Chapter 2

Four principles for WRM financing

Traditionally the water sector has been dominated by plans to achieve certain water policy goals (whether in terms of water availability, water services or flood control) focused on building new infrastructures. Discussions on financing were limited to how much money governments should provide to build the infrastructure. Over time, the discussions have evolved, with an increasing emphasis on cost recovery from water users (both for drinking water supply and sanitation and for irrigation; but potentially also for hydropower, navigation and others). Article 9 of the Water Framework Directive in Europe is a prominent illustration of this issue. It states that "Member States shall take account of the principle of recovery of the costs of water services, including environmental and resource costs, having regard to the economic analysis and in accordance in particular with the polluter pays principle".

Policy frameworks for financing water management around the world have in most cases evolved organically over time, although there are cases where there has been a dedicated effort to design a coherent policy framework (for instance in South Africa). They can be understood as constituted by the principles that define who should pay for water management and the mechanisms that allow to put those principles in practice. They increasingly acknowledge that meaningful participation of water stakeholders in the definition of the policy framework would help to get it right and facilitate its implementation.

These discussions can benefit from a set of principles or considerations on the pros and cons of alternative financing options. This section sketches such a policy framework.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

A case for public funding

Public funding is considered an essential component of water management financing due to the public good dimension of many aspects of water management. Infrastructure designed to deal with periods of water scarcity (reservoirs) and investments in flood management have a public good nature and tend to be under provided by private markets. This leaves a significant role for government (Shaw, 2005; Grafton, 2011). Similarly, in a developing country context, the stock of water-related infrastructure may be so low that public funding is required, at least until basic services are available and benefits accrue to user groups (which then could be harnessed to finance further developments).

The case for public funding is more tenuous if it aims at lowering the costs of water services for water users or at mitigating risks related to water investment. More targeted measures are usually more effective and efficient to do just that. Moreover, as stated by Rees *et al.* (2008), there are high opportunity costs in using scarce public resources to supply private goods to users who can afford them. This consideration has several consequences.

First, while alternative sources of finance need to be channelled, the size of public budgets for water must be commensurate with water policy objectives and the efforts needed to deliver their public good dimension.

Second, there is substantial scope for improving the allocation of public financial resources within the water sector. There are two issues here. One relates to cost-effectiveness in the use of financial resources, so that a given objective is achieved at minimum cost. Chapter 2 discusses this in more details. Another issue is to ensure that public expenditures are aligned with policy priorities. For instance, there is a risk that decisions at river basin level fail to take into account national policy priorities.

Finally, in many cases (sometimes hidden or implicit) public subsidies are actively working against water policy objectives. This is the case when the costs of using the resource (including environmental or opportunity costs) are not reflected in the price paid by users. This is also the case when subsidies originate in non-water policies. Examples abound in the agriculture and energy sectors: typically farmers in several OECD and non member countries do not pay the full price of electricity used to pump groundwater. Reforming those harmful subsidies should also be part of the water financing agenda: for instance, it could free public financial resources (which could then be used for water policies), generate more revenues to invest in water-related services and infrastructures, make water pollution more costly and create markets for water-efficient technologies and practices.

Financing water management deals with ensuring that public money is available to ensure the provision of the public good dimension of water services, and with identifying and channelling alternative sources of finance to cover the other dimensions of water policies. A set of principles can usefully guide policy decisions.

Two well-established principles: Polluter Pays and Beneficiary Pays

Many countries have included the Polluter Pays principle or the Beneficiary Pays principle (sometimes also formulated as a cost recovery principle) in their legislation or their general policy framework for environmental management, and often for water in particular. For example, the Polluter Pays principle (PPP) is a basic element of all European environmental policies. It is explicitly referred to in the EU Water Framework Directive (WFD), which establishes clear requirements concerning financing for water management in the EU member states. The OECD Council recommendation and the Guidelines for Water resources management Policies explicitly claim that they are "meant to supplement and strengthen and not in any way to weaken the Polluter Pays Principle" (see OECD, 1989).

In the European Union, the WFD specifies that Member States must ensure an adequate recovery of the costs of water services (taking into account the PPP), including environmental and resource costs. The different sectors (at least industry, households and agriculture) have to make an adequate contribution for covering the costs of the water services. However, lower cost recovery rates can be justified on social, environmental and economic grounds, as well as due to geographic or climatic conditions.

Although the WFD relates to the integrated management of water resources, there is no agreement on the definition of water services to which the cost-recovery principle applies (from a narrow definition of water services limited to drinking water and sewage to a wide definition of water services that include irrigation services, dams and impoundments for hydropower, flood protection infrastructure, etc.). In Germany, for example, only public water supply and wastewater removal is included in the definition.

The Polluter Pays principle

The Polluter Pays principle is most relevant for water policies.

The case of agricultural pollutions is emblematic. The overall economic, environmental and social costs of water pollution caused by agriculture across OECD countries are likely to exceed billions of dollars annually. No satisfactory estimate of these costs for all OECD countries currently exists. A comprehensive national study in the United Kingdom, however, has

shown that, in 2007, the annual cost of agricultural damage to water systems (pollution of freshwater, estuaries and drinking water treatment costs) was around EUR 330 million (USD 460 million) (OECD, 2012b). Encouraging farmers to internalise their environmental costs through implementation of the Polluter Pays principle (PPP) can bring economic and environmental benefits.

Application of the Polluter Pays principle (PPP) is not widespread across OECD countries. Four main reasons account for this situation:

- Diffuse source pollution cannot be measured at reasonable cost with current monitoring technologies. Specific instruments can be used in that context, such as taxes on fertilisers or pesticides. Denmark, France, Norway, Sweden and the United States report such instruments in the OECD/EEA database on instruments used for environmental policy and natural resources management; in Denmark, the tax is based on mineral phosphorous in feed phosphates; in France, the general tax on polluting activities depends on the toxicity of the chemical substance. Experience with taxes on fertilisers suggests that they must form part of a general policy mix, as the tax may need to be levied at very high levels to be effective in reducing pollution (Fuentes, 2011).
- There is poor enforcement of water pollution regulations in many situations. Stricter enforcement of regulations can assist in meeting the Polluter Pays principle, and also lower the burden on government budgetary resources compared to some other policy instruments to address water quality issues (OECD, 2012b)
- Property rights, institutional and other barriers can prevent a thorough implementation of the Polluter Pays principle (OECD, 2012b). Fuentes (2011) notes an interesting illustration: in Spain, water prices must cover, but not exceed, the operating and capital costs from the operation of government-funded supply infrastructures (transport, storage and treatment)[1]; they can cover administrative costs as well, to the extent that they are directly related to the operation of these infrastructures. While the recovery of costs that results from the scarcity of water[2] is particularly relevant for a country with a semi-arid climate, scarcity and environmental costs cannot be included in water prices over and above operating and capital costs.
- Moreover, some externalities which affect aquatic resources are not related to current or measurable water uses. Bommelaer and Devaux (2012) list such cases: inherited orphan industrial pollution (ruins of war, sediments, sludge, dredging residues, etc.), rain pollution and air pollution fallout, leachate from quarries and mines, contaminated soil leaching, salting of roads and treatments of frontages of buildings,

etc. Putting a price on water cannot compensate for such pollutions, as this would transfer the cost of pollution to agents not responsible for the externality.

Water policies must factor in other legal or financial instruments: prohibiting toxic products, taxing the source of the polluting products, holding polluters responsible for internalising the costs of removing pollution, setting up funds earmarked for orphan pollutions, etc.

Benefits and beneficiaries of water resources management

Water resources management provides a large range of benefits of very different nature, starting with direct benefits received by water users. This first category of benefits encompasses the direct benefits received by water users such as farmers, energy producers and industrial facilities, as well as households. For economic sectors, direct benefits often take the form of increased economic production, but reduction in risks is also an important benefit.

Another type of direct benefit is that of biodiversity conservation and ecosystem protection. In Sweden, six out of 16 national environmental objectives are related to water (IVL, 2010), while in the European Union, achieving good ecological status of water bodies is the ultimate objective of the Water Framework Directive.

The benefits provided by water infrastructure projects have long been recognised. Dikes, levees and floodgates help to protect population centres from flood risks. Reservoirs and canals make possible to supply water to urban areas and agricultural lands. Wastewater treatment plants help to protect water quality in rivers and lakes. There are many examples of benefits estimates for water investment projects. In fact, cost benefit analysis was first applied to water projects in the US, mandated by the 1936 Federal Navigation Act and 1939 Flood Control Act. Over time, estimates of benefits have expanded to less traditional areas of the water agenda, such as river rehabilitation (see Box 2.1 on Israel).

The benefits of water infrastructure are site specific: they depend on the direct service provided (*i.e.* water supply, flood protection, water quality protection), the size of the population or economic activity affected, and the alternative options available to ensure equivalent services.

Water resources management also generates indirect benefits. Examples of those indirect benefits are the reduced costs of other productive inputs (such as agricultural commodities) and transport services faced by industrial producers. Another example is the reduced costs of consumer products (whether agricultural or industrial) bought by households. The macroeconomic

impacts via those second-round benefits may well be the main indirect benefits provided by water resources management.

Much less is known about the benefits of water governance measures. The value of better information, improved planning, or more effective processes for negotiating and enforcing water policies is generally difficult to quantify. Rather

Box 2.1. **Benefits of river rehabilitation in Israel**

Israel's rivers have long been plagued by a range of problems. Most of the springs and flows were captured for water supply for drainage and agriculture. Sewage and solid waste were disposed to river channels. Rivers have become the "backyards" of most localities, serving as sites for the disposal of sewage and solid waste. But over the past two decades, river rehabilitation and recovery of the river's environmental and social function have taken an increasingly important place on the public agenda. The heightened consciousness of the importance of river rehabilitation has been catalysed by the recognition that alongside their function regulating flow, rivers have ecological, social and cultural value. The different benefits identified in Israel with river rehabilitation include:

- Ecological aspects: Conservation of nature, landscape and biodiversity. Prevention of water, soil and environmental pollution.
- Leisure aspects: Benefits derived from the existence of the river as a recreation and leisure site actively used by the public. Benefits derived from the development of intensive urban parks in the case of rivers which pass trough urban fibers. Preservation of open spaces and creation of green lungs. Development of recreation and tourist sites.
- Economic aspects: Benefits derived from the increased value of property adjacent to the rehabilitated river. Benefits derived from the protection of open spaces and infrastructure from floods. Benefits derived from the creation of employment and income sources.

Within the framework of the 2005 National Plan for River Rehabilitation uniform indicators were developed to present the benefits derived from the rehabilitation of the different rivers. The total benefits from river rehabilitation for 14 rivers were calculated to be 5 billion shekels (USD 1.3 billion). The benefits varied greatly by river, from 39 million shekel for the Southern Jordan to 1.5 billion shekel for the Yarkon. As a result, rehabilitation plans have been initiated and implemented by the National River Administration, the Yarkon and Kishon Authorities, in cooperation with drainage authorities.

Source: SVIVA (2010), *River Rehabilitation and its Economic Feasibility*, Israeli Ministry of Environmental Protection.

than trying to value the benefit provided by individual governance measures, it may be worth looking at the benefits that stronger water governance allows to reap. In a sense, water governance enables water stakeholders to enlarge the space of viable solutions that may result in the adoption of less costly solutions (from a society-wide perspective) than would otherwise be the case.

In many cases, the water resources management options that deliver the higher benefits per dollar spent are likely to be in the realm of water governance. They include monitoring and forecasting, dam operations protocols, drought management protocols, or enforcement of existing regulations. These measures do not need massive financial resources. They require sustainable revenues to cover regular costs (personnel, training, equipment).

Table 2.1 provides examples of benefits of water resources management and the corresponding beneficiaries. Careful analysis may reveal more beneficiaries of a particular intervention than initially thought.

Table 2.1. **Benefits and beneficiaries of water resources management**

Selected illustrations

Benefits	Beneficiaries
Avoided costs of supplying water from more expensive sources	Water utilities and households Industrial facilities Farmers
Avoided human and economic losses from floods	Households Industrial facilities Cities
Avoided catastrophic losses from drought (loss of perennial crops, fires)	Farmers, larger communities
Reduced costs of generating electricity thanks to hydropower	Power companies Electricity consumers
Savings in transportation costs from expansion of water-based transport	Water transport companies Producers and consumers of transported goods
Increased opportunities for recreation and revenue from recreation-based tourism	Households Tourism industry
Avoided costs of water treatment thanks to protected water quality	Water utilities and households
Avoided habitat degradation and biodiversity loss thanks to reduced water pollution and increased baseline flows	General population
Reduced incidence of water-borne diseases	Households Health system
Increased value of property thanks to improvements in water and riparian ecosystems	Households

The key feature of cost recovery mechanisms is that they are targeted at the beneficiaries of water management and should, at least in principle, reflect the private benefits that accrue.

Multi-purpose infrastructure highlights the value of adopting a beneficiary perspective. Multi-purpose dams generate a range of benefits – such as flood control, hydropower generation, securing water supply for agricultural and urban use, or recreation. They also point at two important and related challenges. First, reliable estimates of potential benefits are requisites to operate multi-purpose infrastructure in a way that maximises the benefits generated by the infrastructure. This is not always the case. For instance in India, dams are often operated to maximise water supply for farmers, while hydropower generation usually is a higher value use (Malik, 2010). Second, having the benefits estimates accepted by the stakeholders will provide a strong basis for allocating costs among beneficiaries. If the costs of flood control are readily assumed by the government under a public good rationale (as in Spain), there is a strong incentive for other stakeholders to inflate the estimates of flood control benefits and to reduce their own share of the costs.

How to cover the costs of providing water management functions that serve the public more generally is more problematic and this is generally met through allocations from public budgets (*i.e.* from general taxation). Some countries make specific budgetary allocations for water resources management as a whole. South Africa's policy framework details the payment mechanisms that can be employed to cover for different water management functions (such as water research). China's policy framework includes rules for allocating a portion of public budgets (at different levels, from national to local) to water funds.

Cost recovery in selected countries

Differences in the main principles advocated by specific countries and their implementation translate chiefly in differences in the share of infrastructure costs (investment, operation and maintenance) paid by public subsidies and by end-users of specific services (see Table 2.2).

Effective cost recovery rates vary widely among countries. Developed countries tend to rely more on user contributions than developing countries. Some countries, such as France and the Netherlands, fund almost all water management (in excess of 90%) from user contributions. In some cases, like Australia, the rapid evolution of water management needs has prompted an increase in the amount of public resources devoted to public management.

Cost recovery rates tend to vary for each water management sub-sector – for example, in Spain the rates are likely to be around 50% for water abstraction, 95% for distribution in urban systems and 85% for wastewater treatment.

Table 2.2. **Financing of water infrastructure costs in selected countries**

Estimates (%)

	Investment for water sector development		Operation and maintenance costs	
	Government	Water users and municipalities	Government	Water users and municipalities
Spain	70	30	50	50
France	50	50	0	100
Canada	75	25	50-70	50-30
Japan	100	0	0	100
US	70	30	50	50

Source: Dukhovny V., V. Sokolov and H. Manthrithilake (eds.) (2009), *Integrated Water Resources Management: Putting Good Theory into Real Practice: Central Asian Experience*, Tashkent, Uzbekistan.

Potential tensions between Polluter Pays and Beneficiary Pays principles

These two principles need careful implementation. Lax definition can lead to apparent contradictions. This is illustrated by flawed Payment for Ecosystem Services schemes, which can be a way to share the cost of pollution, in disguise. Hanley *et al.* (1998) discuss situations which could be portrayed as "Pay the Polluter Principle": for instance, farmers who behaved in an ecologically responsible way can be penalised vis-à-vis others, if the less virtuous ones receive a larger incentive to change their behaviour. Similarly, Salzman (2005) highlights the perils of payment for ecosystem services, which, despite their high potential, can create moral hazard, rent-seeking behaviour, free-riding, or perverse incentives.

Payment for ecosystem services is only legitimate when the services are clearly defined and properly enhanced. Observers note that this is not always the case, and a number of payment for ecosystem services schemes should be considered as inadequate.

Two additional principles: Equity and Policy coherence

Some countries make reference to additional principles. Equity deserves particular attention, as does the coherence between related policies.

Equity and the issue of proportionate costs of water management

The Netherlands include solidarity as an overarching principle for water management. France has adopted the principle "water pays for water", meaning that the water sector should not receive subsidies from government budgets but also that cross-subsidies within the water sector can be legitimate. These examples illustrate equity issues in water management financing.

Illustrations abound where sound water management has been opposed for reasons of equity, or disproportionate costs for (categories of) water users: affordability issues are often referred to, to block water reforms; farmers and industries claim they cannot cover the costs attached to water management, or that these costs would impair their competitiveness. These considerations are important, but they are often overstated.

Lessons have been learned on the social consequences of water tariff policies for domestic uses. Low water prices hurt the poor most, as they deprive utilities from revenues to expand coverage, forcing the poor to procure poor quality water from private vendors. Water tariffs can be structured to account for the basic needs of all segments of the population. However, social policy objectives are better attained through socially targeted measures such as income support. Targeting and keeping the transaction costs low are essential criteria in designing such measures.

Similarly, where countries have raised water charges for farmers, the available evidence indicates no reduction in agricultural output (OECD, 2009). Where high levels of taxes have been applied to chemical inputs to comply with the Polluter Pays principle, often coupled with a mix of other policy measures, they have usually led to reductions in input use without loss of farm production or income (OECD, 2012b).

Policy debates are opportunities to review the potential impacts of improved water management on specific water users (poor households, farmers, selected industries), to compare with the actual costs of poor water management or poor water services, and with the willingness to pay. Such reviews need to be made at several scales, to balance private costs and benefits and gains for the wider community. This is not a case for public subsidies, but rather due consideration of the equity principle for water management financing.

Based on such debates, the Equity principle can justify that selected beneficiaries do not cover the cost of the service they get; this is acknowledged in Article 9 of the Water Framework Directive, "where this does not compromise the purposes and the achievement of the objectives of this Directive" (see the consolidated version of the WFD). The Equity principle should not be tied to the Polluter Pays principle, as this can result in second and third best solutions to pollution challenges.

Policy coherence and alignment of incentives

Water management is affected by initiatives taken by other policy communities. Policies in agriculture, energy, urban development or trade are often responsible for ever growing pressures on water resources. Changes in those policies, including their financing components, can in many cases facilitate reductions of water management costs.

For instance, policies that raise producer prices or subsidise input use encourage farmers to increase production and use more inputs than would be the case in the absence of this support. Assessing these perverse support mechanisms, with a view to phasing them out, can contribute to lowering the cost of water resources management. Efforts in this direction are ongoing in OECD countries, but more could be done: some 50% (2008-10) of total OECD agricultural producer support provides incentives to produce and/or use variable inputs, compared to 85% in 1986-88 (OECD, 2012b).

A policy framework for water financing needs to look beyond the water sector, and to ensure coherence with non-water sectors. The EU Water Framework Directive has stressed the importance of analysing the financing linked to sector policies (*e.g.* agriculture, energy or climate change) that directly support projects and actions that impact on the water system. For example, in Spain 25% of agricultural subsidies (in the context of the Common Agricultural Policy) remain coupled to production, encouraging inefficient use of water (Aldaya *et al.* 2010).

Because of the intersectoral nature of water management, its financing will rely on financial sources from both the water sector and other economic sectors (in particular for promoting good practices in these sectors and limit their pressures on aquatic ecosystems). The mechanisms and processes developed for ensuring coherence between water and sector policies, and thus financing water resources management, deserve further investigation and analysis.

Notes

1. It is worth noting that when capital costs are based on historic (and not replacement) costs, they tend to largely underestimate the financing requirements.
2. The 1999 amendment of the Water Law introduced a factor of 0.5 to 2, to be applied to tariffs reflecting financial costs, depending on whether consumption exceeds or is below reference levels. But these reference levels are likely to be determined with respect to individual concessions and do not reflect scarcity of the resource.

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