize financial resources from users in Africa (see Figure 1). But the use of water resources pricing is also significant – out of 20 countries surveyed by AMCOW and AfDB, 9 reported having abstraction charges in place and 7 reported having water pollution charges in place. Some countries reported innovative experiences with using hydropower levies and even levies for cooling power plants (Senegal) and river transport (Liberia). Overall, there seems to be potential for higher contributions from users via charges in sub-sectors other than drinking water supply. Indeed, a number of countries report that additional work is being done to develop and implement. charges in particular related to WRM

Figure 1. What types of water levies are used in Africa?
Number of countries reporting that they have water levies in place



Note: The color bars indicate the number of countries that responded YES or NO to the question of whether such a levy was currently being used. In addition to YES and NO, the countries were given the possibility of marking OTHER and providing additional information. Some countries used this option to indicate that such a levy was under study.
Source: Martín-Hurtado (2011)

[13] This sub-section is based on Martin-Hurtado (2011)

Water levies – examples from selected countries[14]

In **Australia**, the Federal departments and agencies do not impose charges to recover water resources planning and management costs, but most of the States do partly recover those costs (varying from 5% in Queensland to nearly 70% in New South Wales) through licensing charges, abstraction charges or other levies. Efforts are being made to improve the transparency and consistency in attributing the cost of water planning and management activities.

Table 4. Water levies in Australia

State	Water pricing mechanism	Revenue generated	Comments
New South Wales	Water license charges	AUD 30.5 million	Two part charge (fixed part for entitlement, variable part for usage). It varies by type of system, valley and reliability class of the entitlement.
Queensland	Water license fee Water harvesting charge	Combined revenue of AUD 2.4 million	Rate: AUD 58.75/ML Rate: AUD 3.52/ML
Australian Capital Territory	Water abstraction charge	AUD 29.5 million	Rate: AUD 0.51/KL for urban users. Rate: AUD 0.25/KL for rural users. The charge covers the costs of bulk water supply, catchment management, environmental impact and scarcity pricing.
Victoria	Levy on water supply authorities	AUD 61 million	It funds programmes that promote the sustainable management of water Rate: 5% of the revenue of urban water supply authorities, 2% for rural ones
South Australia	Save the Murray levy	AUD 21.1 million	Rate: AUD 35.2 per year for residential customers of SA Water, and AUD 158 per year for farming and commercial properties greater than 10 hectares

Source: Created from data provided in DEHWA (2010)

In **France**, the principle "water pays for water" has been in place for several decades. To implement this principle, the six water agencies make use of a wide number of mechanisms. Table 4 illustrates them, as well as other related mechanisms. France has a dynamic financing framework that includes clear principles, a wide variety of revenue raising instruments, and strong institutions. Nevertheless, the system needs to keep evolving because the traditional revenue raising instruments are not well suited to deal with the ecological sustainability dimension (French Ministry of Ecology, 2011). In France (and in Spain) national water laws set out water charges (*redevances*) and River Basin Agencies can directly determine charges at basin level for withdrawals and discharges, applying the 'polluter-user pays' principle (GWP/INBO, 2009).

[14] This section is based on information provided in the case studies that were developed as part of the OECD project on Financing Water Resources Management. The interim results of the project are reflected in OECD (2011).

Table 5. Water levies in France

Responsible body	Water pricing mechanism	Revenues generated	Comments
Water agencies	Tax on water pollution	EUR 1,124 million from domestic users EUR 116 million from non-domestic users	Rate: Up to EUR 0.5/m3 of water consumed
	Tax on modernization of wastewater drainage systems	EUR 201 million	Up to EUR 0.3/m3 of water consumed for domestic users and EUR 0.15/m3 for non-domestic users
	Tax on diffuse agricultural pollution	EUR 24 million	Between EUR 0.5-3/Kg of pesticide
	Tax on the abstraction of water resources	EUR 354 million	
	Tax for storage in low water periods	EUR 1 million	Paid by owners of reservoirs
	Tax on obstacles on rivers	EUR 0.3 million	
	Tax for the protection of aquatic environments	EUR 4.7 million	Paid by fishermen
Municipalities	Tax for the drainage, conveyance, storage and treatment of storm waters		Up to EUR 0.2/m^2 per year
French Inland Waterways	Tolls on freight and yatching	EUR 12.4 million	
	Hydraulic tax	EUR 124 million	Paid by owners of hydraulic works
	Tax on state land	EUR 25.8 million	Paid by telecom and other companies occupying lands on a waterway bank
	Premium for the prevention and compensation	EUR 140 million for flood prevention	Paid by insurance policy holders

Source: Created from data provided in French Ministry of Ecology (2011)

In the **Czech Republic** surface water levies represent the main basis for funding the management of water resources. Five river boards are in charge administering water courses and operating and maintaining WRM infrastructure, and water abstraction charges represent 65% of their budget -- while revenues linked to hydropower generation represent above 15% of their budgets and less than 9% of their revenues come from the State budget. Surface water levy rates vary between water administrators: between CZK 2.68-4.65 /m^3 for major watercourses and CZK 1.34-1.60/m^3 for minor watercourses. Effluent charges for surface water generate over CZK 300 million per year of the State Environmental Fund.

In the **Netherlands**, the 27 water boards finance their work from two local levies. The water board charge (strictly speaking a tax) is used for expenditure in the area of water quantity management and waterways. Owners and tenants of buildings pay according to property value, and there is also a charge per head of population. The water pollution levy is paid by households at a fixed annual rate and by companies and organizations according to the amount of pollution discharged.

In **Sweden**, licensing charges are set at a rate between EUR 150 and EUR 40,000 and help to recover about 24% of the cost of issuing water permits. Daily or weekly sport fishing licenses are the only example of payments for ecosystem services.

In **Mexico**, abstraction charges represent a major source of finance for the water sector. The 1992 Water Law made compulsory the registry of all water use and discharge permits. By end 2008 over 360,000 water use permits were registered, accounting for almost 250 billion cubic meters of water. All entities that use water or discharge wastewater must pay a levy. For the purposes of charging these levies Mexico has been divided in nine availability zones, with higher prices for more water-scarce zones – for example, water for the supply of drinking water costs between 0.08-0.72 Mexican pesos/m^3 (some 0.01 to 0.05 USD/m^3). In 2008, abstraction charges amounted to USD 633 million, representing 74% of the total amount of levies collected from water users. In 2009, the revenues from water levies (MXN 10.7 billion) represented about 50% of CONAGUA's budget (of about MXN 33.9 billion) once investments in the WSS sub-sector (MXN 12.7 billion) are excluded (data from CONAGUA, 2011).

Table 6. Water levies in Mexico

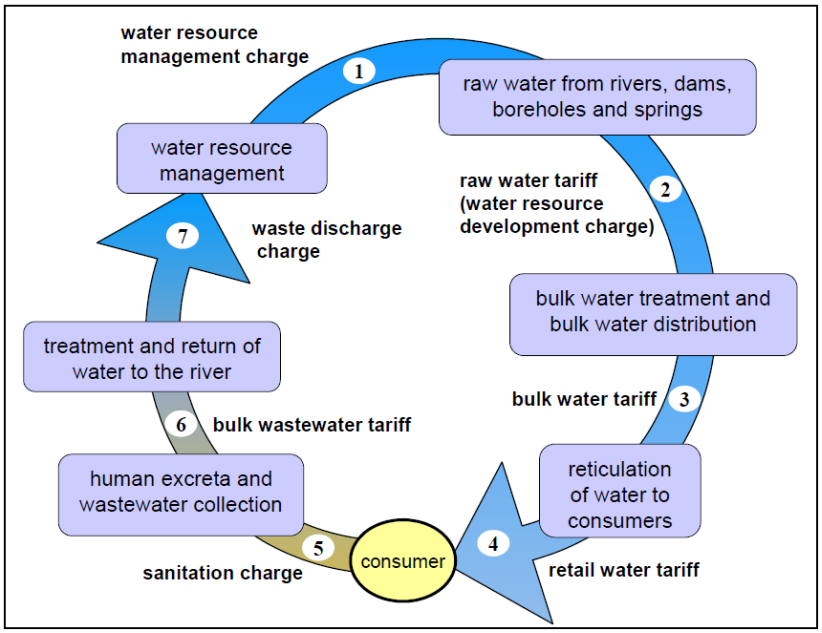
	Revenue generated (USD millions, 2008)	**Percent**
Water abstraction charges	633	74%
Bulk water charges (urban and industrial centres)	170	20%
Irrigation charges	16	2%
Effluent charges	5	Less than 1%
Other (fees for extraction of riverbed materials, fees for use of federal zones, VAT, fines, etc)	35	4%
	859	100%

Source: CONAGUA and IMTA (2010)

In **Brazil**, the national system for water resources management (SINGREH) is financed trough user and beneficiary contributions. The 1997 Water Law introduced the possibility of water charges and in 2009 water use charges generated EUR 20 million in 14 river basins (€1 = Reis2.54) – in addition to extending water charges to other basins, the main challenges are to increase the low rates which are being eroded by inflation. The most important revenue source is the financial compensation for the use of water resources for hydropower generation (a 6.75% levy on hydropower generation and distribution), which generated EUR 527 million of which EUR 59 million were to be transferred to the National Water Agency ,while most of the revenues are not earmarked for the water sector.

In **South Africa,** the 2005 Strategic Framework for Water Services identified seven charges that may be levied for funding the water management functions (see figure 2). Table 4 shows the different charges in place. Since 1994, the development of water resources infrastructure has predominantly been funded off-budget and costs recouped from water users. In South Africa, cost recovery from users for governance functions provides an important mechanism for financing the increasing WRM requirements in highly developed-utilised basins, but users tend to resist additional charges, except where the value-benefit fo these charges is apparent, the collection-disbursement is transparent and/or the information-billing systems are effective (Pegram and Schreiner, 2010).

Figure 2. Water pricing and the water cycle



Source: DWAF (2005)

Table 7. Water levies in South Africa

Water pricing instrument	Revenues (billed amount 2008/09)	Comments
Water research levy	R 140 million	Rate: R 0.0354/m^3 Estimated recovery of costs: 95%
Water resource management charge	R 150 million	R 0.005-0.01/m^3 Estimated recovery of costs: 50%
Raw water infrastructure charge for government funded schemes (it includes an operation and maintenance charge, a depreciation charge, and a Return on Assets charge)	R 1.1 billion	R 0.05-1/m^3 for urban and industrial R 0.01-0.1/m^3 for agricultural users Estimated recovery of costs: 95%
Infrastructure and capital unit charges for off-budget funded schemes	R 2 billion	Rate: R 1.5-3/m^3 Estimated recovery of costs: 100%
Irrigation board and water association scheme levies		
Water board bulk infrastructure and local government water supply tariffs		
Water use licensing fees		Rate: R 114 It does not cover the cost of processing licenses
Waste discharge charge system (it includes a mitigation charge and an incentive charge)		Under study

Source: Created from data provided in Pegram and Schreiner (2010)

In **Uganda,** efforts to generate revenue are limited and have been made only in terms of permit application fees, water quality laboratory analyses and annual fees for abstraction and discharge permit holders. So far this has not resulted in substantial income. Reforms in

this subject have lagged, including the fact that revenues from delivery of services and regulations revert directly back to the general budget rather than to the service/permit provider (DWRM and UNEP-DHI, 2010)

In **China**, most of the water sector revenues come from government funds but there is a general trend to increase the contribution of users and beneficiaries – which varies across sub-sectors. China has been collecting water abstraction charges since 1980, which are set by each province (with groundwater charges usually exceeding surface water charges) and are typically in the range of RMB 0.01-0.12/m^3. Total amounts collected have been increasing rapidly (27% annually in nominal terms from 1998 to 2005) and in 2010 accounted for 2-3% of water resources management expenditure. China has also introduced effluent charges (at a rate of RMB 0.7 per pollution equivalent) as well as water and soil loss compensation levies.

In **Korea**, contributions from water users are an important source of funding for the water sector. Water use charges were introduced in 1999 and are in place in the four river basins, with rates ranging between 0.11 and 0.13 USD/m^3. The proceedings go to a watershed management fund managed by a watershed committee. Between 2002 and 2007 the revenues from user charges increased from USD 288 million to USD 663 million. Part of the increase had to do with the improvements in the invoicing rate (from 77.2 to 80.2%) and in the bill collection rate (from 82.7% to 83.3%), (Cho and Ryu, 2010).

Payments for watershed services as sources of revenue

Payments for watershed services (PWS) are initiatives used to provide financial or in-kind incentives to farmers and other land managers to adopt practices that can be linked to improvements of valuable watershed services. Watershed services (or ecosystem services more generally) refer to the benefits that people receive from natural ecosystems whether direct services (such as food or water), regulating services (such as flood control, erosion control or water filtration) or indirect services (such as nutrient cycling, pollination or soil creation).

A recent review (Stanton et al, 2010) found that in 2008 there were 113 active PWS programmes in 24 countries, mostly in developing countries, distributed as follows:

- **Latin America** had 36 active programmes (up from seven in 2000) that contributed USD 31 million to watershed conservation measures impacting 2.3 million hectares. Of all regions, Latin America has the longest running and most robust experience in the application of PWS mechanisms. This is confirmed by another global survey of "water for cities" PWS schemes (Buric and Gault, 2011) which locates 22 schemes in Latin America out of a total of 36 schemes in the world.
- **China** had 47 active programmes (up from 8 in 1999), all government mediated, that contributed USD 7.8 billion to watershed management (of which 90% corresponds to a single forestry programme).
- The rest of **Asia** had 9 active programmes that mobilized USD 1.8 million and impacted 110,000 hectares
- **Africa** had 10 active programmes that mobilized USD 6.7 million and impacted 200,000 hectares.

- The **United Sates** had 10 active programmes that mobilized USD 1.35 billion and impacted 16.4 million hectares.

Many PWS programmes do not raise revenue from users. The defining feature of a PWS programme is that an entity makes a payment to a land manager in exchange for the adoption of land use practices that will generate watershed services. In the largest PWS programmes, the entity that makes the payment is the government – and the origin of the funds is general tax-payers and not water users. Thus, in many cases PWS programmes may be better understood as a policy instrument for watershed management rather than a revenue raising instrument.

Nevertheless, in many contexts PWS programmes are able to raise significant financial resources from water users and beneficiaries that allow well-defined watershed management activities to take place. In many cases, PWS programmes are able to leverage funds from other sources as well. An example of a PWS programme in place is given below.

Payments for Watershed Services in practice – the Quito Water Fund

Most urban water users in Latin America, as in many other watersheds across the globe, are not aware where their drinking water comes from and the rural communities that live in these areas. Such a disconnect can be reversed by creating sustainable mechanisms to link water users with landowners and natural ecosystems. Urban and industrial water users in the Andean region have proven quite willing to take action by creating Water Trust Funds, entities bound by a legal contract among founding members, generally institutions or companies representing key water users.

The Quito Water Fund (FONAG) is an example of a water trust fund. The municipal drinking water and electrical utilities, a private brewery, and a water bottling company commit resources through a long-term financial mechanism, or 80-year trust fund, as defined by local financial regulations. The returns from this investment leverage donations from international and local NGOs, governments, and Overseas Development Assistance. These funds in turn are invested in critical conservation projects that involve strengthening parks and protected areas, supporting rural families to restore degraded lands and adopt sustainable farming practices, reforestation, and educating children about sustainable water management.

FONAG has generated an endowment of more than USD 6 million from its members, which has allowed it to invest USD 2.3 million and leverage an additional USD 7 million to spend in key conservation activities. Watershed protection activities financed through FONAG from 2000 to 2008 amounted to USD 9.3 million. The Quito model is now being replicated for many Andean cities, such as Palmira, Cali, Bogotá, Medellín, and Cartagena (Colombia); Lima (Peru); and Zamora, Espíndola, Ambato, Riobamba, and Cuenca (Ecuador).

Source: Stanton et al (2010)

Payments for water-related tradable rights

Payments for water-related tradable rights do not generate major financial resources to undertake WRM functions, but on certain contexts they can be useful instruments to ensure that water and water-related ecosystems are better managed. There are three basic types of water-related tradable rights:

- **Tradable water abstraction rights.** This figure allows the owner of an abstraction right to trade it in exchange of money. A typical example is that of a farmer that has been given the right to abstract a given quantity of water, where the farmer may voluntarily decide to sell the water rights that he is not planning to use (whether seasonal water rights or permanent water rights) to another farmer, to an industrial facility, to a water utility, or to a public agency charged with ensuring a minimum ecological flow. This mechanism provides an incentive for the farmer to save water as well as a source of revenue to finance water-saving measures. Depending on the price at which abstraction rights are exchanged, the farmer may decide to invest in water-saving equipment, to shift crops or to produce less in order to free up additional water and sell the rights. Countries with experience in tradable abstraction rights include Australia, China, Chile, Mexico, South Africa, Spain and the USA.

- **Tradable water pollution rights**[15]. This allows the owner of a pollution discharge rate to trade it in exchange of money. A typical example is that of a regulated water polluter (such as a paper mill) that has been given the right to discharge a given amount of pollutants onto a water body. The owner of the paper mill may decide to invest in pollution abatement equipment, funding that investment with part of the revenues obtained from selling the pollution rights to other regulated water polluters, or it may decide to reduce its industrial output in order to sell the freed-up pollution rights. Countries with experience in tradable pollution rights include Australia, Canada, New Zealand and the USA. Stanton et al (2010) estimate that the value of payments of the 14 active programmes identified in 2008 reached USD 10.8 million.

- **Wetland development rights**. This heading covers two different but related figures. The figure of **tradable development rights** allows landowners to transfer the right to develop one parcel of land for which the right to develop it has been curtailed (such as a wetland) to another parcel of land which has been designated as requiring for its development the purchase of development rights – it is a way of making zoning regulations more acceptable and thus make it easier to improve the protection status of some areas such as wetlands. The figure of **mitigation banking** allows a landowner of an ecologically-sensitive areas (such as a wetland) to develop it in exchange for a compensatory payment that finances the protection of another piece of land of equal or higher ecological value. Both tradable development rights programmes and mitigation banking are used primarily in the USA.

[15] Other terms for this market mechanism include water quality trading nutrient trading, and effluent and offset trading.

4. Key issues around water pricing

Water pricing can potentially raise significant financial resources to pay for the sustainable management of water resources. Indeed, as we have seen, in some countries they are the main source of revenue for the water sector – over 90% for countries like France and the Netherlands. Revenues from water pricing are particularly important because they bring stability and predictability to the overall revenue base of the sector -- in many developing countries, funds from public budgets and from donor sources are unpredictable and may vary significantly from year to year.

The adoption of water pricing varies significantly, even among the more developed countries. Some countries (such as France or South Africa) have many different pricing instruments in place, while others may have only one or two.

There are many available instruments to implement water pricing. Traditional water levies (abstraction and pollution charges) seem to have the most revenue raising potential – a potential that is not realized in many countries due to low rates. At the same time, payments for watershed services and payments for water-related rights make possible for users to directly pay for some watershed management functions that would not be otherwise delivered.

The introduction of water pricing mechanisms must be done carefully, both for technical and political economy reasons. The following are some key issues to be considered:

- **Clarifying the objectives of water pricing.** Water pricing is sometimes introduced simultaneously as an incentive mechanism or as a revenue raising mechanism, which may generate confusion in its design and implementation. The nature of the objective has implications in terms of the choice of instrument – for example, if the purpose is to raise revenue and keep it in the sector, a charge may be preferable to a tax (which is more liable to be absorbed by the ministry of finance). It also has implications for the level and structure of the rates and the broader policy package – situations of high-price elasticity favour incentive effects while low-price elasticity favours revenue effects.

- **Integrating water pricing into a full water financing strategy.** This would allow an assessment of how much water pricing is expected to contribute to cover water resource management cost, and which costs it is expected to contribute to. This is relevant for the selection of instruments and rates. The water financing strategy should be part of a sector-wide approach that could include both water resources management and water supply and sanitation services – since water and sanitation utilities are among the main beneficiaries of water resources management functions.

- **Assigning institutional roles.** Water pricing instruments may be applied at different levels (national, provincial, river basin) and by many different agencies. It is important to clarify the level at which the functions of instrument design and implementation will take place and which agencies will be in charge of collecting revenues and spending them. Note that there are risks in separating the revenue and spending functions (it

reduces the incentive to collect), but also in keeping them together (it may alter the nature of enforcement agencies). Raising revenues and spending them will require legal authority for the agency and the most appropriate water institutions may not have that authority.

- **Selecting the number and type of instruments.** There is a wide variety of water pricing instruments that can be implemented in theory. In practice, it may make sense to focus on a reduced number of instruments. The selection of instruments should probably be based on the revenue raising potential of the instruments (preferably high) as well as the administrative complexity of introducing and managing the instrument (preferably low) – hydropower levies, for instance, would seem to fit the bill. It is also important to consider whether existing instruments can be strengthened before new ones are introduced, and whether several instruments can be packaged together (such as for urban users).

- **Getting the process right.** In principle, the introduction of a revenue raising instrument is expected to face opposition from many stakeholders. Ideally, the introduction of water pricing should be the result of a participatory planning process, where the water users get to understand the need of paying for water resource management functions, share their willingness to pay, and express their demands in terms of use of the revenues and the administration of the pricing instruments. Such a process is likely to enhance both the acceptability of water pricing and the effectiveness of the instruments introduced.

- **Keeping the instruments effective.** When introducing water pricing instruments, it is important to avoid exceptions as well as long implementation timetables. Even when water pricing is successfully introduced, there is always a risk that it will over time lose effectiveness in raising revenue. One common problem is that the rates of water charges are subject to a political process of review, which often result in the rates not being revised and thus their value is eroded by inflation – it is thus important to build a system of automatic update of the rates (for example linked to inflation). Another common problem is that revenues are reduced because the billing rates and bill collection rates may fall behind – it is thus important to ensure that enough resources are devoted to the administrative tasks of billing and payment collection.

5. Opening the debate on pricing for WRM

Water pricing offers real potential to contribute to the sustainable financing of WRM, but the lack of hard information is currently a constraint to its promotion. Pricing water supply and sanitation services, and to a lesser extent irrigation services, has attracted a lot of attention. Much less analytical efforts have been devoted to the pricing of water resources management, particularly in developing countries. This document scratches the surface of WRM pricing.

There is scope, and a real need, for much more research and country studies on the role of water pricing in WRM. Water resources management is not prominent in public policies and remains fragmented despite some success in introducing an integrated approach over the last decade or more. It is a complex topic that needs to be presented more simply as a key part of economic development to secure ownership within bureaucracies and within financing institutions. Water pricing issues need to be carefully introduced in the overall WRM narrative in a way that both does justice to the importance of water pricing and supports the uptake of the integrated approach to WRM.

A number of topics within water pricing and the sustainable financing of WRM deserve further attention. In particular,

- **Technical aspects of implementation** – such as analysing the revenue potential and administrative complexity of alternative pricing instruments, as well as costing of WRM functions to guide water pricing decisions
- **Governance and political economy of reform** – such as evaluating the need for financial autonomy of WRM agencies for successful implementation of water pricing, designing participatory processes for defining water pricing strategies, and assessing the advantages and disadvantages of 'big-bang' versus progressive introduction of water pricing
- **"Integrated responses"** – identifying and overcoming obstacles to the development of integrated water pricing (that is, pricing that integrates both WRM pricing and WSS pricing) as well as for integrating water pricing in broader water policy packages
- **Capacities** – identifying and addressing capacity needs for the development and implementation of pricing strategies

A key recommendation from this paper is to call on international organisations and researchers to devote more resources to sharing and developing expertise and application of pricing mechanisms to ensure the sustainable management of water resources.

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