INECO

Guidelines towards the application of institutional and economic instruments for water management in countries of the Mediterranean Basin

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CONTENTS

INTRODUCTION

Water availability in Mediterranean Countries is unquestionably limited, due to the low rate of natural renewal of both surface and groundwater supplies, unwise sectoral water allocation and use and increasing pollution loads discharged to water bodies. The increasing disparity between supply and demand, the high vulnerability to drought events and frequent water scarcity resulting from the temporal and spatial variation of water availability, have motivated a supply-oriented approach, entailing the implementation of large-scale hydraulic projects to meet irrigation and potable water needs. As a result, water management plans are frequently defined at the national level, with river basin management approaches being secondary in importance; in this context, water policies are also centralized, in order to coordinate water transfers across regions and support the development of water-related infrastructure through general taxation and cross-subsidies.

Supply enhancement policies are still dominant in most countries, as significant needs still exist and there is potential for expanding the infrastructure base; on the other hand, it is also gradually becoming evident that the enhancement of socio-economic development, the preservation of food security, of self-sufficiency, and of a healthy water environment cannot rely on the augmentation of water supply alone. In this regard, there is a shift, albeit slow, towards a new approach, which considers the entire water cycle in a holistic way. Policy instruments are gradually being introduced for allocating water according to the principles of economic efficiency, and emphasis is given to the development of schemes flexible in managing variations in supply and demand and in the preservation of water quality. Changes include planning that integrates water quality and quantity, promotion of demand management, and cost recovery towards more financially sustainable water services. The effort also addresses the institutional environment, through the strengthening of governmental agencies, the decentralization of the responsibility for delivering water services to financially autonomous utilities, and the empowerment of institutions to achieve enforcement of environmental regulations.

In general, policy responses to water stress are twofold. Water can be managed in a more sustainable way, by changing the institutional setting defining property rights or discharge and technology standards, as well as by setting rules for water allocation among the different uses. On the other hand, economic instruments, such as those presented in Box 1, can be applied to give “signals” or incentives to water users and internalize negative externalities arising from water pollution and use. It is, however, broadly acknowledged that the distinction between the institutional environment and economic instruments is only theoretical, since in

practice they are strongly linked and interrelated. For example, the introduction of water markets is strictly related with the definition of transferable water use rights. In this example, the economic instrument (the creation of a market) requires change of the institutional setting.

BOX 1: ECONOMIC INSTRUMENTS IN WATER MANAGEMENT – A BROAD CLASSIFICATION

Emission charges: Direct payments based on the measurement or estimation of the quantity and quality of a pollutant.

User charges: Payments for the cost of collective services. They are primarily used to guarantee the cash flow necessary to finance services such as collection and treatment of solid waste and wastewater. In the case of natural resource management, they are labelled as user fees, i.e. they represent payment for the use of the natural resource.

Product charges: Payments applied to products that create pollution.

Taxes: Payments for the use of natural resources

Marketable (tradable or transferable) permits, rights or quotas and water markets.

Source: OECD (1999)

The "economic approach" has dominated many research and policy development efforts of the past decades, emphasising on the effective contribution and implications of different instruments to economic efficiency, environmental sustainability and equity among the affected social groups. However, their actual implementation has often been hindered by social concerns, lack of public acceptability, need for significant and difficult institutional reforms and lack of capacity or limited empowerment of institutions and authorities. In this regard, research has gradually shifted to the more-in-depth analysis of the water governance settings, trying to identify ways through which economic instruments can be embedded in national contexts and adapted to their particularities, and paying close attention to local perceptions and traditions.

Nowadays, stakeholder involvement is universally recognized as the key to successful policy formulation and implementation. Along the same line, policy-oriented research is increasingly focusing on involving local stakeholders, in order to better direct and adapt research outcomes to the needs of local societies. The development of two-way learning processes among the research community, local authorities and water users has also been the cornerstone of many recent EC-funded research and coordination action projects on water management, with the aim to facilitate the uptake of different research results and enhance the effectiveness and upscaling of undertaken efforts.

INECO was also a policy-oriented, EC-funded, Coordination Action project. Under the title "Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region", the project attempted to develop a social experiment in capacity building and policy framing, through the elaboration of seven (7) Case Studies on different water management issues experienced in countries of the Mediterranean Basin.

These Case Studies, primarily aimed at fostering constructive engagement towards Integrated Water Resources Management, were based on participatory processes implemented through workshops, web fora, dedicated surveys, extensive consultation and interviews with key stakeholders representing both authorities and affected user groups. They further aimed at examining ways through which institutional and economic instruments can be employed as responses to address the selected, locally important, water management issues. The approach followed emphasized on revealing the characteristics of socio-economic environments and governance settings affecting water policies, and at identifying important social, economic and environmental trade-offs according to the perceptions of local stakeholders.

This document, titled “Guidelines towards the application of institutional and economic instruments for water management in the Mediterranean Basin”, is one of the final and major outputs of INECO. It describes the outcomes and the lessons learned from the project Case Studies, and presents experiences gained from the process of jointly developing policy proposals for the mitigation of the selected water management issues. To facilitate the dissemination of experience among different Case Studies, as well as the exploitation of lessons learned from other regions facing similar issues, the INECO Guidelines also present the systematic analysis of the Case Studies, in the form of a typology highlighting common underlying factors contributing to the issues at hand and international and EU experiences relevant to the implementation of institutional and economic instruments.

Institutional and Economic Instruments in Water Management

Policy instruments refer to legal, institutional, economic, social change and management mechanisms employed to improve efficiency in water management. However, they do not operate in a vacuum; incentives and regulatory instruments towards water conservation can be effective only when the required capacity for their implementation exists both at the policy and decision-making levels and in society.

Economic instruments refer to mechanisms that create the economic incentives for individuals to freely opt for modifying or reducing their activities, thus indirectly producing an environmental improvement. They encompass a rather diverse toolkit of policies whose main characteristic is that they provide market signals by affecting or modifying relative prices. The aim is to influence the behaviour of consumers, polluters and other economic agents, and provide incentives to them for internalizing the externalities that they may be producing (Robinson and Ryan, 2002).

The pertinent literature outlines many ways of classifying economic instruments, depending on their type, function or management issue that they are designed to address, their position along the water cycle (abstraction, discharge, use), the authority that can undertake their implementation, etc. A tentative classification of instruments based on their type is presented in Figure 1.

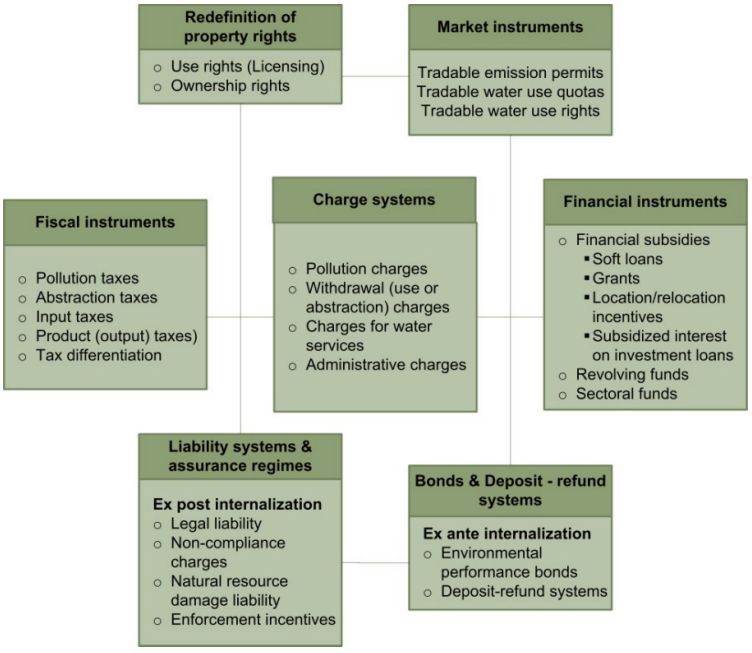

Figure 1: Overview of economic instruments for water management based on their type (adapted from Panayotou, 1994)

A different typology of economic instruments is attempted by Kraemer et al. (2003), where instruments are categorized according to the functions (or objectives) that they are designed to fulfil, as follows:

- Instruments that mostly aim at **creating incentives** for behavioural change (incentive function). This category groups instruments that aim at self-regulation towards the adoption of more environmentally friendly practices. A typical example is incentive taxes that are levied with the intention of changing environmentally damaging behaviour and without the primary intention to raise revenue. These instruments are successful in their purpose if rates are sufficiently high to stimulate users to invest in pollution abatement and/or water conservation.
- Instruments that mostly aim at **raising revenue** (fiscal and financial function). In the case of environmental charges and taxes, a distinction is made on whether the revenue is earmarked, and re-invested in resource protection, or simply added to the general government budget. If the purpose of a tax is merely to contribute to the national budget, the economic instrument can be categorized as a fiscal environmental tax. It is however recognized that even in this form, instruments also offer incentive towards behavioural change.

Kraemer et al. (2003) also underline that the implementation of economic instruments can have additional results (named **"soft functions"**), such as capacity building and improvements in water management operations. Examples can include the provision of an additional source of finance for building personnel capacity and the creation of a need for continuous updating of information on water abstraction, consumption and pollution. It can thus be supported that the adoption of such instruments also offers opportunities to strengthen and enhance available information on water management issues, and introduce many elements of control and enforcement, especially in relation to charge definition, metering and revenue collection.

The design and implementation of any economic instrument cannot be performed independently of the institutional environment, as these are strongly interlinked; economic instruments can effectively be embedded in water policies only when the institutional framework foresees and supports these and their implementation. Furthermore, and as depicted in Figure 2, they are only part of a larger set of tools aimed at inducing behavioural change; other actions and policies for community engagement, the enabling environment and the setting of standards and examples can be equally or more important, depending on the local social, institutional and technical context. For example, local community involvement engages the public to act in a desired way; therefore when institutional and economic instruments can only be gradually integrated into water policy, local

involvement can be seen as the most efficient tool for improved water management.

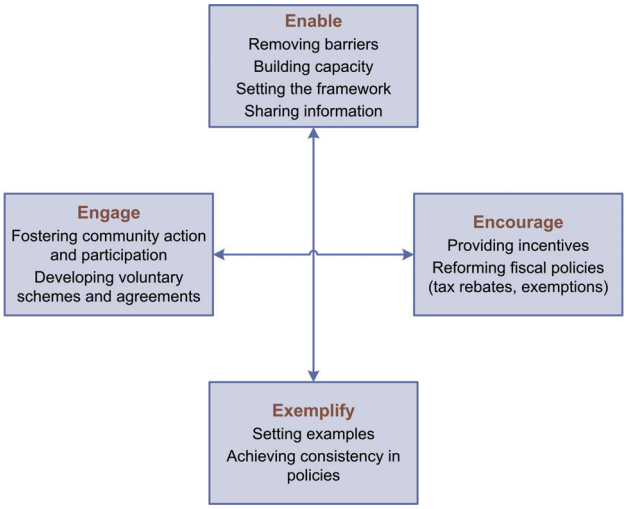

FIGURE 2: THE FOUR E'S TOWARDS BEHAVIOURAL CHANGE
(ADAPTED FROM THE UK GOVERNMENT SUSTAINABLE DEVELOPMENT STRATEGY, 2005)

Institutional instruments and arrangements refer to overall enabling environment to support water management operations; they encompass the entire range of options defining water governance mechanisms, rules and regulations for environmental protection, frameworks, processes and procedures for river basin management, groundwater management, water service provision, etc. They are referred to as the *"sets of working rules that are used to determine who is eligible to make decisions in the arena, and what actions are allowed or constrained"* (Ostrom, 1990). These rules describe what procedures must be followed, what information must or must not be provided, and what payoffs are assigned to affected individuals.

From the above broad context, key themes that are considered most relevant to the analysis described in this document comprise:

- Setting of standards, normative and executive water-related legislation, and enforcement of rules and regulations;
- Decentralization at the appropriate level for maximizing effectiveness;
- Monitoring processes, coordination and collaboration protocols, etc.
- Frameworks for private sector involvement;
- Ways of enabling public participation and fostering civic engagement;

The following sections bring together information obtained from various literature sources on economic and institutional instruments for water management. They further include information on lessons learnt from the application of instruments to address specific water management issues

throughout the world, outlining key success factors, experiences and lessons learned from their implementation.

AN OVERVIEW OF COMMONLY APPLIED ECONOMIC INSTRUMENTS IN WATER MANAGEMENT

MARKET INSTRUMENTS

Market instruments refer to transferable rights to use or pollute water. They aim at creating efficient markets in which rights can be traded, and where, as a result, the welfare surplus is minimized. Markets are often built over existing resource management frameworks; therefore they may co-exist with other institutional arrangements and associated property rights systems. Their main advantage is that they offer a non-political way to solve conflicts over water use, ensuring optimal allocation and efficiency and limiting the need for overall planning and management. However, in the few cases that they have been applied, market instruments operated in far from perfect conditions. The main reasons for this were natural monopolies, high sunk costs, and numerous externalities, social, environmental and economic.

Two categories of tradable rights/permits are described below (Kraemer et al., 2003): (a) tradable emission (discharge) permits, and (b) tradable water abstraction/use rights or tradable water shares (quotas).

TRADABLE EMISSION (DISCHARGE) PERMITS

Tradable emission permits involve the definition of an aggregate level of allowable emissions for each watershed, which is then allocated among polluters either according to the level of output (e.g. production volume) or their current emission levels (Panayotou, 1994). Since the aggregate emissions quota is set at or below the current emission levels, an artificial level of scarcity is created (in total allowable emissions), and permits obtain a market value (a price). In this context, producers with a deficit or with expansion plans must secure additional permits either by reducing their emissions or by acquiring credits from other users who are able to do so at a lower cost than themselves. The advantage is that the desired reduction of emissions, and therefore the desired level of environmental quality, is attained at the minimum possible cost to society. Furthermore, a strong incentive is provided for continuous efforts to enhance efficiency and develop improved technologies, since the excess allowable quota for a user can be sold, and thus an additional profit can be gained. The prerequisite is that emission permits are fixed in number and freely tradable.

In principle, emission permits should not be initially issued free of charge, as this is equivalent to assigning users with property rights over the environment. If instead, permits are sold or auctioned, the revenue raised by the State can then be passed to the citizens.

The establishment of a system of emission permits generally has rather high management costs as it requires: (a) proper definition of the

watershed and impacts of diffuse and point pollution from the various sources, (b) monitoring of water quality and development of models correlating emissions with water and ambient quality, (c) capacity to monitor and inspect individual emission sources, so as to ensure that the emissions are below the limit allowed by the permit, and (d) a system for approving and recording credits, offsets and trades among the permit holders. A key problem often associated with this form of water pollution management is the risk of creating pollution hotspots, due to improper definition of pollution credits or deficient monitoring over the operation of the entire system.

BOX 2: WATER POLLUTION LOAD MANAGEMENT SYSTEM IN KOREA

The Total Pollution Load Management System (TPLMS) of Korea was introduced with the aim to improve efficient regional environmental management, and address deficiencies and limitations of previous water quality management policies (deterioration of water quality in major reservoirs, difficulties in controlling pollution sources, upstream-downstream conflicts concerning the implementation of environmental regulations).

The TPLMS for water involves (a) the determination of the target water quality standard for each block of the water system, (b) the computation of the maximum allowable load, and (c) the regulation or control of the amount of pollutants discharged from the region to meet the maximum permissible load standard. This system is expected to help achieve a balance of preservation and development in each region, by permitting regional development solely up to the extent to which the target level of water quality is attainable. Additionally, Special Acts introduce water use charges, as well as pollution charges when total pollution loads are exceeded.

Source: Moon (2007)

TRADABLE WATER SHARES AND TRADABLE WATER USE (ABSTRACTION) RIGHTS

Tradable water shares work in a similar way to tradable emission permits. Water management authorities issue to water users of an area a share of the total available supply. Users are free to use water as they want (use it for their own purposes, sell it to other users, store it for future use or sell it back to the water authority).

Tradable water rights or quotas can improve water distribution, water resource conservation and possibly environmental protection, as new supply expansion schemes become unnecessary. However, they also require the ability to measure and monitor water use, which might entail significant management costs in the case of multiple water users. Implementation difficulties can be alleviated if allocation and trading of water quotas is performed at the level of water user associations instead of individual users (Box 3). Associations can then allocate water to their members using their own allocation rules, and monitor water use using their own monitoring mechanisms. Another problem that often arises in the application of the instrument is deficient cost recovery, as users do not pay for water service costs to the authority responsible for the operation

and maintenance of hydraulic infrastructure, but instead "buy" their water share from other users. This deficiency be addressed by defining user charges for the initial allocation of water shares.

BOX 3: THE SPANISH "WATER BANKING"

In Spain, the trading of water use rights between rural communities and cities can traced back to the beginning of the 20th century.

The case of the Camp de Tarragona is a good example of how this mechanism could co-exist with existing management practice. In this area, a lively water market was developed, with transfer of permanent and temporal water rights among farmers and urban users, through the intermediation of municipal water supply companies.

The concession for water use was granted by regional water authorities for the Siuriana-Riudecanyes system in 1904, under the condition that two thirds of the total water would be utilised for irrigation and one third for urban water supply. The share corresponding to agricultural water use was allocated through 3,750 entitlements.

In 1911, an Association of water users (small landowners and urban middle-class users) was set up to bring private capital for the construction of large public works (i.e. dam and canals). Water titles have always been tradable among members of the Association (i.e. the municipalities and the farmers). The additional water supply made available through this infrastructure was allocated through the establishment of new water rights (corresponding to 6,250 additional entitlements). As a result, an informal arrangement was developed for the transfer of "extra" water between agricultural and urban users. In particular, urban users paid a negotiated price to landowners (i.e. the water right holders). The fact that water companies negotiated on behalf of the urban users and the association negotiated on behalf of the farmers considerably decreased transaction costs.

The market proved effective in allocating water in a context of changing urban water demand and irrigated land. The activity of the market seemed to be conditioned by the economic situation: in stagnant years, there was an increase of lease (temporary) transactions, while in years characterised by expansion of agricultural activities, long-term transfers were dominant. The administration of the system evolved over time. Initially, trading was made possible through informal transactions. In 1982, an official exchange administered by the Association was set up, with the purpose to improve the operation of the market.

This system persisted in a legislative vacuum. In fact, until 1999 there was not a piece of legislation addressing temporary water transfers. The 1999 Water Law specified the institutional framework necessary for the implementation of these systems. In the developed framework, the State determines the areas and temporal periods when water rights can be traded, under the following conditions: (a) water cannot be sold to uses which are secondary to that for which the permit was granted; (b) public institutions have preference in purchasing; and (c) public authorities can prohibit contracts if they oppose the public interest.

Source: Mariño and Kemper (1999)

ENVIRONMENTAL TAXES AND CHARGES

In water management, this category of instruments refers to water abstraction charges and taxes, and water pollution charges and taxes. In the pertinent literature, the terms "charge" and "tax" are often used interchangeably. By definition, charges are "prices" for public goods or publicly-provided private goods. They differ from market prices for private goods because they are not market-determined but are administratively set by a government agency, a public utility, or other types of regulated natural monopoly. This contrasts them with taxes which are not payments for "services" but means for raising fiscal revenue. A major difference is that taxes are connected to the general budget, forming part of the general government revenues, while charges are extra-budgetary, aiming to recover cost for a specific public investment (Panayotou, 1994).

BOX 4: AGENCES DE L'EAU AND BASIN PARLIAMENTS IN FRANCE

The six Water Agencies (Agences de l'Eau, AdE) of France were created through the 1964 Water Law as the executive arm of the "Water Parliaments" (Comités de Bassin, CdB), which were established under the same law. Members of the CdB represent main water users and local institutions are represented (20% of seats is devoted to the State, 20% to the Region of reference and the remaining 40% to local users).

In fact, the AdE are technical bodies responsible for financing water policies. Financial resources are raised by a system of ear-marked taxes and levies that co-finance the water-related investments of local authorities. The CdB decides on the level of levies and financial plans, allocating collected funds to water projects. It also has a role in the validation of Master Plans. There are two layers of basin planning: (a) the SDAGE (strategic and long-term planning), referring to the entire River Basin and (b) the SAGE, which refers to management at the sub-basin level.

The role of the AdE in river basin management is crucial. In fact, they represent an important share (15% on average) of total investment funds. This financial mechanism helps in undertaking investments while maintaining capital costs as low as possible.

Finally, through this framework, the users become responsible for the implementation of water management plans, since they are obliged to co-finance the interventions needed to achieve the priorities defined by the Agency.

Whatever the terminology used, the main issue concerning environmental charges and taxes is the use of generated revenue. The common and most easily accepted practice is that revenue is earmarked for explicit water management purposes, so that it is indirectly returned to those liable to pay.

In its simplest form, **earmarking** involves allocating resulting revenues to the group that paid for the originating taxes. Usually, different formulae are used to raise and disburse revenues. Simple earmarking usually has little environmental effect and transaction costs can be high. However, such systems can be useful, for example in mutual insurance schemes.

The French model of raising “redevances”, which recycles revenues back to those who contributed to them, is more complex. The main principle is that payers have a moral claim on their contribution and should expect a subsidy when it is their turn to make pollution control investments. Such systems can be useful to alleviate the burden of heavy investment, especially in the context of comprehensive water management programs, spanning long periods of time. Depending on the degree of solidarity among water users within a river basin area, such schemes can either work for the basin as a whole or be segmented to specific sectors or regions.

Finally, earmarking can be relaxed so that revenue does not go back to those who paid, but is instead used to finance typical water management operations, undertaken by public authorities. Examples include surface and groundwater monitoring, modelling, research and technical development, awareness raising and training initiatives, etc.

WATER ABSTRACTION CHARGES

Water abstraction charges concern the direct abstraction of water from surface and/or groundwater bodies, by individual users or water service operators. Charges can be different depending on the source and the specific environmental conditions, and can be set to reflect relative water scarcity.

Except for raising revenue, abstraction charges can induce a change in user behaviour, resulting in lower water demands through the improvement of efficiency in water use and the reduction of water leakage in public distribution networks. If the tax is set to reflect marginal costs of water abstraction, it can considerably enhance the cost-effectiveness of the service provided.

WATER POLLUTION CHARGES

A water pollution charge takes the form of a direct payment based on the measurements or estimates of the quantity and quality of a pollutant discharged to a natural body of water (not a sewer). Pollution charges are an important step towards the implementation of the polluter-pays principle, even if their calculation is not based on estimates of environmental damage costs. By levying a charge on pollution, a clear signal is given that society is not willing to bear the costs of pollution and that at least part of the costs associated with damages induced should be recovered directly from the polluter. To provide adequate incentives, the charge must be high enough to be effective in directing and encouraging pollution control measures. In some cases, pollution charges are also structured in a way that provides progressive incentive in pollution control.

WATER TARIFFS

Water tariffs have the primary goal of recovering costs related with water supply provision; tariff elements are also often designed so as to provide incentives towards more efficient water use and allocation, taking into

account that different price structures send different signals to consumers. A fundamental element in determining their structure lies in the consideration that the response of users and customers to economic incentives is not obvious; in this regard, there is need to carefully understand in each context what the likely outcomes and impacts will actually be. Responses differ according to the target group (e.g. final consumers, producers), and have also important differences in the short and long run. Therefore, adopting certain measures such as a temporary increase of water rates in order to face seasonal water stress will have completely different impacts than in the case in which they are intended to face long-run structural issues.

Several methods exist, all of which have been broadly applied and extensively discussed in numerous policy papers, with regard to their effectiveness, contribution to equitable access, incentive function, management and transaction costs, implementation problems, etc. These are outlined in the following paragraphs. The following paragraphs briefly outline the main methods for recovering costs relating to water supply provision, while Table 1 (p.18) summarises their main contribution in relation to ecological sustainability, economic efficiency, financial sustainability and equity/affordability.

In **flat pricing,** a charge of a constant fee is set, irrespectively of the water quantity used. Flat pricing methods are widely applied for recovering water service costs, where metering has not been introduced or is extremely difficult and costly to implement. Their advantage is that they produce fixed revenue, and can therefore provide stability. On the other hand, they offer no incentive for water conservation. **Uniform rates** charge for the quantity of water used at a constant per-unit fee. Uniform rates are easy to apply and easily understandable by consumers. However, employing a constant per-unit fee means that the objectives of equitable access and disincentives to wasteful water use are in conflict. **Decreasing block tariffs** (DBT) charge a volumetric rate that decreases for higher levels of use. They reflect per-unit costs of production and delivery that are reduced as customers consume more water, due to economies of scale. Although in some cases DBRs reflect the actual financial cost of water delivery, they offer no incentive for water saving and are not applicable in the case of increasing water scarcity (i.e. when marginal costs for water supply provision are increasing). In some cases, however, they offer incentive to large-scale consumers to connect to public water supply systems, and abandon individual abstractions that can entail significant environmental costs. **Increasing block tariffs** (IBT) apply a volumetric rate that increases for higher levels of use. They are the most popular form of determining volumetric charges in domestic water use, as they offer easier cost recovery than uniform rates, are considered to impose conservation incentives on large users and provide water at an affordable rate to disadvantaged users. On the other hand, they have also been strongly criticized by many researchers in the past years, due to several

shortcomings. These, according to Boland and Whittington (2003), can be summarized in the following:

- Difficulties in the definition of the rate for the initial block to ensure access to basic water services;
- Conflict between revenue sufficiency and economic efficiency;
- Lack of simplicity and transparency;
- Unfairness and limited applicability in the case of shared connections (i.e. more than one household sharing the same connection), which is often the case for poorer households in developing countries.

In most OECD countries, water tariffs include a fixed charge, not dependent on consumption, and a volumetric charge, set through one of the volumetric methods described above. The main objective is to secure a minimum amount of revenue to cover water supply costs, while at the same time providing incentive to users towards water conservation.

In countries and/or regions experiencing strong seasonality in water demand, **seasonal rates** are also often applied. These are designed so as to recover part of the costs for the additional infrastructure required to supply peak demands, and provide further incentive in water saving (e.g. in outdoor water use or in commercial and tourist facilities).

In most countries, water tariffs for urban water services also include **sewerage charges**, paid for discharges into the sewer system (domestic and other effluents). Sewerage charges have the objective of providing water utilities with the financial resources necessary for wastewater collection and treatment. In most OECD countries, revenues for sewage collection and treatment are largely based on volumetric charges, as applied to public water supply provision. Therefore, it is supported that the continuing trend toward more incentive-based charging for the public water supply system can lead to more wastewater revenues being recovered through volumetric charging. Furthermore, volumetric charging reinforces the incentives to use the water supplied more carefully (OECD, 1999).

AGRICULTURAL WATER PRICING

The issue of adopting appropriate water pricing methods for **irrigation water provision** has been in the focus of economic and water-related research for several years, both at the EU and on an international level. Applied methods comprise flat rates, calculated according to the area irrigated, and sometimes differentiated according to crop types, and uniform volumetric rates, where metering has been introduced (e.g. in public developed irrigation schemes, or systems managed by user associations).

Particularly in Southern Europe, and given the introduction of the Water Framework Directive, as well as the reform of the Common Agricultural Policy, many studies have been launched so as to assess the impact of the

wider introduction of volumetric charges on farmer choices (shift to efficient irrigation methods, choice of crops), as well as on agricultural income.

All studies emphasize that in addition to water price the agricultural demand for irrigation water depends on many other factors, like, the prices of the commercial yield of irrigated crops, the crop-mix planted in the area under consideration, prices of agricultural inputs other than water (e.g., fertilizers, insecticides), the available irrigation technology, soil types, weather conditions, etc. Empirical evidence suggests that as water price increases, water use per hectare planted for a given crop may drop somewhat, but the major change will be a reduction of hectares irrigated as cultivated areas are converted to crops that demand less water and/or to dry crops. In addition, farmers may choose to switch to more efficient irrigation systems and, in more extreme cases, irrigated land might be removed completely out of production.

If the price of a non-water-related agricultural input increases, water demand may either decrease or increase. For example, freshwater and recycled wastewater are substitutes, while water and capital inputs may be complements. If so, the use of fresh water rises when recycled waste water becomes more expensive will increase; on the other hand, a reduction in water use is to be expected if advanced irrigation technologies become less expensive.

It should be noted that farmers make water decisions at various times. In the long-run, all factors of production under the farmer's control are variable. For example, the choice of whether to install a drip irrigation system is variable in the long-run. Annual decisions (intermediate run) focus largely on the choice of crops, subject to various constraints and expectations, including water availability. It is worth noting that the majority of studies which estimate agricultural water demand use data corresponding to intermediate or long-run planning horizon.

In many countries and despite recent efforts, the universal introduction of volumetric pricing or even the metering of irrigation water consumption at the farm level remain in the margin of water and agricultural policies. Reasons include strong opposition from the affected groups; however, they are also related to concerns over the effectiveness of the instrument and the high costs of introducing metering at small (user) scale. Focus is rather given to instruments that would enable technology shifts and wide introduction of water saving methods, and to the integration of water-related and agricultural policies, so as to enable rationalization of water demands without compromising developmental and social objectives.

TABLE 1: ALTERNATIVE WATER TARIFF STRUCTURES AND PERFORMANCE RESPECT TO SUSTAINABILITY TARGETS (OECD, 2009)

	Ecological sustainability	Economic efficiency	Financial sustainability	Equity / affordability
Flat rate/ Uniform license fee	Very poor. No incentives to water saving	Acceptable as a way to recover the fixed cost; inefficient if marginal costs are relevant	Potentially satisfactory, but commitment to cost recovery required Need to avoid the political definition of fees	Very regressive
Non-uniform flat rate	Poor, unless rates are eventually calculated according to specific circumstances (e.g. surface of gardens; swimming pools; water recycling devices)	Acceptable as a way to recover the fixed cost; inefficient if marginal costs are relevant	As above	Potentially good effects, provided that criteria used correspond to personal wealth
Uniform volumetric rate with fixed charge	High, depending on the marginal rate and individual metering	Potentially the best solution provided rates reflect short-run marginal costs (SRMC); particularly suited in case SRMC are constant	Good	Potentially good effects, provided that criteria used correspond to personal wealth
Uniform volumetric rate	As above; higher, since zero fixed charges means higher marginal rates	Not very efficient; inefficiency depends on demand elasticity (the lower the elasticity, the lower inefficiency)	Good	Encourages connection
Uniform volumetric rate with rebates	As above Highest if rebates take into account specific circumstances (e.g. surface of gardens; swimming pools; water recycling devices)	As above; In turn, could be efficient in combination with a positive fixed fee	Good	Progressive and useful for reducing impact on poorer users; Best if rebate is targeted; otherwise, distributive effect depending on income elasticity
Traditional IBT and fixed charge	Highest, provided that metering is individual and marginal rates in the upper blocks are high	Potentially the best solution provided rates reflect short-run marginal costs; particularly suited in case short-run marginal costs are increasing (e.g. .costly extra supply to be purchased)	Good potential for Full Cost Recovery; Attention needed for sudden reforms from flat charges to IBT (effect on demand)	Regressive, according to demand elasticity to income
IBT and exact occ. amendment	Highest, provided that metering is individual and marginal rates in upper blocks are high	As above	As above	Reduces impact on large families
IBT with default 1st block and targeted subsidies	Highest, provided that metering is individual and marginal rates in the upper blocks are high	As above	As above	Not very useful; subsidized block not necessarily targeted to the poor
Seasonality on tariffs	Not very useful unless used as a complement to bans for certain uses	Good for reducing demand in peak periods and optimizing capacity use	Generally no effect	Potentially regressive: Poor more likely to be impacted during stress periods

INDIRECT TAXES

Although not as efficient as direct environmental taxes and charges, taxation of inputs (e.g. fertilizers) and/or final products (industrial or agricultural) has the advantage of relying on existing administrative arrangements.

Taxes can reduce the use of polluting inputs. However, they provide no incentive for pollution abatement; their ability to act as an incentive for pollution reduction depends on their level being high enough and on the demand for the product being elastic enough to discourage the use of the polluting input.

Taxes on final products are particularly suited for the control of consumption-related pollution (e.g. industrial goods), because consumers are made aware, through the higher prices, of the environmental consequences of their choices.

FINANCIAL INCENTIVES

SUBSIDIES AND GRANTS

Generally, subsidies address one of two following main objectives: they are either introduced for compensating users for a cost they bear for a required action or prohibition, or they are put in place in order to provide the necessary incentives for inducing a desired, but not required, action. Subsidies are economic instruments that may lead to inefficient situations. However, they can create the necessary incentives to stimulate change in user behaviour towards environmentally friendly practices or encourage investments in best available technology, thereby mitigating or eliminating negative environmental effects.

INVESTMENT TAX INCENTIVES

Investment tax incentives are usually more widespread than targeted subsidies. Their most common forms are investment tax credits and accelerated depreciation for pollution control equipment and wastewater treatment facilities. While their impact on the State or regional budget is no different than that of subsidies, investment tax incentives are more popular because: (a) their costs are hidden from public scrutiny and hence are an expedient way to provide hidden subsidies, and (b) they appear to promote environmental protection without compromising competitiveness. However, environmental protection is not assured since the installation of the mandated (and subsidized) pollution abatement facilities does not also guarantee their efficient functioning.

OTHER FINANCIAL INSTRUMENTS

Other financial instruments, such as relocation incentives and subsidized interest or soft loans for projects with significant positive externalities, can be justified as means to either internalize these externalities or reinforce willingness to pay for socially responsible investments.

LIABILITY SYSTEMS

Liability rules can provide strong incentives to avoid environmental impacts. They imply consistent monitoring and enforcement of sanctions by the governmental authorities responsible for environmental regulation (PRI, 2005).

Environmental liability rules aim at inducing socially and environmentally responsible behaviour. They are intended to internalize and recover the costs of environmental damage through legal action and to make polluters pay for the damage their activity causes. To that extent, they can be considered as the most "traditional" expression of the "polluter-pays" principle.

Normally, liability laws include fines and other forms of sanction in the case of non-compliance with existing environmental regulations. Their aim is two fold: first they aim at inducing polluters to make more careful decisions about the discharge of pollution according to the precautionary principle, and, second, they seek to ensure the compensation of victims of pollution. They can provide a rather powerful incentive when the expected damage payments (or incurred costs) exceed the benefits from non-compliance. The frequency with which liability cases are identified and penalized and the magnitude of damages awarded can ex ante influence the behaviour of potentially liable parties. Advantages and disadvantages/limitations are summarized in Table 2.

TABLE 2: ADVANTAGES, DISADVANTAGES AND LIMITATIONS OF LIABILITY SYSTEMS (ADAPTED FROM KRAEMER ET AL., 2003 AND PANAYOTOU, 1994)

Advantages	Disadvantages/Limitations
• Pollution control through the decentralized decisions of polluters to act in their own interest (incentive towards self-regulation) • Environmental liability laws constitute a significant step towards the application of the polluter-pays principle • Compliance costs are also reflected in prices of end-products and therefore contribute to the principle of ecologically honest prices	• Damage is assessed and damage costs are recovered ex post • Not applicable in cases of diffuse pollution, where it is impossible to identify and link individual polluter(s) activities to the negative environmental impact • Not recommended for developing countries with poorly developed legal systems, or with cultures that very rarely use courts to resolve disputes or award damages

ENVIRONMENTAL PERFORMANCE BONDS

Environmental performance bonds are economic instruments that aim to shift responsibility for controlling pollution, monitoring, and enforcement to individual producers and consumers who are **charged in advance for the potential damage** (Panayotou, 1994). Therefore, their main difference from conventional liability is that they internalize environmental risks ex ante (before) and not after environmental damage has occurred.

The general principle of performance bonds is that the supervising government agency is guaranteed sufficient funds, in the form of a bond or security, to cover the cost of rehabilitation in the event of failure by the enterprise concerned. Furthermore, the individual users have the interest to ensure minimization of their impact; in case that the bond applies to the members of an industrial association, self-regulation and mutual control are further strengthened.

The arrangement has evolved in a manner similar to risk insurance, where guarantees of rehabilitation or restoration to the water environment are obtained by payment of a risk premium to a bank, insurance company or other financial institution. Furthermore, as bonds can be invested in interest-bearing accounts, they do not necessarily constrain economic activity.

The success of the tool requires adequate monitoring and enforcement mechanisms within the public authority. The main potential disadvantage of performance bonds is that they may not be able to compensate for irreversible environmental damage. Thus, where large-scale irreversible damage is possible, it may be more effective to rely on direct regulations (James, 1997).

VOLUNTARY AGREEMENTS

Voluntary agreements (VAs) are not purely an economic instrument, as they usually encompass a range of tools for achieving improved environmental performance. They are becoming increasingly popular as, through proper design adapted to regional context, they are more easily accepted, understood and effective than economic or regulatory instruments alone. Voluntary agreements can be defined as *a contract between the public administration and the user (or the user group) in which the user agrees to achieve a certain environmental objective and receives a subsidy or other forms of assistance to change its technology or practices.* The agreement is bilateral or multi-lateral and requires a voluntary element on both sides.

Voluntary agreements can present advantages when compared to the traditional "Command-And-Control" approach, based on regulation and enforcement. They can provide quick progress due to rapid and cost-effective implementation, and allow for flexible and adjusted adaptation to technological options and market sensitivities. In this regard, they can help to achieve policy objectives faster than mandatory requirements and statutory rules. In general, VAs cover a wide range of responsibilities by the contractor or contractor(s), including periodical reporting on performance, implementation of best practices, improvement of efficiency, public information on environmental performance, and awareness raising initiatives on environmental issues (EFILWC, 2000).

In principle, three types of voluntary agreements can be distinguished (Lyon and Maxwell, 2003):

- *Unilateral agreements* refer to self-regulatory actions in which users/polluters initiate a public pledge to improve their environmental performance;
- *Public voluntary agreements* refer to the commitment of participating firms to make efforts to meet program goals established by the regulatory agency. In return, they may receive technical assistance and/or favourable publicity;
- *Negotiated voluntary agreements* describe situations where the regulator and users or polluters jointly set environmental goals and decide on the means to achieve them.

The initial main area of application is the industrial sector; however, in recent years several voluntary or negotiated agreements have been established in agriculture, to help reduce agrochemical use in vulnerable areas, enhance efficiency in water use and promote organic farming.

VOLUNTARY AGREEMENTS IN THE INDUSTRIAL SECTOR

VAs have been and are still broadly applied in the industrial sector. Pursued environmental objectives are not limited to water management (reduction of discharged pollution loads or water consumption) but also address the reduction of CO_2 emissions, improvement of energy efficiency, etc.

BOX 5: THE CLEAN RIVER PROGRAMME OF INDONESIA

The PROKASIH programme began in 1989 and was aimed at cleaning up the most heavily polluted rivers in Indonesia. It involved five steps: (1) establishing local PROKASIH teams; (2) identifying specific firms in highly polluting industries – the target polluters; (3) getting these firms to sign voluntary letters of commitment to reduce pollution loads by 50% within an agreed timeframe; (4) monitoring subsequent results; and (5) applying pressure on those not making efforts to comply with their commitment.

The implementation of PROKASIH was carried out by provincial authorities with the support of central agencies as needed. In addition, the media, NGOs and community groups were encouraged to participate and get involved. In the early 1990s, the programme was replaced by the "PROPER PROKASIH", which signalled a move towards public participation, transparency and recognition of the power of the media. This new programme awarded companies for their environmental performance by rating them according to a colour scheme (with five hues from black to gold) and published the relevant information.

Both programmes were evaluated positively. The awarding of companies on the basis of their environmental performance revealed a clear improvement in the ratings of the industrial firms that participated: "red" or "black"-rated industries were significantly reduced even during the 1st year of programme implementation.

Sources: O' Connor, 1998; Wheeler and Shakeb Afsah, 1996

Self-regulation through VAs has become increasingly popular in industrialized countries over the past two decades. Their application in developing countries is also being enhanced; however in this case, the

targeted objectives are quite different. While VAs in industrialized countries aim mostly to encourage firms to "over-comply" with mandatory regulations, in developing countries, VAs aim mostly at helping users address their non-compliance to regulations. This non-compliance is mostly due to the weak capacity of authorities to enforce regulations and to the inability of users to respond to stricter standards, due to technical and financial constraints. In this case, four types of commitment are usually entailed:

- First, a user group agrees to make investments to comply with the pertinent legislation within a certain timeframe.
- On the other hand, environmental authorities agree to not sanction for non-compliance during the grace period.
- Regulatory authorities agree to take the actions needed for eliminating barriers in the enforcement of regulations, e.g. by promulgating missing regulations.
- Environmental authorities promise to subsidize and promote users' investments.

As depicted from the example of Box 5, additional incentives are offered through the wide publication of agreements at local level.

VOLUNTARY AGREEMENTS IN AGRICULTURE

Similar agreements are also applied in the agricultural sector, where regulation becomes increasingly complex. Their aim can be to reduce pollution from agricultural activities or to control surface and groundwater use when these cannot be easily controlled by the relevant authorities.

The participation of farmers in such programs is encouraged by means of positive incentives (e.g. tax returns, subsidies etc.), whereas education, training on best practices and continuous support and advice are crucial.

An evolved form of the instrument is **cooperative agreements**, which are entered into as a result of negotiations on the application of agrochemicals or water abstraction between farmers and water utilities, with direct or indirect involvement of water authorities (Heinz, 2007). Cooperative agreements have significant benefits for all parties involved:

- Farmers get compensation payments and save costs by improving their production methods;
- Water utilities save treatment costs or supply enhancement costs, which also benefits their customers (lower charges for water services);
- Water authorities and water utilities save costs for required restoration and remedial measures.

A reported limitation to broad implementation is that in many cases (e.g. in the UK), legislation does not allow the passing-on of the costs of such agreements to the water consumers as part of a water utility's operational cost. The instrument also violates the "polluter-pays" principle: the

polluter, i.e. farmers, is compensated instead of paying. However, experiences report that CAs can establish win-win situations for all the involved parties and help to effectively reduce environmental pressures on water bodies.

BOX 6: VOLUNTARY AGREEMENTS FOR WATERSHED MANAGEMENT IN COSTA RICA

The initial approach to water management in Costa Rica was based on isolated policy instruments (e.g. regulatory approaches, financial incentives, education campaigns) which had limited success. Subsequently, Voluntary Environmental Agreements (VEAs) were introduced, as a multiple stakeholder instrument. The VEAs were undertaken with strong involvement of the energy sector, which is highly dependent on the conditions of the watersheds in which hydropower plants are located. The sector has considerable interest in improving watershed management in order to guarantee its main input (enough water of quality acceptable for hydropower). The established VEAs have a formal status. Parties involved include State Agencies, Landowners, Energy Production Firms and NGOs. They are based on the fulfilment of mutual interests:

- Energy production firms are interested to invest in watershed protection, as this results in an increase of their profit (the more water of suitable quality becomes available for hydropower, the greater the energy sales). Furthermore, this promotes the "green image" of the firms.
- Farmers and landowners, although not directly involved in some VEAs, can receive an Environmental Service Payment (ESP) by the State for reforestation activities, together with the protection of their forests and land. This, in some cases, can become an important part of their income.
- NGOs and State Agencies benefit from such agreements through the protection of fragile watersheds and ecosystems, or through the reduction of their costs (e.g. for water supply).

Since 1997, seven voluntary agreements have been signed. Overall, it is supported that the agreements have accomplished their goals as instruments for watershed protection, because they were embedded in a broader set of environmental policies. Almost all agreements were concluded between separate energy production firms and NGOs, with a more limited role of the central state.

Source: Miranda et al. (2007)

BROADER POLICY CONSIDERATIONS: WATER PRICING AND COST RECOVERY

As mentioned above, economic instruments serve different purposes (functions), and thus are selected and applied according to the water management issue at hand. Experience also demonstrates that the specific characteristics of instruments in each case are unique, as they are shaped by the institutional environment, political and public acceptance, and not always by economic theory. Based on information from the relevant literature, Table 3 links the instruments described above to likely policy objectives in water service provision, river basin and aquifer management, and national water management and planning.

TABLE 3: POTENTIAL CONTRIBUTION OF INSTRUMENTS TO DIFFERENT WATER MANAGEMENT OBJECTIVES

Level	Possible objectives	Instruments
Water service provision (water utility)	Increase perceived value of water Internalize costs and reduce use Finance increase in infrastructure capacity	Utility pricing to meet/include full cost (water charges, sewerage charges) Subsidies/incentives to efficient water use
Watershed, River Basin, Aquifer Management (River Basin Agency)	Capture full cost and reflect value of water (internalize external costs) Regulate water use Offer incentives to water utilities to reduce abstractions	Tradable water use rights Water abstraction charges– Earmarked funds for watershed management initiatives and demand management programmes
	Limit nutrients from all sources (source and non-point)	Tradable emission permits / licenses Pollution charges Voluntary agreements
	Focused on point source discharges (industry and/or municipal)	Tradable emission permits Effluent charges high enough to encourage capital investments to improve treatment Voluntary agreements
National water management and planning and/or river basin management (State, River Basin Agency)	Demand management Pollution prevention and abatement Raising of financial resources for water management Economic efficiency in water use, etc.	Pricing policies Investment tax incentives Grant programmes for best performance Tax rebates on high efficiency product purchases Other forms of financing Voluntary schemes

Source: Adapted from Sawyer et al. (2005)

Despite the specific norms of each option, all economic instruments in fact concern the implementation of different mechanisms for sharing water-related costs among the society. Figure 3 sketches financial flows occurring at different stages of water management. These financial flows are captured by a variety of forms of economic instruments, from water tariffs to subsidies. Other types of economic instruments, such as water abstraction charges or water pollution charges, are also present in many water systems, even if they are not set at a level which would account for external environmental costs incurred by specific uses.

The first main mechanism is identified in the cross-subsidisation among tax-payers and water users. Usually, and in most countries facing water stress, the development of infrastructure entails high involvement of the State. Through the State budget, heavy subsidies are made available for the implementation of inter-basin transfers, irrigation projects, rural development schemes and infrastructure for sewage collection and treatment.

The second mechanism refers to the cross-subsidisation among different use(r)s. Often the implementation of major water development works involves joint infrastructure, i.e. infrastructure used by more than one use (e.g. dams and conveyance systems used both for domestic water supply and irrigation). As there is a shift towards the recovery of costs associated with the maintenance, operation or even the rehabilitation of such systems directly from the water users, it is often the case that some uses contribute more to the recovery of costs for joint infrastructure, implicitly subsidizing the others.

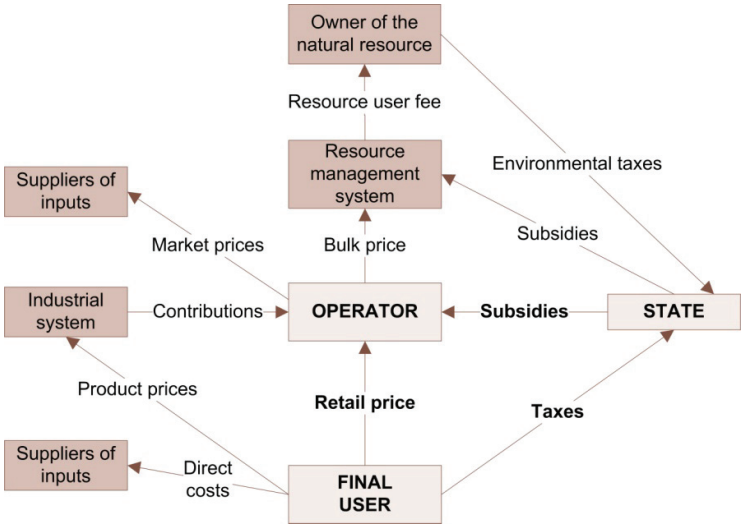

FIGURE 3: A SKETCH OF FINANCIAL FLOWS IN WATER SUPPLY SYSTEMS

Full cost recovery, in theory, is always guaranteed: total costs could be covered by a broad range of instruments whose extremes are, on the one side, water pricing policies (including environmental charges) and on the other general taxation. In the former case the user will bear the burden of financing the service provision (together with environmental costs), while in the latter case these costs are split among all tax-payers. Therefore, costs, even those associated with capital investment, are recovered at all times. What remains different, however, is the distribution of costs among the different groups.

In this regard, sources of financing for water management operations present different levels of endogeneity. Box 7 highlights that different sets of solutions exist. Generally, the theoretical optimum calls for State financing for components that are public goods, and marginal cost pricing for private-good components.

The choice among endogenous or exogenous source of finance is determined by several key constraints. First, in most countries, public finance is becoming scarcer. Central and regional governments have limited possibilities to increase public expenditure on public services such as water and wastewater services. On the other hand, there are several issues that impede financing through water tariffs alone. Firstly, metering is costly; therefore, if elements based on volumetric charges are introduced, and

systems have to be placed from scratch (for example in irrigated agriculture in many EU and Mediterranean Countries), total costs to be recovered are increased. Secondly, financing through tariffs alone would have significant distributional impacts, as an increase in tariffs combined with a decrease in public finance availability could make water unaffordable for certain uses. There are several solutions: one would be to introduce cross subsidies among use(r)s; another option concerns water demand management policies, in order to decrease water consumption and, consequently, some of the water service costs borne by the users.

BOX 7: SOURCES OF WSS FINANCING

ENDOGENOUS **EXOGENOUS**	**From water users** • On individual basis (marginal cost) • Compensating among customers according to the charging criteria adopted • On a collective base (territorial cross-subsidies) • Through ear-marked taxes **Cross-subsidies** • From the collectivity • Cross-subsidies among services operated by the same authority; • Cross-subsidies among users of the same water resource **General taxation** • Direct subsidies (grants for new investment; coverage of operational deficits) • Indirect subsidies (e.g. low-interest loans, under-pricing of commodities and services supplied by the public sector) **Transferred elsewhere as an external cost** • To other water users (inter-generational externalities: e.g. pollution of a river used for bathing / fishing) • To next generations (inter-generational externalities: e.g. poor maintenance of assets, public debt for covering operational expenditure, permanent contamination of a water table)

With this premise, it is clear that full cost recovery is not the main issue in the application of economic instruments. The problem concerns rather the definition of "full" cost, and in particular how to evaluate capital costs for infrastructure development and external environmental and resource costs, and capture these through economic instruments and tools, according to the "polluter-pays" principle.

The European experience from the preliminary assessment of the recovery of water service costs, within the context of the WFD implementation, shows that different tariff structures can be employed, depending on local/national contexts, such as:

- Individual full cost recovery with flat prices applied in very large territorial units (UK);
- Individual full cost recovery with average cost pricing and ear-marked taxes system for helping initial investment (France);
- Individual full cost with average cost pricing, inter-service cross-subsidies and local finance (Germany and Italy);
- Public and EU funding for large bulk water transfer schemes, cost recovery for distribution (Spain, Italy, Portugal and Greece).

Apart from the above differentiation, in all cases quoted above serious doubts exist concerning the feasibility of recovering the "true" cost of capital. That means that there is strong possibility that massive financing will be required in the long run for sustaining infrastructure systems. For example, historically, in the UK when the Government decided to fully invest in water services, corresponding debts were erased, and the established water companies undertook responsibilities for new investments only. In France the Agences de l'Eau provide a "compulsory saving bank", lending money at no interest, which decreases the above risk. In Germany, capital costs are valuated at reinstatement value. As a consequence, infrastructure never loses value during time, provided cash flow is reinvested in water sector.

INSTITUTIONAL INSTRUMENTS AND BROADER CONSIDERATIONS

From the broad range of institutional arrangements and instruments, key issues that were considered most relevant to the development of the INECO Case Studies mainly referred to the enabling environment for the effective implementation of economic instruments. This section focuses primarily on providing basic information on broader factors that can contribute to enhanced sustainability, as well as complementary or alternative approaches to problem mitigation, such as enhanced regulation, decentralisation and alternative forms of institutional organization, public participation, and private sector involvement.

THE COMMAND-AND-CONTROL APPROACH

The "traditional" regulatory approach to mandate change in the behaviour of water users is commonly referred to as "command-and-control" (CAC).

Command and control measures (CCM) refer to regulatory norms and standards that forbid or allow certain actions or outcomes. The "command" phase involves the definition of standards and allowable actions. During the "control phase", public authorities monitor and enforce the legislation, and in case of non-compliance initiate relevant procedures (e.g. fines, sanctions etc.), according to the existing liability rules.

With regard to water pollution, types of standards can include:

- **Ambient standards**, which regulate the amount of pollutant present in the surrounding (ambient) environment. These types of

standards cannot be directly enforced. Action requires that the sources of pollution are traced and regulated to ensure that the ambient standard is met.

- **Emission standards**, which regulate the level of emissions allowed but do not guarantee a specific ambient level of pollution.
- **Technology standards**, which require polluters to use certain technologies, practices, or techniques. While emissions standards require polluters to meet a goal for the level of pollution, but give the polluter freedom to choose the technology used, technology standards require a specific technology.

With regard to water use, a legal water standard or quota can be introduced that places restrictions on the amount of water that can be extracted for use. It will be effective if water users face substantial monetary penalties for not lowering water abstraction below this standard or not adhering to the quota.

TABLE 4: ADVANTAGES AND DISADVANTAGES OF THE COMMAND-AND-CONTROL (CAC) APPROACH

Advantages	Deficiencies
• Standards are a more widely understood form of environmental policy. • Standards are a pragmatic approach when there is uncertainty about the effects of pollution on the environment. • Political costs of standards are lower compared to market-based instruments.	• An 'optimum' standard is difficult to determine. • Users and polluters have no incentives to reduce pollution beyond the standard. • Penalties for violating standards tend to be too low and enforcement tends to be weak. • To be effective, standards need to be revised frequently, but in practice legislation tends not to keep up with the change. • Standards tend to be less cost-effective than other (economic) instruments. • The financial costs for meeting standards may be high to the users. There could also be political costs if the standards are stringent and users are adversely affected. • CAC is very difficult and costly to apply in cases of diffuse pollution, and has many times proven ineffective (e.g. groundwater abstractions)

When compared to other instruments, command-and-control approaches to water management issues have advantages, but also difficulties in implementation, and evident deficiencies that require complementary action and strong institutional mobilization (Table 4, above).

DECENTRALIZATION

Decentralization aims at enhancing local involvement in water management and could refer to specific activities or to devolution (van Beers, 2006). In the first case, community (or river basin) planning and management is promoted, while in the second the devolution of responsibilities could lead to participatory decision making processes.

Decentralized water management requires an institutional framework, defining at least the relationships between administrative units, procedures for access to information, financing schemes, and means through which the ability of decentralized bodies to perform water management can be enhanced.

As argued in the introductory section of this document, in countries facing temporal or spatial disparities between water availability and demand, the water sector is highly centralized; the main objective is to facilitate construction and effective operation of the hydraulic schemes required to transfer water from relatively water-rich areas to others, facing water scarcity problems. With a high degree of water exploitation already achieved, and the strengthening of efforts towards demand management, responsibility is gradually being shifted to institutions and authorities operating at lower spatial scales, so as to improve the effectiveness and efficiency of water management operations. Several examples exist both in Southern EU Member States and in other Mediterranean Countries, where river basin management and decentralization in water service provision have been introduced.

Efforts however are often hampered by the lack of capacity of established authorities; financing schemes, capacity building, improved coordination and cooperation, and empowerment of institutions mandated with water resources monitoring and environmental legislation enforcement, are all issues that have not yet been effectively addressed in many areas.

BUILDING INSTITUTIONS AT THE RIVER BASIN SCALE

Water governance is strongly influenced by the shift from centralisation towards subsidiarity. It is widely acknowledged that sustainable water management means that water resources are managed at the “appropriate level”, i.e. the river basin or the aquifer scale. In turn, this implies the establishment of institutions responsible for water management at this scale, so as to ensure integration of policies and water management operations. However, the uneven spatial distribution of water resources has often been viewed as an inhibiting factor towards decentralization, as solidarity would dictate that areas having more water should share it with those in need.

As pointed out above, the key premise in allocating water management responsibilities from central authorities to River Basin authorities lies in providing the latter with the power required to deal with water management issues. In turn, this is shaped by the legal status of basin

organisations and their relationships with other government layers, i.e. the hierarchy of decisions taken at basin level.

Effective power is guaranteed when decisions taken at the basin level are binding with respect to global decision making. Furthermore, it is crucial to guarantee that River Basin Authorities are in a position to actively influence the policy process, e.g. by influencing the financial resources available for investment in water infrastructure.

It can be expected that one of the main challenges of the next years will be to put in place "true" public participation with representation of all interest parties and their active involvement. Ways of enabling such processes entail the consultation of stakeholders on the development of water policies and their involvement in the overall implementation process through the allocation of responsibilities.

This evolution is gradually introducing a great change in the roles and functions of basin institutions, which are becoming water policy enablers instead of planners. In other words, the shift from top-down to bottom-up policy definition can result in the enhancement of cooperative relationships between river authorities and other stakeholders instead of the traditional command-and-control approach.

COMMUNITY-BASED WATER MANAGEMENT

Community based management (CBM) refers to the involvement of the beneficiary communities in the management of water supply facilities (Wegelin-Schuringa, 1998). The focus of CBM is to pay attention to consumer demand for services, build community capacity to manage resources and facilities, and consider long-term institutional arrangements for providing technical assistance to communities. In general, the main premises of community management are (Lockwood, 2004):

- Local society in direct or indirect control over the operation and management of its own water supply system,
- Development of ownership perception by the user community, and
- Contribution (financial or as human resources) of the community to the recurrent costs of running and maintaining the system.

Community management does not imply that communities must take care of everything or pay the full cost themselves. The idea of partnership allows for sharing responsibilities between supporting agencies and communities. The partnership is often expanded to include the private sector, which may be contracted for service delivery by either of the other partners. The division of responsibilities between these partners can vary considerably, but should be agreed upon in advance. Many agencies and communities are working together to find solutions for efficient operation and maintenance of water supply systems and to find a strategy which assigns responsibilities to each of the partners, where each has a

comparative advantage, and which places responsibilities in the whole project cycle at the lowest possible level.

Community management is increasingly accepted as the most appropriate model for providing sustainable water supply and sanitation services to rural communities. However, much of the success of community management to date has been at the level of the individual community or group of communities. In addition, despite the efforts put into developing community management during the implementation phase of projects, the evidence indicates that without external support systems continue to fail before the end of their design lives.

The key factors for success at the implementation stage is the (baseline) level of community capacity, the existence of demand at community level, governmental and donor support in financial terms but also through a supportive policy framework, sufficient water resources and capacity of implementation agencies. The prerequisites for success during the sustainability phase involve the effective support of intermediate-level agencies, the appropriateness of the technology in terms of maintenance requirement, the availability of spare parts, the availability of funds (to finance support agencies) from either external sources or cost recovery and continuing availability of sufficient water resources.

PUBLIC PARTICIPATION

The development of IWRM processes towards more sustainable and socially equitable water management includes public participation aimed at ensuring that the interests of all stakeholders, including water users and the civil society, are taken into account and adequately addressed. In participatory processes all citizens, both men and women, should have a voice, directly or through intermediary organizations representing their interests, and throughout the process of policy and decision making. Public participation does not necessarily imply decision making, but it is an instrument that facilitates consensus, making users aware of the interests of others.

Public participation can take many forms. Initially it could mean accountability, transparency and access to relevant information. It could also mean communication among the various stakeholders who carry specific interests or competences in the water management sector. At higher levels, it could mean public consultation during decision-making, offering the opportunity to raise objections against proposed decisions or processes. At the highest level, it can involve the public at a deliberative stage, by assigning them impeditive power (veto), or even co-decision.

In recognition of the significance and benefits to enhanced public involvement, various methods have been employed, depending on the institutional and political context, levels of civic awareness, engagement and mobilization, capacity and knowledge of authorities and the importance of the issues under discussion. These can range from “Public Notice and Comment Requirement” procedures, and “Public Hearings”, to

more deliberative and co-deciding processes, which in past years have led to the development of local "Agendas 21", or "Water Management Protocols" signed by all parties involved (Table 6).

Whatever the form of public involvement (information, consultation or full deliberation), the process should be carefully designed and founded on a thorough consideration of the following issues:

- **Access to relevant information:** Information access is crucial to ensure that (a) all stakeholders are informed on the issues at stake, their impacts and causes and (b) trust can be built among all parties involved. Furthermore, disclosing information about water may also mobilize public opinion and urge users, polluters and authorities to take action. Experience has shown that although in many cases the quality of information available is good, the access of the public remains limited. The sharing of information through the internet and the media, the dissemination of assessments, surveys and management plans in plain language, and the organization of information meetings are first steps towards this process.
- **Awareness and education**, not only for the specific issue at hand, but also on the rights and obligations that each party has throughout the process.
- The **building-up of the system of representation**, in order to guarantee the legitimacy of the process and the decisions taken, and ensure that all interests, including those of minorities or marginalized groups are known, respected and taken into account.

PRIVATE SECTOR INVOLVEMENT

The enhanced involvement of the private sector has often been advocated as a potential solution to inefficiencies in public water service provision. Public-private partnerships can be introduced in different stages of water development; in turn, this choice has significant implications in the organization and management of water services. The main institutional prerequisite is the formulation of a framework that clearly defines the responsibilities of the different parties and ensures that all draw benefits from cooperation.

Especially with regard to the management of water services, the operation and maintenance as well as asset management of the water supply system can be delegated to public or private operators through competitive bidding. Since water and wastewater services are natural monopolies, tariff regulation has to be introduced. Several forms exist, ranging from incentive regulation to benchmarking.

Private sector involvement can also be guaranteed in the provision of inputs to the water industry. It can be the case that WSS operators cannot deliver alone on all services and products required. As a result, they could

outsource part of their activities. In the case of public entities, the respect of procurement rules must be guaranteed.

TABLE 5: FORMS OF PUBLIC - PRIVATE PARTNERSHIPS[1]

	Definition of performance standards	Asset Ownership	Capital Investment	Design & Build	Operation	User Fee Collection	Monitoring of performance
Fully Public Provision	○	○	○	○	○	○	○
Passive Private Investment	○	○	⊙	○	○	○	○
Design and Construct Contracts	○	○	○	●	○	○	○
Service Contracts	○	○	○	○	●	○	○
Joint Ventures	○	⊙	⊙	⊙	⊙	⊙	○
Build, Operate, Transfer	○	○	●	●	●	○	○
Concession Contracts	○	○	●	●	●	●	○
Passive Public Investment	○	●	⊙	●	●	●	○
Fully Private Provision	○	●	●	●	●	●	○

Source: OECD (2003)

The heavy need for investment in bulk water supply provision has been commonly financed through the central budget. However, there are still important investment requirements in treatment and distribution, and more importantly in sewerage and sanitation services. The main problem regards the capacity of being attractive to professional water operators and market investors. Experience shows that when tariffs finance the full cost of the service, economic regulation is crucial to guarantee both the welfare of consumers and the viability of businesses. When full cost recovery through water tariffs is undesirable or unattainable due to socio-economic considerations and concerns, public bodies maintain at least partial responsibility for asset financing. The choice is usually mandated by the analysis of the impacts that different forms of partnership have on water tariffs and social acceptability.

[1]Legend: ○ Public responsibility; ⊙ Shared public and private responsibility; ● Private responsibility.

TABLE 6: OVERVIEW OF MOST COMMONLY APPLIED METHODS TOWARDS PUBLIC PARTICIPATION

Participation Method	Representation Time scale and duration	Main characteristics	Advantages	Disadvantages
Referenda and deliberative polls	Potentially all members of the national or local population; realistically, a significant and representative proportion of these Vote cast at single point in time	Vote is usually a choice of one or two options. All participants have equal influence. The final outcome is binding Deliberative polling compares reactions before and after opportunity to discuss an issue or proposal	Straightforward and easily interpreted results Allows variety of means for communication Can provide opportunity for extensive debate and information-sharing in advance Large sample size extends involvement and can provide legitimacy to outcome	Does not provide information on reasons for choice Result can be significantly influenced by volume, quality and balance of information provided Low turnout may damage credibility of result
Public hearings/ inquiries	Interested citizens, limited in number by size of venue. True participants are experts and politicians making presentations May last many weeks, months, even years Usually held during week-days/working hours	Entails presentations by agencies regarding plans in open forum. Public may voice opinions but have no direct impact on recommendation	Provides opportunities for comments and questions Is highly visible, if well publicized Encourages discussion and flow of information	People attending may not be drawn from or representative of the local population Contributions may be limited by a lack of knowledge and lack of interest Event may be stage-managed by organizers or dominated by conflict, without means of resolution Contributions may be dominated by particular individuals or by local, topical and personal concerns
Public opinion surveys	Large sample (e.g., 100s or 1,000s), usually representa-tive of the population seg-ments of interest Single event, usually lasting no more than several minutes	Often enacted through written questionnaire or telephone survey. May involve variety of questions. Used for information gathering	Can provide statistically valid and representative information of opinions Allows responses from people who might not normally attend meetings Can be used to introduce and gather views on project options and choices Detailed analysis may allow correlation of support with social characteristics and identification of profile of supporters and opponents	Provides only snapshot of opinions, heavily dependent on level of information and opportunities for deliberation Costly to conduct additional surveys so that changes can be tracked as information is provided Poor or manipulative design can bias responses and allow misleading interpretations May be difficult to get reasonable sample size and access to some groups

Participation Method	Representation Time scale and duration	Main characteristics	Advantages	Disadvantages
Citizens' jury/panel	Generally, twelve to twenty members of public selected by stakeholder panel to be roughly representative of the local population Not precise, but generally involves meetings over a few days (e.g. four to ten)	Lay panel with independent facilitator questions expert witnesses chosen by stake-holder panel. Meetings not generally open. Conclusions on key questions made via report or press conference	Allows participants to select and pursue own lines of enquiry and interact with experts and proposers Supports detailed and critical consideration of key issues and may identify areas of agreement or disagreement Can help identify relative influence of different types of argument, evidence and information on beliefs and responses Jury members usually value opportunity to make significant contribution to deliberation process	Expensive to organize and run Requires significant time commitment from jury members and expert witnesses May develop unrealistic expectations if role and terms of reference are not agreed and clear May produce confrontational environment, not conducive to building trust and promoting consensus
Citizen/public advisory committees	Small groups selected by sponsor to represent views of various groups or communities (may not comprise members of true public) Takes place over an extended period of time	Group convened by sponsor to examine some significant issue Interaction with industry representatives	Collective ownership of challenges and pressures All sectors engaged in selecting management measures/options	The key to success is to ensure "balance" among the members of the Committee. If participants are not representative of the wider community in terms of income and education, then recommendations are possibly not legitimate or helpful in reconciling/incorporating conflicting interests
Focus groups	Small group of five to twelve selected to be representative of public. Several groups may be used for one project (comprising members of subgroups) Single meeting, usually up to two hours	Free discussion on general topic with video/tape recording and little input/direction from facilitator Used to assess opinions/attitudes	Allows interaction and collective generation of understanding, ideas and concerns Can explore extent of understanding and basis of interviewees' responses Generates more detailed feedback than surveys and allows probing of initial responses Can show how understanding and views change over time and in response to information and interaction, and help identify relative influence of different types of argument, evidence and information	Detailed analysis is resource-intensive Without good facilitation group dynamics may allow domination by individuals or diversion from topic Awareness and understanding of issues may vary greatly among participants Should not be relied on, as sole point of contact with community or seen as necessarily representative

Participation Method	Representation Time scale and duration	Main characteristics	Advantages	Disadvantages
Written submissions		Open or targeted invitation to comment in written submission on proposal. Usually preceded by provision of information	Provides opportunity to distribute detailed comprehensive information Allows respondents to work together to formulate response Responses likely to be considered comprehensive and measured, and provide insights from local expertise Fits existing planning procedures in many jurisdictions	Response rates vary greatly by demographic characteristics Cost of printing and distributing documents can be significant May require more time than other methods, and analysis can be prolonged and resource intensive Without adequate and detailed response from commissioning authority, often seen as wasted effort

Sources: Rowe and Frewer (2000); Beierle (1998); Jeffrey and Russel (2007)

THE INECO METHODOLOGICAL APPROACH

This chapter provides an overview of the methodological approach followed by the INECO Project towards the development of recommendations relevant to the local Case Study context and to broader policy considerations in the countries concerned. It introduces subsequent chapters that present the range of water management issues addressed by the Project Case Studies, and the specific outcomes of processes undertaken for identifying potential implications of alternative policy approaches towards the mitigation of these issues.

Key elements outlined concern the main principles, challenges and innovative elements in the formulation of the INECO methodology, and outlines the major steps undertaken in the implementation of participatory processes in the Project.

GENERAL FRAMEWORK AND PREMISES

The INECO Project was launched with the aim to introduce an interdisciplinary approach to water management, building upon the integration of three major aspects: environment, economics and society. The project's main strategic goal was capacity building for promoting constructive engagement among stakeholders towards Integrated Water Resources Management (IWRM). INECO, through its activities and analyses also emphasized on the principles adopted by the EC Water Framework Directive 2000/60, towards integrated management at the river basin level, recovery of water service costs, implementation of water pricing policies towards the attainment of environmental objectives and public participation.

Starting with the premise that sustainable water management is intrinsically linked to stakeholder involvement and participation, the project focused on discussing shared problems in the decision-making processes and the deficiencies of the current water governance structures in Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco.

Of the seven (7) water management challenges defined in The Hague Ministerial Declaration on Water Security in the 21st Century, three were identified as broadly related to the project's scope and objectives and to the water management issues faced in most Mediterranean Countries:

- The **"Sharing water"** challenge, with reference to the processes and mechanisms (institutional, regulatory, legislative, economic) for water allocation at the river basin level, at the service provision level and at the transnational level.
- The **"Valuing water"** challenge, with reference to the assessment of costs and values associated with water use, the implementation of the cost-recovery principle for supporting sustainable water

service delivery, and the implementation of the user-pays and polluter-pays principles, while at the same time ensuring equitable access to water resources.

- The **"Governing water"** challenge, referring to the institutional and regulatory framework that creates the enabling environment towards the implementation of IWRM. Criteria towards effective water governance, as outlined by the UN (2003) are presented in Box 8.

BOX 8: CRITERIA FOR EFFECTIVE WATER GOVERNANCE

Participation: All citizens, both men and women, should have a voice – directly or through intermediate organizations representing their interests – in all processes of policy and decision-making. Broad participation hinges upon national and local governments, following an inclusive approach.

Transparency: Information should flow freely within the society. The various processes and decisions should be transparent and open for scrutiny by the public.

Equity: All groups in society, both men and women, should have opportunities to improve their well-being.

Accountability: Governments, the private sector and civil society organizations should be accountable to the public and to the interests they are representing.

Coherency: The increasing complexity of water resource issues, appropriate policies and actions must all be taken into account, so that policies become coherent, consistent and easily understood.

Responsiveness: Institutions and processes should serve all stakeholders and respond properly to changes in demand and preferences and new circumstances.

Integration: Water governance should enhance and promote integrated and holistic approaches.

Ethical considerations: Water governance has to be based on the ethical principles of the society in which it functions, for example by respecting traditional water rights.

Source: UN (2003)

Each challenge suggests different and complementary issues that need to be addressed within a water management system, so as to achieve long-term sustainability without compromising the well-being of all user groups. These challenges and their relevance to the Mediterranean context formed the backbone of the project's Case Studies; they further motivated efforts towards the constructive engagement of stakeholders in the different areas for discussing implications of alternative or complementary institutional and economic responses for water stress mitigation (Figure 4).

A further distinction was made in order to outline institutional and economic deficiencies in different functions and allow the coherent identification of prerequisites for comprehensive policy development and implementation.

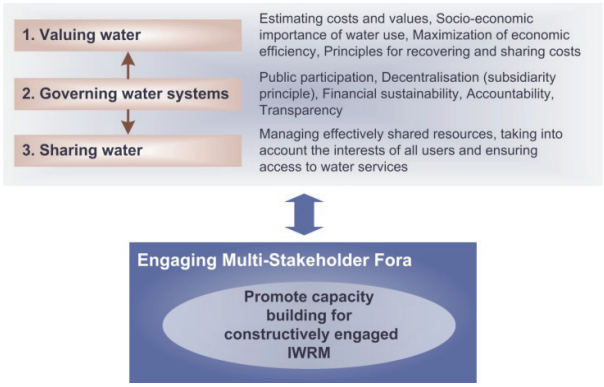

FIGURE 4: THE INECO FRAMEWORK AND GOALS

In this regard, the "sharing", "valuing" and "governing" dimension of water management issues and proposed alternatives was examined in relation to: (a) the constitutional function, relating to national (water) policies, management and law; (b) the organizational function (referring to river basin or aquifer management) and (c) the operational function, referring to water service provision for specific uses (Figure 5).

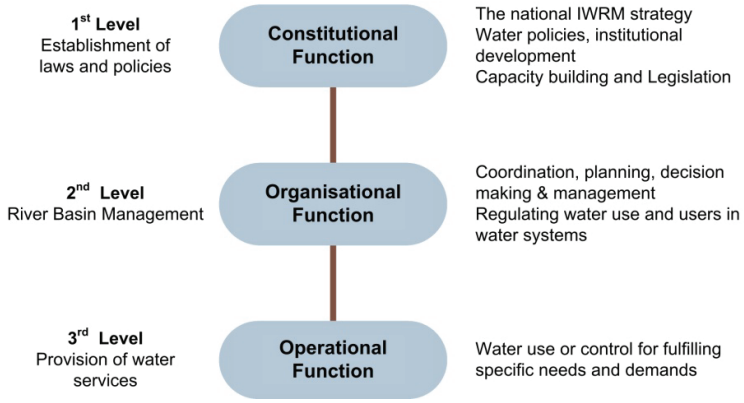

FIGURE 5: FUNCTIONS IN INTEGRATED WATER RESOURCES MANAGEMENT (ADAPTED FROM HOFWEGEN AND JASPERS, 1999)

According to Hofwegen and Jaspers (1999), the **constitutional or water policy and law functional level** provides the enabling environment for the successful functioning of the system. It includes the development of water policies, institutional policies, processes for developing human resources and technical capacity, as well as normative and executive legislation. At this level, the basic requirement towards IWRM is a framework that:

- Enables effective development and implementation of laws and regulations,
- Enables effective constitution and development of relevant institutions,
- Regulates decision making based on interests of all stakeholders,
- Enables all stakeholders to participate in decision making,
- Provides quantitative and qualitative standards for use and effluents,

- Enables and regulates effective control and sanctioning of violations,
- Enables implementing agencies to take the necessary steps to secure and conserve the resource,
- Provides effective and transparent accountability mechanisms;
- Provides sufficient capable people to meet the IWRM demands of policy making, adapting legislation and all other activities;
- Enables and regulates the participation of the private sector in water-related operations.

The **organizational or water resource management function** involves the coordination, planning, decision making and policing of water use and users in water systems (river basins and aquifers). Processes involve resource assessments, planning, decision making, implementation and policing on allocations and use of water resources, with and based on the interest of stakeholders. These processes are time and location specific. However, some general activities are listed in Table 7.

TABLE 7: ACTIVITIES OF THE ORGANIZATIONAL FUNCTION FOR IWRM

Context	Activities
Assessment	Water resources assessment (quality and quantity) Environmental assessment
Planning and decision making	Problem analysis Activity analysis Demand analysis and demand forecasting Formulation of WM objectives and constraints Design of alternative water resource systems System analysis System simulation and optimization Sensitivity analysis Multi criteria and multi constraint trade-off analysis Selection and decision making Involvement of stakeholders
Implementation	Allocation of water resources Demand management Administration of service provision to water institutions Operation and maintenance Monitoring and evaluation Financial management and performance auditing Communication, negotiation and conflict resolution
Policing	Inspection and control Sanctioning of violators

Source: Savenije (1997)

While the management of water resources is usually a responsibility of the State, to be undertaken by regional or river basin management public authorities as appropriate, the delivery of water services is usually the task of other public, private, or cooperative agencies. The delivery of water services is referred to as the **operational function**, focusing at the use and

control of water for specific purposes. Enhanced effectiveness and responsiveness to societal needs at this level can be achieved through:

- Effective control of service providers by users.
- Representation of users' interests at and by the managing agency;
- Cost recovery by the service provider;
- Negotiations and consensus between the managing agency, the service provider and its clients on the level of the service provided and recovery of its associated cost, without however compromising demand management efforts and basic needs;
- Assessment of demands, actual use and availability of water (quantitative and qualitative);
- Empowerment of the service provider to control and sanction violations (e.g. for illegal connections or discharge of untreated industrial effluents in sewerage networks);
- A system that allows market incentives to make most economic use of water, also through participation of the private sector.

In an ideal IWRM situation, water resources are managed at the appropriate level, in a globally sustainable way, and balancing the diverse technical, financial, social, economic, institutional and environmental aspects. At the same time, the water-related interests of all stakeholders are considered in decision making on water use. In the above context, stakeholder involvement and participation governed the entire INECO cycle of Case Study development, in order to:

- Ensure that project research and outputs are in line with the needs of local societies;
- Raise awareness among user groups on the impacts of their use on other users, including the environment, and encourage civic responsibility in water management;
- Foster constructive engagement among parties concerned for reaching consensus on solutions to local water management issues of common interest.

In the above context, the following section outlines the processes followed for stakeholder involvement and participation, focusing primarily on procedures and tools employed, so as to attain the widest possible visibility and impact at local level.

THE STAKEHOLDER INVOLVEMENT PROCESS

The approach followed for the development local participatory processes in the INECO Case Studies was based on the method of Objective Oriented Project Planning - OOPP (GTZ, 1997).The OOPP method, which is based on the Logical Framework Approach, has been proposed as a tool for supporting urban participatory planning processes (UN-Habitat, 2001). It is broadly divided in three stages, as depicted in Figure 6.

The first stage, **Problem Analysis**, involves identifying stakeholders, their key problems, constraints and opportunities; determining cause and effect relationships between threats and root causes.

The second stage, the **Analysis of objectives**, concerns the development of policy objectives from the identified problems, and the identification means to end relationships.

Finally, **Option analysis** includes the identification of different options that can contribute to the achievement of objectives. Options are then evaluated by stakeholders in order to determine the most suitable strategy for achieving the mitigation of the problem at hand.

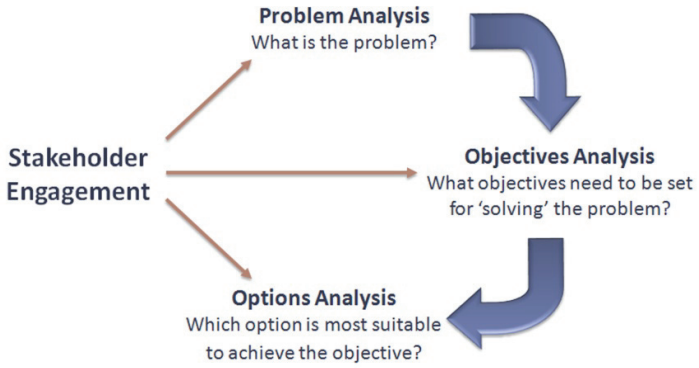

FIGURE 6: AN OVERVIEW OF THE OBJECTIVE-ORIENTED PROJECT PLANNING METHOD

In INECO, the OOPP method was implemented through a series of Regional Activities that followed the schema presented in Figure 7, in order to arrive to a synthesis of findings into regionally adaptable guidelines.

The first step involved the **"Situation analysis",** which was aimed at identifying a water management issue of concern to the local society and decision-makers. Employed tools involved data collection and review, and in some cases, targeted interviews with decision-makers. Two important outputs were derived from this stage:

- The identification of the range of natural, technical, financial and institutional constraints facing the water sector in each country/region;
- The analysis of the current governance setting, mapping responsibilities of the actors involved in water management operations, and the relevant rules and regulations defining the overall (water) policy context.

The analysis of the current situation led to the selection, by the research team, of an issue considered important in each region of interest, but also of relevance to other countries of the Mediterranean Basin, hereafter described as "focal problem".

Subsequently, the **"Stakeholder Analysis"** step involved the identification of stakeholders, and the mapping of their constraints and opportunities in relation to the issue at hand. This step entailed the implementation of individual stakeholder consultation meetings, to identify who can affect or

is affected by the discussed issue and is likely to be impacted by alternative solutions.

The **"Problem Analysis"** step involved the identification of causal interrelationships between threats and root causes of the focal problem. The key purpose was to ensure that "root causes" are correctly determined, so that they can be subsequently addressed, and that the analysis does not merely focus on the symptoms of the discussed issue.

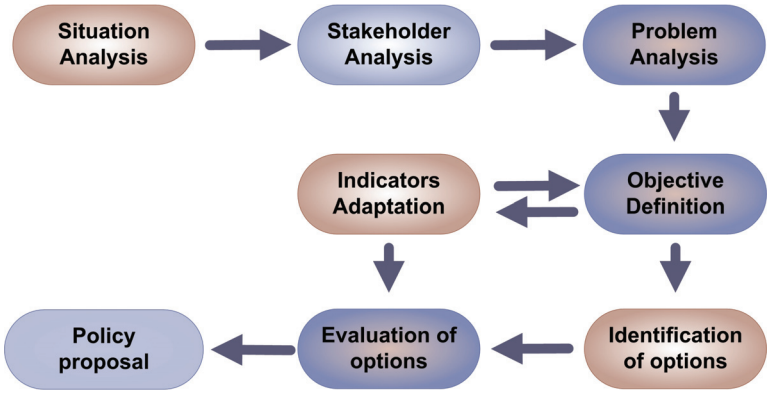

FIGURE 7: THE INECO FRAMEWORK FOR CASE STUDY DEVELOPMENT

Due to the importance of this step, the analysis of the focal water management problem was undertaken in three stages. Firstly, a preliminary identification of causes and effects of the focal problem was undertaken through data collection and personal knowledge and experience. Causes and effects were mapped into a draft "Cause-and-Effect" diagram, the "Problem Tree" of each Case Study, so as to facilitate discussion with stakeholders. In the tree diagram, the main (or focal) problem was represented as the tree trunk. The causes of the problem were designed as the tree roots whereas effects were the tree branches.

Following from this preliminary analysis, indicators relevant to the identified problem causes and effects were developed, so as to objectively highlight the significance of each component. Although the development and adaptation of indicators was in some cases hindered by limited data availability, it also offered the opportunity for developing a clear framework for monitoring the effectiveness of current and future policies for the mitigation of the selected problems.

Findings were then extensively discussed in dedicated regional workshops, which aimed at consolidating result outcomes and reaching consensus on the different degree of impact of the identified causes (minor or major, one-time or permanent). Workshop events also fostered dialogue between parties concerned, allowing the free exchange of views on current policy deficiencies and areas where action needs to be prioritized.

The next step included the **Definition of Policy Objectives**, implemented again in two stages:

- In the first stage, the validated Case Study "Problem tree" was used as the basis for the development of an "Objective tree". The

process involved: (a) reformulating problems into positive, desirable conditions, and (b) changing relationships from cause-effect into means-ends.

- In the second stage, the objective tree was presented to local stakeholders in dedicated workshops or meetings. Stakeholders collaborated in modifying the tree, ensuring that objectives are feasible, in line with current policy priorities and contributing towards their implementation.

Throughout the process of analyzing problems, effects, causes and developing objectives, views on potential merits or difficulties, and risks associated with different possible interventions were also brought to the table. Proposed interventions served as the basis for the **identification of alternative, mainly institutional and/or economic options** that could contribute to the achievement of the suggested objectives. Suggested responses were scrutinized against deficiencies associated with the implementation of instruments already in place, and supplementary ones were added, according to stakeholder suggestions, previous research outcomes, international experience and literature review.

The evaluation of the suggested responses was undertaken in two steps. Firstly, stakeholders were asked to evaluate broad categories of options, not focusing on specific measures (e.g. public participation instead of Advisory Councils or focus groups). This first step was mainly aimed at assessing the feasibility and the applicability of suggested options. Feasibility depends on the timeframe required for the implementation of an instrument, particularly with regard to the development of the resources required (financial, human, technical, institutional, social). Applicability on the other hand involves relevance to the issue at hand, and is also linked to the acceptability of the proposed instrument, as shaped by the overall institutional and socio-economic context (local perceptions, beliefs and traditions, existing policies, laws, regulations, etc.). In this regard, the first evaluation of the identified instruments was based on the following criteria:

- Individual stakeholder preference, taking into account effectiveness and applicability,
- Relevance to address current water management problems,
- Relevance to the focal water management problem of the Case Study,
- Need to prioritize in terms of actual implementation, and
- Relevance to future water management challenges that can be envisaged by stakeholders at national level.

Approaches selected by the different groups were then more extensively discussed so as to refine the context of proposals made, and identify policy pathways and prerequisites to their implementation. They were further evaluated, using the criteria framework described in Table 8, which was

defined taking into account the "headline" overriding criteria for IWRM (Environmental Sustainability, Economic Efficiency, and Social Equity).

TABLE 8: FRAMEWORK THE EVALUATION OF INSTITUTIONAL AND ECONOMIC INSTRUMENTS

Category	Criteria
A. Effectiveness	**A1**. Contribution to the achievement of the key objective **A2**. Mobilization of local community **A3**. Promotion of technological/institutional innovation
B. Social considerations	**B1**. Affordability for sensitive user groups (poor, women etc.) **B2**. Promotion of inclusion of all user groups **B3**. Cultural/ethical acceptance **B4**. Alleviation of conflict among user groups
C. Economic efficiency	**C1**. Financial cost of implementation **C2**. Negative economic impact on important sectors (agriculture, industry, tourism) **C3**. Impact on regional economic development strategies
D. Ease of implementation	**D1**. Need for institutional and legislative reforms **D2**. Required effort for integrating with existing policies for other sectors (e.g. agriculture, industry) **D3**. Administrative barriers to implementation **D4**. Existing capacity constraints (human, technical, managerial)

This framework was translated into a dedicated questionnaire, aimed at mapping the perceptions of the different groups in matters of:

- Effectiveness, to evaluate contribution to the achievement of the objectives set, but also to the enhancement of collaboration, public participation and community empowerment.
- Social considerations, to map impacts on equitable access, social sustainability and affordability, especially for low-income groups and users.
- Economic considerations, outlining the overall economic impact that an option or proposal can have in the regional economy and local development strategies.
- Ease of implementation, describing efforts required for implementation, taking into account the current political environment, legislation, existing administrative structures and capacity constraints.

It should be noted that the approach described above was not implemented as a strictly linear process; similarly to all related efforts, stakeholders did not move mechanistically from one step to the next, always in a forward direction. Planning is an iterative and creative process; the selection of an option often involves significant leaps in thinking, which cannot be neatly slotted into a specific "step" of the overall process.

Despite the limited timespan of INECO, significant efforts were devoted to the maximization of local opportunities for multi-faceted solutions, by fostering the discussion among all interested parties before an option (in

this case an institutional or economic instrument) was proposed. To achieve this goal, efforts were made to mobilize stakeholders upfront, and give floor to their participation in the analysis of local problems, the definition of objectives and the discussion and evaluation of suggested options. Throughout the articulation of the process, emphasis was also given to openness and inclusiveness; stakeholders were regularly informed of all outcomes and replies of other parties, whereas information collected was made accessible to the public through the distribution and web uploading of material.

INTRODUCING THE INECO CASE STUDIES

As mentioned in the introductory section of this volume, the process of deriving local policy recommendations was based on 7 Regional Case Studies, developed in Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria, and Morocco. Each Case Study was formulated around a water management issue (focal problem), selected on the basis of the following criteria:

- Importance and significance of its implications to the local society and the environment;
- Relevance to water management challenges and constraints facing the water sector at the national level;
- Broader relevance to current water management challenges faced in Southern Mediterranean countries.

Box 9 below presents the scope of the INECO Case Studies, outlining the issues examined per country, and providing a brief description of their main causes and effects.

BOX 9: THE SCOPE OF THE INECO CASE STUDIES

Cyprus: *Increasing vulnerability of the Pegeia Aquifer* (western part of Cyprus) due to the rapidly increasing residential and tourism demand and the lack of sewerage and wastewater treatment infrastructure. Groundwater resources are significantly degraded in several regions of Cyprus, as a result of many years of overabstraction, and are further associated with the inability of the current water management framework to promote the use of alternative supply sources, such as treated wastewater, institutional framework overlaps and inadequate legislation enforcement.

Tunisia: *Aquifer depletion and sea intrusion*, mostly due to uncontrolled abstractions for irrigation purposes and the inadequacy of the presently applied alternatives and disincentives to groundwater overexploitation. The problem is further exacerbated by the lack of technical capacity in the agricultural sector, the limited application of water saving methods in irrigation and the current water-intensive cropping patterns.

Egypt: *Water quality deterioration in the region of the Bahr Basandeila Canal of the Dakahlia Governorate*, where waste disposal, heavy use of pesticides, inadequate domestic wastewater treatment, and uncontrolled discharge of industrial effluents have transformed the open waterway to a repository and conveyor of liquid waste. The major water pollution issue, which is common in the entire Nile water distribution network, poses great risks for human health, agricultural production, and the river and coastal ecosystems.

Lebanon: *Increasing water stress for meeting domestic, agricultural and industrial water demands in the Damour River Basin*, further exacerbated by upstream pollution, groundwater interbasin transfer, and lack of financial and technical capacity to address infrastructure requirements and enforce legislation.

BOX 9: THE SCOPE OF THE INECO CASE STUDIES (CONT'D)

Syria: *Water pollution in the Barada River Basin (Greater Damascus Area)*, due to the discharge of high loads of industrial and domestic waste and wastewater, which exceed the river's self purification capacity, and the decrease of river flow, resulting from rainfall decrease and use of the Feige Spring for drinking water supply. Water pollution has significantly contributed to the collapse of the Barada river ecosystem, which also sustains the large forest of "Ghouta", a cultural heritage area and environmental hotspot in the region.

Algeria: *Pollution of the Seybousse River*, which receives large volumes of untreated industrial and domestic effluents posing both direct and indirect risks on human health, agricultural production and the river ecosystem.

Morocco: *Increasing water stress in the Oum Er Rbia Hydraulic Basin*, resulting from increasing demand and inefficient water use in the agricultural sector, where high losses in irrigation distribution networks combined with the currently adopted irrigation practices (inefficient irrigation methods and water intensive, economically unsustainable cropping patterns) contribute to what can be perceived as significant water waste.

The variability of the water-related issues and their causes and effects, as outlined above, calls for their systematic characterization in order to analyse their respective context and determine potential measures for their mitigation. This section elaborates on the typology of water management issues faced in the seven (7) Project Case Studies, analysing their respective dimensions and range of associated issues.

A TYPOLOGY OF WATER MANAGEMENT ISSUES

Despite the fact that all case studies deal with various aspects of water stress, it becomes evident that on the basis of their scope these can be classified in two broad categories: those mostly associated with water scarcity and overexploitation of available resources (Pegeia, Cyprus, Tunisia, and Oum Er Rbia, Morocco), and those mostly relating to water quality degradation (Barada River Basin, Syria, Bahr Basandeila area, Egypt, and Seybouse River Basin, Algeria). The Damour River Basin Case Study, Lebanon, forms a distinct example that touches upon both issues (water stress due to the inefficient allocation of limited water supply, but also due to the quality deterioration of available supply).

Furthermore, Case Studies can also be grouped according to the type of emerging policy questions into: (a) Case Studies mostly related with **River Basin (or Groundwater) Management and Planning**; and (b) Case Studies mostly associated with **Urban Water Management and Planning**.

This classification is presented in Table 9, and is strongly linked with the overall socio-economic development pattern and trends experienced in each region. For example, in Syria the problem is exacerbated by urban growth (hyper-urbanization); pressures exerted on the Barada River and its ecosystem stem from the rapid development of the greater Damascus area. Similarly, the pollution of the Seybouse River in Algeria is mostly due to industrial activity and lack of sewerage infrastructure in rapidly

expanding urban areas. Water quality deterioration in the Bahr Basandeila Canal is due to the lack of infrastructure for the collection and treatment of domestic sewage and affects drinking water supply. In all three cases the issues of sustainable water service provision and expansion of existing infrastructure for water supply and sanitation constitute policy priorities.

TABLE 9: SCOPE AND ASSOCIATED ISSUES FOR THE INECO CASE STUDIES

Case Study Area	Main Scope	Associated issues
Pegeia, Cyprus	River Basin Management/ Groundwater depletion	Wastewater reuse & competition between uses Development patterns
Tunisia		
Oum Er Rbia Basin, Morocco	River Basin Management/ Water Allocation	Intra and inter-sectoral water allocation at the basin level
Damour River Basin, Lebanon		
Bahr-Basandeila, Egypt	Urban water management	Hyper-urbanisation Sustainability of water services
Barada River Basin , Syria		
Seybouse River Basin, Algeria		

The thematic area of River Basin Management and Planning groups the cases of Damour, Lebanon, Oum Er Rbia, Morocco, Tunisia, and Pegeia, Cyprus, with the last two focusing on groundwater management. In all cases, overexploitation of surface and/or groundwater resources is an issue that provokes conflicts over water use and environmental degradation. However, the management of the Pegeia aquifer is also linked to the rapid development of the area, the change of land-use patterns and the need to further develop and sustain tourist activities (issues that can be associated with land use planning and urban development). This is further portrayed in Table 10, which describes the main drivers contributing to the exacerbation of the focal water management problems.

TABLE 10: DRIVERS CONTRIBUTING TO LOCAL THE EXACERBATION OF LOCAL WATER MANAGEMENT PROBLEMS IN THE INECO CASE STUDY AREAS

Case Study Area	Major Driver 1	Major Driver 2
Pegeia, Cyprus	Urban and tourism development	Drought episodes
Tunisia	Agriculture	Other rapidly developing economic sectors
Seybouse River Basin, Algeria	Intensive industrial activity	Urban development
Oum Er Rbia Basin, Morocco	Agriculture	Droughts and climate change
Damour River Basin, Lebanon	Increase of demand (all water use sectors)	Inter-basin transfer
Bahr-Basandeila, Egypt	Urban development/expansion	Agriculture
Barada River Basin , Syria	Urban development	Intensive industrial activity

The issues at hand, broadly defined in Box 9 have serious environmental, economic and social implications at local level; their symptoms, as identified by local stakeholders in the "Problem Analysis" step, are outlined in Table 11.

TABLE 11: THE "EFFECTS" OR "SYMPTOMS" OF FOCAL WATER MANAGEMENT PROBLEMS[2]

Case Study Context	Environmental effects	Socio-economic effects
Urban water management and planning	Low quality of irrigation water/water becomes unsuitable for irrigation (DZ, EG) Loss of biodiversity (EG, SY) and fisheries (EG) Threats to aquatic ecosystems (EG) Groundwater contamination (EG, SY)	Increased conflicts among water users (DZ) Increased health risks (DZ, SY) and correspondingly higher direct and indirect costs (SY) Serious health and quality of life problems (EG) Reduction of agricultural productivity (EG) Decrease in income from tourism due to low water quality (EG, SY) Higher cost for the production of safe drinking water (SY) Drop in real-estate values (SY)
River basin management and planning	Water shortage in peak demand seasons (LB) Desertification phenomena (TN) Groundwater degradation and increased salinity levels (TN, CY)	Increased conflicts among water users (LB, MA) Increased social costs (LB) Increased health problems due to the use of polluted water (LB) Reduction of agricultural income (TN, MA) Increase of unemployment in rural areas (TN, MA) Higher cost for alternative supply (CY) Lack of strategic reserves to cope with drought (CY,TN)

From the summary analysis presented above, it becomes evident that the water sector in all the above areas needs to face up to challenges that also originate from the implementation of other policies, related to patterns of economic development and broader social goals. In addition to the need for a wider integration of water-related issues in overall policy formulation and implementation, deficiencies in water policies themselves, combined with lack of adaptive capacity, often impede the effective implementation of options for mitigating the issues faced. According to this perspective, the subsequent sections provide an enhanced analysis of the focal water

[2] List of abbreviations:
EG: Egypt; MA: Morocco; DZ: Algeria; LB: Lebanon; SY: Syria, CY: Cyprus; TN: Tunisia

management issues, focusing on their "sharing", "valuing" and "governing" dimensions.

Analysis of the "Sharing" dimension

All identified problems have a "Sharing" dimension, associated either with their impacts or with their causes. "Sharing" issues are related to the allocation of available water resources, and occur either at the river basin level or in the provision of water services. They can also be associated with pollution originating from upstream diffuse and point sources. In some cases (Damour, Lebanon, and Oum Er Rbia, Morocco), inter-basin transfers for supplying neighbouring areas also contribute to the exacerbation of local problems. This section provides an overview of the "Sharing" problems associated with the seven Case Studies, commenting also on existing mechanisms for water allocation and conflict resolution.

Conflicts over water allocation and use

According to Howe, water-related conflicts can be classified into three main categories: (a) conflicts over the use of present supplies; (b) conflicts over future water development; and (c) conflicts stemming from water policies and the institutional framework for policy implementation. It is apparent that all these categories are not independent of each other. For example, groundwater overexploitation can be placed under the first or the second category; it is also clear that the way chosen to resolve conflicts over the use of present water supplies impacts on future water development. Similarly, the way that water policies are implemented can also induce conflict, as "conflicts" often refer to a situation where the perceived improvement for one or more user groups is accompanied by a perceived decrease in the well-being of others.

A comprehensive framework for deriving a typology of water-induced conflicts, addressing the concerns and particularities of the different Case Studies, would attribute these to their primary cause, i.e.:

- Pollution generated from specific uses, which affects the quality of water available for other purposes;
- Groundwater overexploitation, compromising the availability of water supply for current and future use;
- Water allocation processes inside the river basin (i.e. sharing of available water resources between downstream and upstream use(r)s);
- Sharing resources with users outside the area of interest, referring to local water scarcity resulting from inter-basin transfer to meet demands in other regions.

Pollution-induced sharing issues are outlined in the Regional Case Studies of Lebanon, Syria, Egypt, and Algeria, and the problem is also reported as significant in the case of the Oum Er Rbia, Morocco. Similarly, stakeholders in Pegeia, Cyprus repeatedly express their concern over the potential contamination of the local aquifer with nitrates, as a result of local

agricultural activity. Industrial pollution is the key problem in the Case Studies of Algeria and Syria, due to the reported uncontrolled discharge of industrial wastewater and the lack of corresponding wastewater treatment facilities. Reported causes also include the lack of sewage collection and treatment infrastructure (Algeria, Lebanon, Cyprus, Syria and Egypt).

In all cases, pollution originates from agricultural and industrial activities located upstream, in the vicinity of rivers and lakes or groundwater bodies used for drinking water supply. As discussed in subsequent sections of this Chapter, the issue cannot be solved through the development of the corresponding infrastructure alone, mostly due to financial and/or technical constraints. This results in significant conflicts, both among user groups and between the affected user groups and authorities, with the user groups requiring the development of infrastructure to meet their needs.

Groundwater overexploitation is the primary cause of aquifer depletion in Tunisia, linked to limited efficiency in irrigation water use. Similarly, the current groundwater exploitation pattern causes concern in the Pegeia area. However, in this case groundwater is used for domestic water supply only, and conflicts concern the development pattern of the area, with stakeholders perceiving that the current rapid tourism and urban development cannot be sustained by groundwater resources alone. Groundwater overexploitation is linked to future water resource development and use, as it is also considered a strategic reserve for coping with droughts.

Competition over water allocation also arises at the inter-regional level in the cases of Lebanon and the Oum Er Rbia. In the Damour River Basin, groundwater is extracted by the Beirut Water Authority to supply water needs in the Beirut Metropolitan Area. Groundwater exploitation in this case motivates stakeholders to demand the development of additional hydraulic infrastructure, in order to ensure adequate water supply and avoid relying on overexploited and depleted groundwater reserves. In the Oum Er Rbia, and according to the priorities set in the National Master Plan, water from the local storage reservoirs is used to supply the urban water demand of the cities of Casablanca and Marrakech. Due to the increasing water stress and the inability to meet local irrigation needs, the Hydraulic Basin Agency supports either setting restrictions on water quantities transferred, or that supplementary water supply is conveyed from other Hydraulic Basins in the vicinity.

Water allocation issues in the two regions do not originate from inter-basin transfers only but also from water allocation among water users of the Basin. In the Damour River Basin, water allocation problems concern the sharing of surface water resources among upstream and downstream users, with the latter, farmers in the majority, experiencing water shortages during the summer as a result of excessive abstraction upstream. In the Oum Er Rbia the issue is mostly related to the use of water among

the different irrigation perimeters and the intra-sectoral allocation of water available, depending on the type of crop and the irrigation method applied. Problems also arise from the use of water for hydroelectricity production, with farmers complaining that dam releases do not take into account irrigation scheduling constraints.

MECHANISMS AND PROCESSES FOR "WATER SHARING"

Mechanisms and processes for "water sharing" are usually defined for addressing two main issues:

- The prioritization of water needs during drought;
- The allocation of routine bulk water supply.

Additional rules are set to protect important strategic reserves and ensure rational water use, especially in countries frequently experiencing drought or bound to face water scarcity because of demand growth. Usually, the setting of such rules is mandated by socio-economic priorities (at the national and at the catchment level), and reflects both the original design criteria of hydraulic infrastructure and emerging policy priorities. Mechanisms often applied include (UN, 2003):

- Socio-economic priorities at catchment level, defining the prioritization of different, local and external, water uses and the scheduling of releases from storage reservoirs;
- Legislatively predefined priorities and hierarchy of water uses, especially in low water availability periods;
- Demand management and regulations during shortage, targeted at certain sectors (e.g. agriculture) and end-uses (e.g. car washing) in priority;
- Harmonization of sectoral policies and laws, to allow integration among different development plans and conflict resolution at the policy implementation stage;
- Abstraction management (issue of permits/licenses) to limit water use for particular purposes or during particular seasons;
- River water quality objectives for specific river systems, which through discharge, treatment, and/or quality standards ensure water of quality appropriate for downstream purposes;
- Prescribed flow points to meet demand for specific uses, including the environment;
- Reservoir operating rules, often optimized to meet different purposes, as well as multi-reservoir system management, optimized to meet different demands and reservoir compensation flow releases.

Table 12 summarizes the mechanisms for "water sharing" in the INECO Case Studies. Legislatively defined priorities over water use exist in all the Case Study areas, as drought episodes are quite common and require strong regulation over water use. However, there are cases where the

implementation of these priorities becomes difficult, as for example in the Damour River Basin. Along the same line, rationalization of water uses in times of shortage and clear definition of reservoir operating rules are also often applied mechanisms. The harmonization of laws and policies in place is an ongoing effort in all countries. In Cyprus, however, the implementation of the EC Water Framework Directive and earlier concerted efforts, have managed to reduce overlaps and contradictions among different policies and laws. Problems arise as to the effective implementation of frameworks for abstraction management (Cyprus, Lebanon, Tunisia, Morocco) and the achievement of river water quality objectives through the monitoring and control of discharges (Syria, Algeria, Egypt), due to lack of technical capacity and deficient enforcement of environmental regulations.

TABLE 12: MECHANISMS FOR WATER SHARING IN THE INECO CASE STUDIES[3]

Mechanism	CY	TN	EG	LB	SY	DZ	MA
Catchment socio-economic priorities	+	+	+	+	+	+	+
Legislatively predefined priorities	+	+	+	+	+	+	+
Demand management (during shortages)	+	+	?	?	+	N/R	+
Harmonization of policies and laws	+		?	?	?	?	+
Abstraction management	+ (?)	+ (?)	+ (?)	+ (?)	+ (?)	N/R	N/A
River water quality objectives	+	N/R	?	?	-	-	N/R
Prescribed flow points	+	N/A	N/A	N/A	N/A	N/A	+
Reservoir operating rules	+	+	+	N/R		N/R	+

ACCESS TO BASIC WATER SERVICES AND HEALTH CONCERNS

Access to basic water services is a core component of all water management policies, within the framework of the global effort for the achievement of the Millennium Developmental Goals (MDGs). Efforts are made to provide an adequate quantity of safe drinking water supply, sanitation and wastewater collection and treatment facilities for urban and rural areas. The issue is perceived as a cause of varying importance to the water management problems in many of the INECO regions. The problem is more acute in the case of the Bahr Basandeila area, Egypt, where significant concerns are raised as to the quality of the drinking water provided and the protection of water abstraction points. Stakeholders and citizens report health problems and inadequate and unreliable water supply provision.

3 Legend: (+) Existing; (?) Not effectively implemented; N/R: Not relevant to the case study context; N/A: No answer provided.

Health concerns are also reported in the cases of the Barada River Basin, Syria, and of the Seybouse River Basin, Algeria, due to the pollution of water courses and groundwater supplies. Although supported by user groups, relevant indicators reveal that the problem is not as significant in the case of the Damour River Basin, Lebanon.

Analysis of the Economic ("Valuing") Dimension

Despite the extensive debates in international and national fora, the fourth Dublin principle (*"Water has an economic value in all its competing uses and should be recognized as an economic good"*) still remains controversial and not widely understood by several decision-makers and the public at large, as it is considered in conflict with traditional beliefs and values. However, awareness is growing on the economic dimension of water management issues, especially with regard to the:

- Integration of water planning and management in the national policies for economic development;
- Achievement of efficiency in water allocation, especially in cases of limited supply, taking into account social, economic and environmental needs;
- Recovery of water service costs, with the aim to guarantee long-term sustainability of water supply and sanitation;
- Enhancement of the financial resources allocated to the water sector to support water conservation incentives and ensure successful undertakings of water management operations also at the national and catchment levels.

This section focuses on the "valuing" dimension of the INECO Case Studies; it discusses issues relating to (a) cost recovery and funding for infrastructure development/rehabilitation, (b) economic instruments in place, (c) issues concerning the implementation of the "polluter-pays" principle, and (d) economic considerations towards "optimal" water allocation.

Infrastructure development and Cost recovery

An often cited cause of almost all focal water management problems in the INECO Regions is the lack of financial resources that would allow the timely implementation of appropriate measures and the development of the infrastructure required to address the issues at hand (Table 13).

In several case studies (e.g. Lebanon, Syria and Egypt), infrastructure deficiencies are also linked to the poor recovery of water service costs. The lack of financial resources is also cited as the main reason for the poor quality of water services provided. As the corresponding charges are low and do not ensure adequate recovery, water services rely on the important State subsidies; the strong dependence on a centralized financial system, where the allocation of funds is based on a different set of priorities and bureaucratic and time consuming procedures, results in delays in the

implementation of rehabilitation and expansion programmes and affects day-to-day operation.

Water service and infrastructure development problems do not only arise from lack of financial resources but also from the technical point of view. For example, in EU Member State Cyprus, sewage treatment schemes are being developed as part of the overall programme for the implementation of the EC Urban Wastewater Treatment Directive. However, the scheme under construction in Pegeia does not fully address the rapid development of the region, and the expansion of facilities may be unable to keep up with the increase in building permits. Similarly, in Algeria, the State is funding the development of sewerage facilities in the Seybouse River Basin. In this case the delay in the implementation of the programme has contributed significantly to the environmental degradation of the River.

TABLE 13: INFRASTRUCTURE DEFICIENCIES IN THE INECO CASE STUDIES

Context	Case Study region	Requirements and deficiencies
River Basin Management and Planning	Oum Er Rbia Basin, Morocco	Rehabilitation of irrigation networks
	Damour River Basin, Lebanon	Lack of hydraulic infrastructure (storage reservoirs) to regulate river water abstractions and offer alternative supply Lack of infrastructure for sewage collection and treatment
River Basin Management and Groundwater management	Pegeia, Cyprus	Lack of alternative supply (desalination) Lack of infrastructure for sewage collection and treatment
	Tunisia	Rehabilitation of irrigation networks Development of reuse schemes
Urban water management and pollution prevention	Barada River Basin, Syria	Poorly maintained sewerage network Low share of population connected to sewerage networks Lack of wastewater treatment schemes for industries
	Bahr Basandeila Area, Egypt	Insufficient capacity for sewage treatment
	Seybouse River Basin, Algeria	Delay in the implementation of sewerage facilities (mainly due to technical constraints)

GRANTS AND ECONOMIC INCENTIVES/DISINCENTIVES

The lack of (or the need for additional) subsidies, grants and economic incentives is a common factor in all cases considered. Relevant provisions exist or are being pursued either as priorities of the national water policy, or as measures taken at the river basin management (organizational) or operational levels. However, it is noted that measures need to be re-designed, priorities should be reconsidered or new measures need to be

introduced (Table 14), so as to encourage users towards water saving and pollution prevention.

TABLE 14: DEFICIENCIES AND ISSUES ASSOCIATED WITH INCENTIVES AND/OR DISINCENTIVES FOR WATER CONSERVATION AND POLLUTION PREVENTION

Context	Case Study region	Deficiencies and associated issues
River Basin Management and Planning	Oum Er Rbia Basin, Morocco	Need for additional incentives for irrigation method improvements Low price of water for irrigation
	Damour River Basin, Lebanon	Lack of incentives for water conservation/ irrigation method improvements
River Basin Management and Groundwater management	Pegeia and Cyprus	Low cost of groundwater exploitation vs. other sources (surface water and desalination)
	Tunisia	Low cost of groundwater exploitation vs. other sources (surface water) Need for additional incentives for irrigation method improvements
Urban water management and pollution prevention	Barada River Basin, Syria	Lack of (or need for additional) economic incentives to the industrial sector Low water tariffs
	Bahr Basandeila Area, Egypt	Limited commitment to implement pollution prevention measures
	Seybouse River Basin, Algeria	Limited financial resources of industries to implement pollution prevention measures

IMPLEMENTATION OF THE "POLLUTER-PAYS" PRINCIPLE

The polluter-pays principle is advocated in the water-related legislation of Cyprus, Algeria and Morocco. The wider approach towards the implementation of the principle is related to the introduction of appropriate economic instruments, internalizing the external costs associated with environmentally damaging behaviour. However, the principle often cannot be applied because of uncontrollable (legal or illegal) water pollution. Similar obstacles are encountered in the implementation of the "user-pays" principle because of uncontrollable (legal or illegal) access to water resources, mostly groundwater.

The recently updated water-related legislation of Algeria and Morocco foresees the operation of River Basin Agencies, adopting an institutional framework for River Basin Management similar to the French "Agences de l'Eau" model. The "polluter-pays" and "user-pays" principles are implemented through the foreseeable introduction of pollution charges and abstraction charges. However, and as the model is rather new, deficiencies exist as to its effective operation. For example, in Algeria, the relevant legislative decrees that would allow for the definition of pollution charges have not yet been issued, and industries pay a yearly lump sum instead of fees proportional to the pollution loads discharged to the water environment. It is expected however that the enhancement of the knowledge base on water pollution of the Seybouse, along with the

development of the corresponding inventories, will allow more effective implementation and operation of the system.

In all the Case Study regions, the effective implementation of the principle remains incomplete, because of technical constraints or institutional deficiencies. Diffuse pollution from agricultural activities or inability to monitor the abstraction from wells and boreholes call for the implementation of other approaches (voluntary schemes, community-based management, involvement of water users in decision-making etc.) Institutional deficiencies can comprise lack of financial resources, not fully developed monitoring programmes, lack of human resources and expertise, lack of equipment, multiplicity of authorities, fragmentation of responsibility etc. In some cases, social constraints (affordability concerns) or opposition and political influence from specific user groups are also of relevance (e.g. Case Studies of Cyprus, Lebanon, Tunisia).

Economic efficiency in water allocation

In all the Case Studies dealing with the allocation of limited water supplies, allocation is based on historical water rights and/or and socio-political priorities. Although the prevailing perception is that the current status quo should be maintained, in several cases stakeholders underline the need for better evaluation of the overall socio-economic benefit generated from specific water uses. Such policy questions are set forth especially in areas with significant agricultural demand that face increasing water stress (Oum Er Rbia, Morocco and Tunisia). Although changes in water allocation policies are not broadly supported, due to socio-economic considerations and constraints, it is also believed that these need to be re-assessed in relation to the modernization of the agricultural sector and intra-sectoral water allocation practices (improvements in water use efficiency, shift towards less water intensive crops, etc.).

Analysis of the "Governing" dimension

The first volume of the World Water Development Report (UN, 2003) highlights the fact that the water crises faced in many countries is essentially a crisis of governance. The term "water governance" is used in several contexts, with the most widely accepted definition being "*the range of political, social, economic and administrative systems that are in place to develop and manage water resources and the delivery of water services, at different levels of society"*.

Institutional analysis and investigation of working rules and legislation for water management in the countries considered in this report have been the focus of many international initiatives, supported both by the EU and other organizations. For example, UN-ESCWA has undertaken an in-depth analysis of the institutional and legislative frameworks in the MENA region, highlighting the historical evolution of water-related legislation, pertinent customary laws and water use rights, and the development of the overall organization of the water sector to cope with emerging water management

challenges (UN-ESCWA, 1997). Recently, an initiative undertaken by the Word Bank analysed institutional issues in the MENA area in relation to water scarcity, focusing on the aspects of accountability, equity, public participation, cost recovery and integration among different sectoral policies (World Bank, 2007). For Cyprus, in-depth analyses have been carried out both by the Government, as part of the EC Water Framework implementation process, and through different EC-funded research efforts (WaterStrategyMan, 2002-2005, AquaStress IP, 2005-2009). An in-depth analysis of the institutional framework (water sector organization, legislation and institutional analysis) has also been carried out within the framework of INECO, as part of the situation analysis process undertaken in all Case Studies.

In the above perspective, the following paragraphs outline key water governance issues that are considered critical for the INECO Case Studies, focusing primarily on deficiencies related to: (a) the overall organization of the water sector; (b) existing legislation and law enforcement; (c) public participation and community empowerment; and (d) accountability, transparency and information sharing.

OVERALL ORGANIZATION OF THE WATER SECTOR

THE NEED FOR EMPOWERING INSTITUTIONS

Deficiencies in the organization of the water sector, overlaps in responsibility and need for better coordinated or decentralized management underpin all the INECO Case Studies.

In Cyprus, despite the fact that water management operations are considered effective throughout the country, all actors pinpoint the need for re-allocating responsibilities for borehole permit issuing. Currently, borehole permits are issued by District Officers and not by the Water Development Department, the authority responsible for the execution of the National Water Policy in the country and for the assessment and allocation of both surface and groundwater supplies.

In Lebanon, the administrative and institutional framework is considered outdated in its majority and there are significant overlaps in responsibility.

In Syria, it is reported that there is no or limited integration of functions among the different parties involved in water management operations, especially with regard to water policy and legislation formulation, water allocation and investment plans. Problems also stem from the lack of communication and data exchange among decision-makers, engineers, and water management specialists and professionals, and the lack of human resources that could enhance the development of an integrated water management plan. Regulatory principles for establishing a system of specialists were only recently drawn under the supervision of the Syndicate of Engineers.

In Algeria, water management responsibilities have been modified several times during the past 15 years. Water distribution in particular has often

been centralized and then decentralized. For example, irrigation water, previously managed by the Ministry of Agriculture, is now managed by the Ministry of Water Resources through the corresponding agency. The frequent changes have not assisted in simplifying the overall water management framework, and in developing the appropriate technical and human capacity and resources in the different departments/agencies.

In Morocco, the overall administrative and institutional setting suffers from the delay in the implementation of the Water Law of 1995 whose main characteristic was the complete reform of the water sector and the establishment of River Basin Agencies. This delay is actually inhibiting a more rational management of water resources and the application of the polluter-pays principle. Issues slow in implementation are mostly associated with the water charges that will constitute the financial resources of the Basin Agencies, and that would permit them to provide financial assistance in the development and protection of water resources.

In Tunisia and Egypt it is considered that there is some overlap in responsibility between water authorities and water institutions; however, responsibilities are generally complementary and coherently allocated. Efforts towards decentralization through the establishment of financially autonomous public companies for water service delivery and development of water user associations are beginning to yield results, but require further capacity development and strengthening, as discussed below.

DECENTRALIZATION & COMMUNITY- MANAGEMENT

Decentralization of water management operations at the lowest appropriate level and empowerment of water user associations is considered a key issue in all Case Studies, with the exception of Cyprus.

In Egypt, such efforts have been successful through the development of Water User Associations (WUAs). Lack of water management at the river basin level is also considered a cause of water stress in the Damour River Basin, Lebanon.

In countries where the organizational function has already been decentralized at the appropriate unit, (Morocco and Algeria), community involvement in water management is pursued as a means to assist user groups in the management of their resources and facilitate modernization. A similar initiative is also undertaken in Tunisia, through the empowerment of Agricultural Development Groups (GDAs).

THE INVOLVEMENT OF THE PRIVATE SECTOR

Given the often cited inability of the public sector to provide efficient water services and meet growing needs, in most cases public-private partnerships have been perceived as a potential tool to attract capital investment and ensure efficiency in water delivery/provision of sewerage services. However, it should be noted that in all case studies, stakeholders consulted insisted that priority should be given to State-funding; full privatization of

water services is rejected. This section summarizes the context for the involvement of the private sector at the national level, as it is an issue more closely related to overall governmental policies rather than local decision-making.

In Morocco, there are private water service operators monitored by a Committee, which ensures that the operator abides to its contract and monitors the evolution of tariffs, as well as technical, administrative and financial management. Water tariffs are revised according to previous agreements with the Government. The Committees function under the supervision of the Direction of Regies and conceded services (DRSC), under the control of the Ministry of the Interior.

In Cyprus and Syria, private sector involvement is limited to construction contracts. As most water-related infrastructure has already been completed in Cyprus, and there are no relevant problems with regard to the delivery of water services, privatization is not an issue under examination. However, public-private partnerships are being implemented for public desalination schemes, following the BOT model. According to the relevant contracts, private companies have undertaken the construction and operation of desalination plants that are transferred to the State after a certain period. Throughout the contract duration (usually a 10-year period), the State buys a fixed quantity of desalinated water at a fixed price. The scheme has been flexible enough for securing potable water supply, especially during droughts. However, problems were encountered when freshwater availability was high; although freshwater was available, the State was still obliged to purchase desalinated water at a high cost, as a result of the contract provisions.

In Lebanon, the Government has been advocating private sector participation in many sectors including water, there are still many factors hindering private sector involvement. Reasons include gaps in the current legislative framework and unclear procedures for creating and sustaining public-private partnerships. In the absence of an overall strategy, the Government is pursuing a piecemeal approach, proceeding with a management contract with a private operator in the city of Tripoli and considering other arrangements supported by the World Bank in Baalbeck. Private sector participation efforts grow, partly due to the recognition of the weak performance, inadequate staffing, and poor resources of the regional water authorities. These efforts are closely linked to a planned merger of authorities, but a clear and broadly accepted framework of operational partnership among the central, regional authorities, and the private operators has not yet emerged despite being a necessary step in the overall process.

In Tunisia, the contribution of the private sector in the financing and operation of water infrastructure is limited to the maintenance of installations by local Development Groups of collective interest and to soil and water conservation structures consolidations by land-owners. Farmers

self-finance the excavation of wells and boreholes and are sometimes subsidised by the government, when a permit has been granted and the project has been approved by the relevant authorities.

In Egypt, there are ranges of options available as to the ways in which straight operational contracts can be negotiated, which place the responsibility directly with the concession company and at the same time leaving direct control with the public utility. In major capital investments, however, the normal major water and sewage treatment projects are undertaken under the build, operate, transfer arrangement (BOT). In BOT type projects the private sector organization has the responsibility of: design, construction, operation and maintenance and project funding. Many public utilities, in addition to controlling charges and establishing their own standards of service, want to retain a direct involvement in the design, construction and operation of their water infrastructure. It is possible to achieve this objective and at the same time, through a joint venture, introduce the latest "private sector" technology and operational and design know-how into the utility company, together with the shared funding of capital investment for new works and infrastructure. This type of arrangement links the public sector utility to a private company, or group of companies, in order to develop water services through both operational and capital investment projects.

LEGISLATION, LAWS AND REGULATIONS AND ENFORCEMENT

The need for legislation updating to cope with new or emerging water management problems and enforcement of the relevant provisions are considered primary causes to focal problems of all the INECO Case Studies. Despite the fact that in most cases the relevant provisions and regulations exist, they often remain inactive, due to:

- Lack of technical and/or financial capacity, especially with regard to the monitoring of groundwater abstractions and industrial wastewater discharge.
- Social pressures from user groups and lack of alternative water supply, particularly in the case of groundwater exploitation and use.

The range of identified issues is summarized in Table 15. Concerning water pollution and discharge of untreated industrial effluents, poor legislation enforcement has led to the establishment of a “water police”, in Morocco and Syria. In Algeria, where the water police has already been established several years ago, problems continue due to limited capacity (lack of human and technical resources of the established water police to effectively monitor and sanction as appropriate).

Furthermore, and in order to facilitate compliance and alleviate part of the cost burden, grace periods and other forms of financial assistance are often provided to the industrial sector.

With regard to groundwater management, easy access to the resource is perceived as a cause of overexploitation in Tunisia. Indirect control of abstractions is exercised through the provision of soft loans for borehole drilling outside of irrigation perimeters. In Cyprus, and given the fact that the majority of groundwater bodies have been identified as "under risk" or "vulnerable", strict procedures are applied for new borehole drilling.

TABLE 15: UNDERLYING CAUSES OF POOR LEGISLATION ENFORCEMENT ON WATER ABSTRACTIONS/DISCHARGES IN THE INECO CASE STUDIES

Context	Case Study region	Underlying causes
River Basin Management and Planning	Oum Er Rbia Basin, Morocco	None identified in the Case Study context
	Damour River Basin, Lebanon	Limited enforcement of legislation on discharge standards No monitoring of water quantities abstracted upstream
River Basin Management and Planning / Groundwater management	Pegeia and Cyprus	Inability to monitor groundwater abstractions (both from illegal and legal boreholes and wells)
	Tunisia	Lack of regulation and control over abstractions from water tables
Urban water management and planning/Pollution prevention and control	Barada River Basin, Syria	Inadequate law enforcement for the violation of discharge standards due to the lack of efficient monitoring systems
	Bahr Basandeila Area, Egypt	Inadequate law enforcement due to deficiencies of the discharge permit system and lack of efficient monitoring
	Seybouse River Basin, Algeria	Limited enforcement of legislation on discharge standards due to lack of technical capacity and institutional empowerment

However, the numerous boreholes and wells already operating in both countries render the monitoring and control of groundwater abstractions either ineffective or impossible. Instead, emphasis is given to providing incentives for efficient water use in agriculture (the major groundwater user) and in the domestic/tourist sector. The effort has already been successfully implemented in Cyprus (more than 90% of irrigated land is equipped with micro-irrigation systems) and is underway in Tunisia.

AWARENESS AND PUBLIC PARTICIPATION

In recent years, the most important shift in governance thinking is that development should be seen as a task that involves society as a whole and not as the exclusive domain of governments and public authorities. In this context, the development of the IWRM process for more sustainable and socially equitable water resources management includes public

participation aimed at ensuring that the interests of all stakeholders, including water users and the civil society, are taken into account and are adequately addressed. In a participatory process, all citizens, both men and women, should have a voice, directly or through intermediary organizations representing their interests and throughout the process of policy and decision making.

The lack of public participation is recognized as a cause to water management problems in all of the INECO Case Studies (Table 16). However, stakeholder (and authorities') opinions are diversified as to: (a) the form of public participation that is considered as lacking (simple awareness on the importance of issues and on rights/obligations, commitment to implement mitigation measures, public consultation or deliberative processes), and (b) the way that public participation should be pursued.

TABLE 16: ISSUES ASSOCIATED WITH POOR PUBLIC PARTICIPATION IN THE INECO CASE STUDIES

Context	Case Study region	Issues associated
River Basin Management and Planning	Oum Er Rbia Basin, Morocco	Need for involving water users (farmers) in water management
	Damour River Basin, Lebanon	Limited cooperation/joint planning for surface water allocation No institutional platforms in place
River Basin Management and Planning / Groundwater management	Pegeia and Cyprus	Lack of a "water culture" among local residents
	Tunisia	Lack of farmer awareness for rationalizing groundwater use Social pressure from sensitive/affected user groups on procedures for borehole authorization
Urban water management and planning/Pollution prevention and control	Barada River Basin, Syria	Need for enhancing the role of beneficiaries users in water management
	Bahr Basandeila Area, Egypt	Limited awareness of environmental impacts and best practices in the use of agrochemicals Insufficient interaction between authorities and beneficiaries, local residents and NGOs
	Seybouse River Basin, Algeria	Lack of cooperation and joint decision-making

Furthermore, consulted actors and stakeholders underline an apparent lack or deficiency in key elements that can make participation and empowerment efforts successful.

The most commonly identified deficiency is lack of access to information on water-related issues, due to deficient mechanisms for information sharing or due to the lack of information in itself (e.g. the case of the Seybouse River Basin, Algeria). In Cyprus, stakeholders identify lack of information at

the local level. In fact, limited information is made available for the local problem of the management of the Pegeia aquifer, while information at the river basin district level in the context of the WFD implementation is disclosed to the general public. Furthermore, there are cases where in water management decision-taking is limited transparency or where water management decisions are not adequately communicated to the general public or the targeted user groups.

Finally, in the Case Studies of Damour, Lebanon and Barada, Syria, decision-makers and consulted stakeholders also highlight deficiencies in the lack of local organizational capacity, i.e. the ability of people and authorities to work together, organize themselves and mobilize resources to solve problems of common interest.

SUMMARIZING THE DIMENSIONS OF THE INECO CASE STUDIES

As demonstrated above, although diverse the cases analysed within INECO present commonalities on the underlying causes of focal water management problems. These, beyond the technical challenge, call for improved decision-making, effective governance, enhanced application of incentive-based policies, and increased public awareness and participation

Table 17 summarizes the underlying causes of these problems, in relation to the "Governing", "Valuing" and "Sharing" dimensions discussed throughout this chapter. In addition, Table 18 summarizes the key deficiencies identified in relation to the constitutional, organizational and operational function of water management, in terms of policy formulation, implementation and water service provision. The matrix demonstrates that, although potential solutions to water problems are in most cases well known they have often not been implemented due to:

- Organisational problems, related to the lack of funds, facilities, capacity and procedures, but also to inadequate legal imperatives and administrative guidelines;
- Social perception issues, linked to the lack of societal understanding and of the underlying causes to water-related issues, but also to limited awareness and participation of stakeholders and affected/affecting user-groups.

Subsequent chapters present emerging policy needs in relation to the issues at hand and management options of relevance in more detail. They further present the acceptance of different policy approaches for coping with current and emerging water management challenges.

TABLE 17: TYPOLOGY OF THE MAIN CAUSES OF FOCAL WATER MANAGEMENT PROBLEMS ANALYSED WITHIN INECO

Country/Region	Sharing water			Valuing water			Governing water				
	S1	S2	S3	V1	V2	V3	G1	G2	G3	G4	G5
Pegeia, Cyprus	+	+			+			+	+	+	
Tunisia		+		+	+	+	+	+	+		
Bahr-Basandeila Region, Egypt		+	+	+	+		+	+			+
Damour River Basin, Lebanon	+	+	+	+	+		+		+		+
Barada River Basin, Syria		+	+	+	+		+	+	+	+	+
Oum Er Rbia River Basin, Morocco	+	+		+	+	+		+			
Seybouse River Basin, Algeria		+		+	+		+	+	+		+

TABLE LEGEND

Sharing water	Valuing water	Governing water
S.1: Water allocation conflicts S.2: Ineffective management of resources shared among different users (e.g. groundwater, upstream pollution) S.3: Access to water services	V.1: Low recovery of water service costs V.2: Ineffective application of the polluter-pays principle V.3: Inefficient water allocation	G.1: Problems in the financing/planning for technical solutions & water works G.2: Limited/no public participation and awareness G.3: Deficient legislation enforcement G.4: Overlaps in responsibility G.5: Lack of human/technical resources

TABLE 18: AN ASSESSMENT OF INSTITUTIONAL FRAMEWORKS WITHIN THE CONTEXT OF THE INECO CASE STUDIES

	River Basin Management /Groundwater management				Urban water management and planning		
	Damour River Basin, Lebanon	Oum Er Rbia Hydraulic Basin, Morocco	Pegeia, Cyprus	Tunisia	Barada River Basin, Syria	Seybouse River Basin, Algeria	Bahr Basandeila area, Egypt
Constitutional function							
Effective development and implementation of laws and regulations	-	+	+/-	+/-	+/-	-	+/-
Decision making based on interests of all stakeholders	-	+	+	+/-	+/-	+/-	+/-
Inclusive participation of stakeholders in decision making	-	+/-	+	+/-	+/-	-	+/-
Effective and transparent accountability mechanisms	-	+/-	+	+/-	-	-	-
Existence and regular updating of quantitative and qualitative standards for use and effluents	+	+	+	+	+	+	+
Development of adaptive capacity to address water management challenges	+/-	+	+	+/-	-	+/-	+/-
Effective control and sanctioning of violations	-	N/A	+/-	+/-	+/-	-	+/-
Organizational function							
Assessment of water resources	+	+	+	+	+/-	-	+
Planning and decision making	+/-	+	+	+/-	+/-	+/-	+
Policing	-	+/-	+/-	+/-	+/-	-	-
Operational function							
Cost recovery for provided water services	-	-	+/-	+/-	+/-	N/A	-

EMERGING POLICY NEEDS IN THE LOCAL CASE STUDY CONTEXT

This chapter provides an overview of the main outcomes of the INECO Case Studies in terms of policy recommendations; these recommendations were derived through the implementation of the methodological approach presented, and were jointly developed and evaluated with local stakeholders.

For each Case Study, and according to the previously described typology of water management issues, the chapter presents jointly agreed objectives, the main elements of current policies to achieve problem mitigation, and suggestions for their enhancement. Incentive-based policies form the core of the developed policy proposals, and economic instruments are discussed in relation to the overall socio-political context and objectives that need to be pursued, while emphasis is also placed on necessary supporting and enabling instruments that can facilitate and promote comprehensive policy development and implementation under each Case Study context.

RIVER BASIN MANAGEMENT

The two areas of INECO Case Studies dealing with water management and allocation at the river basin and watershed scale have both received significant attention by international and EC-funded research efforts.

On the one hand, the Damour River Basin constitutes a small area that brings together diverse economic activities, and where water allocation between uses and between regions constitutes a source of conflict, aggravated by the lack of infrastructure. On the other hand, water stress in the Oum Er Rbia Hydraulic Basin is mostly related to irrigation water management and use, as well as intra-sectoral water allocation issues. The area has been at the focus of past water management policies for large-scale hydraulic infrastructure development and institutional reform. Currently, efforts to cope with increasing water stress entail the implementation of incentive-based policies, demand management and regulation, as well as capacity building at the user level.

THE CASE OF THE DAMOUR RIVER BASIN, LEBANON

The Damour River Basin is currently facing increasing water stress, manifested through the decrease in the total available amount of surface and groundwater of adequate quality to meet the needs of local domestic, agricultural and industrial users. The problem is particularly acute in the irrigated coastal plains of Damour, where farmers complain about the lack of water during the summer season because river water is abstracted upstream. The groundwater resources of the area are also under stress due to significant abstractions, mainly for inter-basin transfer to the Beirut area. In addition, local authorities repeatedly express their concern about the increased salinity of groundwater.

The main solution proposed for alleviating water stress is dam construction for the interseasonal storage of surface run-off; the option is included in the corresponding Master Plan but has not yet been implemented. Although the development of a large-scale hydraulic scheme would address water scarcity, the water sector of the River Basin also faces additional important challenges, stemming from lack of adequate (mainly financial) resources for infrastructure development and rehabilitation, pollution of water courses, overexploitation of groundwater resources, and increased disputes among upstream and downstream users concerning the "sharing" of water resources. The results of a SWOT analysis (Figure 8) undertaken in the area identified the strengths, weaknesses, opportunities and threats that the water resources management system is currently facing. Strengths and weaknesses refer to issues internal to the area and related to its inherent characteristics. Opportunities and threats originate from outside the Damour area boundaries.

Strengths	Weaknesses
➢ Availability of groundwater ➢ Presence of major surface water courses ➢ Presence of the Litani River Authority which manages major irrigation projects ➢ Limited industrial activities ➢ Acceptable level of urbanization ➢ Feasibility study for water supply in the area already prepared	➢ Peak demand for irrigation occurs during summer when water is least available ➢ Geologic formations with fissured karstic bedrock and narrow steep valleys do not always favor the construction of dams for surface water storage ➢ Water establishments and offices are set up by geopolitical boundaries rather than by water basin limits ➢ Old water supply infrastructure leading to excessive losses ➢ Lack of wastewater management infrastructure ➢ Lack of adequate monitoring data for the proper assessment of water resources ➢ Seawater intrusion in coastal aquifers due to overexploitation ➢ Insufficient level of awareness and knowledge of best management practices in agriculture ➢ Inadequate water pricing and lack of economic incentives for efficient water use and less polluting practices
Opportunities	**Threats**
➢ Interest from international funding sources in the development of the new liberated south, leading to potential financial assistance that can be used in water resource management activities/projects	➢ Difficult climatic conditions with most rainfall occurring within a short period of time ➢ Attraction of new investments that could pose a stress to water resources if not properly planned ➢ Sensitivity to the geo-political context that hinders economic development

FIGURE 8: SWOT ANALYSIS FOR WATER RESOURCES MANAGEMENT IN THE DAMOUR RIVER BASIN, LEBANON

In this regard, local stakeholders consider that strategies towards the integrated mitigation of the problem need to incorporate measures for achieving:

- Regulation over groundwater abstractions, in order to address overexploitation and safeguard groundwater supplies;

- Reduction or elimination of water pollution originating from the discharge of untreated domestic and industrial effluents and solid waste;
- Consensus between upstream and downstream users on the allocation of river water;
- Improvement of efficiency in water use.

Alongside these objectives, stakeholders also stress the need for strengthening the overall institutional framework both at the River Basin level and at the national level. Decentralisation of decision making processes, knowledge enhancement among users and professionals, information sharing, and enhanced awareness and public engagement emerge as appropriate supporting and enabling instruments for effective water stress mitigation.

As mentioned above, **infrastructure development** is strongly supported as a potential option to water stress mitigation; the construction of the related dam is considered by the local users a way for compensating for the transfer of the local (and vulnerable) groundwater resources to meet the needs of the Beirut Metropolitan Area. Furthermore, the expansion of the public water supply system to supply areas that rely solely on individual boreholes for drinking water supply and the development of collective schemes for irrigation water supply can help to mitigate groundwater overexploitation. Other solutions, such as the development of water reuse and recycling schemes are also gaining momentum and support.

The **reduction of groundwater abstractions** to sustainable levels is considered a key objective by all local stakeholders. The relevant legislation in Lebanon foresees procedures for borehole drilling permit issuing. In particular, extraction permits are subject to strict conditions and require a Republican Order or Decree except for those under 150 meters depth and not exceeding 100 m^3/day. Abstraction from public boreholes normally complies with permits issued; questions arise as to the effectiveness of the system in the case of private boreholes and wells, or when alternative sources of water supply are not available or costly to exploit. However, in many areas of Lebanon, Damour included, the drilling of individual boreholes is a common practice, because water supply interruptions are frequent, and/or the relevant water service operators cannot secure sufficient water quantities or quality.

Despite the above deficiencies, strict legislation enforcement, especially with regard to extractions from private boreholes and wells, is strongly advocated; it is however recognized that the current technical and financial resources are not adequate for monitoring all groundwater extraction points in the region. In this regard, abstraction metering is considered the first priority towards enforcement of stricter limitations in groundwater extraction from existing schemes.

The Damour River Basin does not have “heavy” industrial activities; however, there is uncontrolled discharge of industrial wastewater from

small manufactories and facilities, as confirmed by measured COD concentrations. From the range of potential instruments for industrial **pollution prevention and control**, local stakeholders underlined the following:

- The implementation of effluent charge systems or the introduction of tradable emission permits (market-based instrument) are not considered applicable given the current institutional framework and the administrative context;
- Legislation enforcement, through the establishment of a discharge permit system and the regular monitoring of industrial discharges, is strongly supported. The option can have the potential to achieve the suggested objective, provided that there is commitment from the part of the administrative authorities;
- Voluntary agreements could provide the technical and financial resources necessary to implement water pollution mitigation measures.

Water pollution abatement in the River Basin would also require interventions in the management of domestic wastewater. To that end, suggestions mostly focus on the development of the necessary infrastructure, through State or other funds, as it is estimated that the recovery of capital costs in this case can compromise the affordability of water service charges. However, it is also widely recognized that a reform of water tariffs should be implemented and that sewerage charges should be introduced in order to recover at least the operation and maintenance costs of the required schemes. This reform could be accepted by local stakeholders, provided that the increase is reasonable and charges are calculated in an open and transparent way.

The **allocation of the water** of the Damour River is an issue that provokes disputes among upstream and downstream users in the area. Potential responses towards the alleviation of these conflicts can entail:

- The establishment of tradable water use/allocation rights for surface water.
- The establishment of a surface water abstraction permit system; although such a system is already in place, there is need to re-define water use rights, as the current framework is considered outdated and does not take into account the change of the river flow patterns experienced in the last decade.
- Cooperative agreements between upstream and downstream users, possibly also involving “informal” water trading. Such agreements can be the outcome of negotiations between users. Prerequisites for the implementation of this option would be the development of public participation processes to help reach consensus on water allocation and environmental protection.

Consensus or mitigation of conflict over surface water allocation could be also achieved through additional infrastructure development (i.e. the construction of the relevant dam in the Damour River Basin), provided that the reservoir operational rules are defined in accordance with the interests of both upstream and downstream users.

The **improvement of efficiency in water use** is a key objective broadly recognized by all local stakeholders. The development of a water culture, through regular awareness and information campaigns and disclosure of information on water-related issues, is strongly supported. Individual efforts are being undertaken both at the national and local level, but a more systematic and professional approach that would include the provision of advice on technical issues (irrigation methods, irrigation scheduling, and water saving in the home) needs to be pursued.

BOX 10: COST RECOVERY AND WATER PRICING IN LEBANON AND DAMOUR

In Lebanon, the base of metering water consumption is one cubic meter per day, i.e. 365 m³/year. This basis is the same for all categories of subscribers and the water bill varies according to the number of cubic meters required per day and per subscriber.

The Municipality of Damour applies an individual rate, based on a lump sum of LL 100000/year (i.e. €45). There are no reliable statistics on the number of connections to the public water supply system; as only the coastal villages of the River Basin (Damour and Meschref) have a public water supply system, it is estimated that the total number of connections is approximately 10,000 over a total population of 86,000 persons. The Damour municipality has a reduced fixed charge of LL100000 (45 €) per year for their subscribers. Volumetric components are defined via water gauges, calibrated to provide the required quantity.

Full recovery of financial costs for domestic water supply would entail a 4 or 5-fold increase of current water tariffs. Due to affordability issues, especially with regard to low-income users, the tariffs should not be increased more than two-fold. In case that water prices exceed a certain threshold, it is evident that some uses will be phased out or search for alternative water supply sources, as public water supply would become too costly.

Overall, a reform of water pricing policies faces opposition from particular user groups, and is inhibited by the fact that most establishments are not equipped with water meters. In the Damour River Basin only, it is estimated that around 50,000 meters should be installed. The main reason why water metering has not been yet implemented is lack of funds.

Additional incentives, requiring financial resources from the State or water management authorities and water service providers, include the provision of grants, subsidies, soft loans and/or tax rebates for the installation of water saving equipment. Notably, reinforcing the incentives provided by water tariffs is an option that wins the acceptance of stakeholders, provided that the main objective in water pricing policy design and implementation is cost recovery and not penalization of water use. Currently, and due to the lack of an efficient water metering system, water

pricing is based on the payment of a lump sum determined according to theoretical water consumption (Box 10). Water pricing reforms can be oriented towards the introduction of a fixed charge, aimed at recovering maintenance cost, and a volumetric charge, provided that water meters are installed in households and that water metering is regularly practiced in all establishments.

In addition to the above, **supporting instruments** towards more sustainable water management would need to incorporate policies aimed at enhancing awareness on water-related issues, at the development of more inclusive decision-making and at the effective implementation of decisions taken.

Decentralization of water management at the River Basin Level is an option that needs to be pursued, as it can facilitate the management of locally shared surface and groundwater resources in an integrated and participative way.

Similarly, public participation or at least public consultation at the local level is considered essential. Specific measures can comprise the establishment of local Advisory Committees, the implementation of Notice and Comment Procedures and the organization of public hearings and meetings. Awareness raising and reinforcement of civic responsibility is considered extremely important; in the absence of a strong regulatory framework, community respect to rules needs to be enhanced as much as possible.

Furthermore, there is strong need to improve the knowledge base on water resources in the area, as data are often unavailable or hard to retrieve. Towards this end, inventories and databases, accessible to all users and citizens of the region, can contribute to enhancing awareness on significant water management problems and towards more informed water exploitation and use by local authorities and end-users.

The case of the Oum Er Rbia Hydraulic Basin, Morocco

The Oum Er Rbia Hydraulic Basin, located in the mid-west part of Morocco is a River Basin of strategic importance for the country, which has already been the focus of important investments in hydraulic infrastructure (Figure 9). The Basin provides water to the strategic economic zone of Morocco (Tadla, Doukkala and the inshore zone Casablanca-Safi), sustains important economic activities (hydroelectricity, industry and agriculture), and hosts a significant share of the country's population.

Currently, the water sector of the Basin is faced with various natural and technical constraints, mostly concerning the sustainability and availability of water in terms of both quantity and quality. The most important of these comprise: (a) the overexploitation of groundwater resources, due to overpumping but also to reduction in precipitation; (b) water quality deterioration; (c) low efficiency in water use; and (d) increased requirements for flood protection. As the largest part of available water

resources has already been exploited, there are limited alternatives for water supply enhancement; in this regard, water management authorities of the area focus their efforts in regulating the demand for different water use sectors.

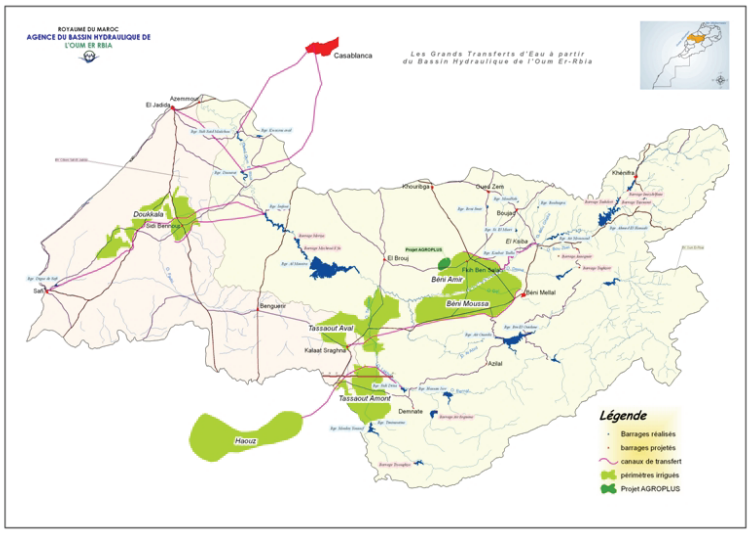

FIGURE 9: THE OUM ER RBIA BASIN, MOROCCO – MAJOR DAMS, WATER TRANSFER SCHEMES AND IRRIGATION PERIMETERS

As depicted from the SWOT analysis of Figure 10, the reform of the water management framework of the country, through the Water Law 10/95, offers significant opportunities for dealing with existing problems and emerging challenges. The establishment of Hydraulic Basin Agencies and the development of open fora at national, regional and local level are expected to enable the enhanced implementation of demand management policies and the early identification of local constraints that can limit the effective uptake of incentives by individual users and water service providers. Furthermore, and especially at the Hydraulic Basin level, important efforts are being undertaken towards capacity building, both among water management authorities and on the users' side.

TABLE 19: WATER DEMAND AND SUPPLY IN THE OUM ER RBIA BASIN (MILLION M^3)

Use	Surface water	Groundwater	Total
Irrigation	3411	534	**3945**
Urban water supply	72	88	**160**
Inter-basin transfer	165	-	**165**
TOTAL	**3648**	**622**	**4270**

With agriculture being the dominant water use in the area (Table 19), the improvement of efficiency in irrigation water use has emerged as a key policy objective to mitigate water stress and secure freshwater supply. Currently, losses in the irrigation distribution networks of the Basin are estimated at 20%; however, water losses due to the applied irrigation methods and practices are of the order of 50%, whereas the agricultural land equipped with advanced irrigation systems is estimated at only 10%. In this regard, it becomes evident that additional measures need to be

implemented for water conservation, in order to foster changes in water use patterns.

Strengths	Weaknesses
➢ The existence of the Water Law defining the Hydraulic Basin as the unit for water management. ➢ The establishment, since 1999, of the Hydraulic Basin Agency in the OER. ➢ The existence of efficient operators: ONEP, Municipal Utilities (Regies), ORMVAs, private companies, etc.	➢ Communities and municipalities have often been not as efficient in managing water, sewerage and electricity services. They had to resort partly or completely to professionals, who were able to reduce costs and ensure the sustainability and quality of the services provided. ➢ There is difficulty in setting up contracts for the management of water tables. The multiplicity of users makes necessary the implementation of such contracts, co-managed by the Hydraulic Basin Agency and professional associations. ➢ There is insufficient level of knowledge and expertise of farmers towards irrigation water use. Farmers should reduce or abandon the irrigation of water-intensive, low-value crops, which are irrigated using groundwater, and apply new techniques for irrigation and pumping, so as to increase agricultural output. ➢ The price signals towards water users are rather weak. The State provides a subsidy between 1.5 and 3 DH/m³ for the cost of mobilizing water resources through dams and for the maintenance of irrigation canals. It will also subsidize wastewater treatment. ➢ Water transfers from the OER should be performed only towards the Tensift basin, and other, external to the basin, water demands should be backed up by the Hydraulic Basins of Sebou and Loukkos. ➢ The efficiency of drinking water distribution networks has to be improved.
Opportunities	**Threats**
➢ A regional debate is organized by the Water Basin Authorities in 2007 on water-related issues. ➢ The State contributes in the financing of the sewage treatment program whose budget is 44 billion DH . The program aims to reduce by half the relevant pressures within a timeframe of 15 years. ➢ The ONEP has undertaken the program for rural water supply since 2004. ➢ Subsidies of 60% are given to farmers for implementing drip irrigation systems. ➢ Public authorities are encouraged to integrate water supply and sewerage services in regions and to assign their management to operators. The OER Agency is also considering this approach. ➢ There are State Programmes for developing "satellite" cities around large urban centres. ➢ The tertiary sector is under development and will possibly alleviate pressures exerted by agriculture.	➢ Pollution is increasing as a result of nitrates, pesticides, sewage and industrial wastewater discharge. ➢ Coastal water tables are threatened by sea intrusion. ➢ Droughts have significant impacts on water quantity and quality, and flood risks are increasing. ➢ Water is used inefficiently. ➢ There are several polluting industries, which discharge their effluents without prior treatment (e.g. OCP, sugar, dairy etc.) ➢ There is delay in the implementation of Law 10 - 95, particularly with regard to the polluter-pays principle.

FIGURE 10: SWOT ANALYSIS FOR WATER MANAGEMENT IN THE OUM ER RBIA BASIN

As depicted from Box 11, important incentives are already being implemented to encourage the large-scale adoption of advanced irrigation methods. Financial encouragement through the Agricultural Development Fund is made available to local farmers for the modernization of irrigation systems. However, stakeholders and water managers advocate the need to further support undertaken policies through:

- The strengthening of economic incentives already provided to farmers for implementing modern irrigation methods and rehabilitating irrigation equipment;
- The strengthening of the overall framework for water management in the area, addressing empowerment and capacity building of farmer associations, to facilitate technology uptake and participation in decision-making processes.

With regard to **currently offered incentives**, it is broadly supported that further incentives targeting the agricultural sector can have extremely significant impact: irrigation demand can be reduced as much as 30%

through rationalization in scheduling, implementation of advanced methods for irrigation water delivery and field application, and change of cropping patterns.

BOX 11: COST RECOVERY AND GRANTS TARGETING THE AGRICULTURAL SECTOR IN MOROCCO

Forms of financial assistance towards demand management in the agricultural sector of Morocco are primarily addressed to those who install water saving equipment. A grant, covering 60% of the total installation cost is provided by the State through the Agricultural Development Fund. However, the application of this mechanism has been thus far limited; obstacles that farmers encounter in deciding to shift towards water-saving techniques are:

- Requirements for infrastructure outside the field, which entails high costs;
- Small size of farms, which render installation costs particularly important;
- Lack of technical training.

Cost recovery in irrigated agriculture is effected through the setting of a simple volumetric rate (not differentiated according to the overall consumption), which varies according to the region. With regard to groundwater, two water charges are applied:

- The first concerns water delivered by the ORMVAs (Offices régionaux de mise en valeur agricole) at the entrance of the farmer's field, which is generally equal to 0.50 Dh/m³.
- The second concerns water pumped by farmers using their own equipment. In this case, a charge of 0.02 Dh/m³ is paid to the ORMVA.

For surface water, the: tariff varies among basins. In the Oum Er Rbia Basin, the price is equal to 0.24 Dh/m³.

The low tariff for groundwater pumped from individual private boreholes (0.02 Dh/m³) results in the irrational use of water by agricultural users and to the overexploitation of groundwater resources. Overall, cost recovery is low, and does not exceed 30%.

Currently, it is pointed out the funding mechanism cannot be easily accessed by small-scale farmers, due to problems faced at the initial funding stage (i.e. before the grant is received). To enable faster and wider implementation, grants could be redirected to those who install the equipment, instead of individual land-owners. Financial incentives could be further strengthened through the enhancement of the role of the Hydraulic Agency (both in terms of funding and in terms of technical assistance), through the promulgation of the relevant legislative texts.

In addition to the strengthening of financial incentives, there is also need to inform farmers, as well as decision-makers on the wider economic benefits from improved water use practices. Tools towards this end include wide assessment of economic value of water in irrigated agriculture and avoided (long and short-term) costs from water conservation projects. Outcomes on economic benefits for farmers should be effectively communicated to water users, so as to facilitate the uptake of the offered incentives.

Economic and particularly cost recovery policies need to re-examine the issue of cost allocation among different users and regions that share the same hydraulic infrastructure (storage reservoirs and conveyance networks). Costs relating to the maintenance and rehabilitation of existing infrastructure need to be shared more equitably among water users, taking also into account the wider economic, environmental and social benefits of the different uses involved.

From the above, it becomes evident that the successful implementation of demand management policies should also build on efforts to addressing deficiencies of the overall institutional framework. The main objective is to enable effective policy implementation, but also better coordination among decision-makers, water managers and user associations. In this regard, and further to the strengthening of the role of Hydraulic Basin Agencies local (and broader) policy priorities towards IWRM address the following key issues.

First, the **role of water user associations** needs to be enhanced, as they can help in developing the capacity required among farmers through training, education and increased awareness. Furthermore, water user associations can act as intermediaries between individual farmers and public authorities, also ensuring their representation in the decision-making process. In this regard, it can be proposed to revise regulatory texts that concern agricultural water user associations, introducing processes that allow for more immediate and effective action.

Second, the **enhanced involvement** of politicians, researchers and users (farmers, ORMVAs, ONE, professional associations, etc.) in the design and implementation of demand management policies needs to be pursued, so as to ensure commitment from all parties to decisions taken.

GROUNDWATER MANAGEMENT

The two INECO Case Studies dealing with groundwater management concern areas that are very different both in terms of size, but also in terms of drivers contributing to groundwater overexploitation. Their main commonality lies in the fact that they both concern countries with significantly developed surface water resources; widespread groundwater abstraction, however, has contributed to its overexploitation due to the easy access to the resource, mostly for sustaining agricultural activities.

In Cyprus, concerted efforts currently aim at protecting groundwater resources from further overexploitation; the Case Study of INECO concerns a small aquifer, used almost solely for drinking water supply, whose vulnerability is increasing due to the rapid expansion of the area and tourism growth. On the other hand, groundwater overexploitation in Tunisia is mostly associated with crop irrigation, especially in areas where there is no available alternative water supply.

THE CASE OF THE PEGEIA AQUIFER, CYPRUS

Efficient groundwater management is a policy priority in Cyprus, as:

- It is widely recognized that there is need to reduce borehole abstractions to sustainable levels. In the past years, the heavy over-pumping from groundwater aquifers to address increasing water demand or to mitigate drought effects has resulted in the depletion of almost all aquifers and seawater intrusion in many coastal ones (13 out of 19 groundwater bodies, or 68%, are at risk from over-pumping).
- Groundwater resources are considered strategic reserves, as they can secure a minimum water supply to respond to highly variable precipitation levels and prolonged droughts that diminish available surface water supplies.

The Pegeia aquifer is located near Paphos, in the western part of Cyprus. The aquifer is a locally important water resource, as it supplies water to the rapidly developing village of Pegeia and the nearby tourist establishments.

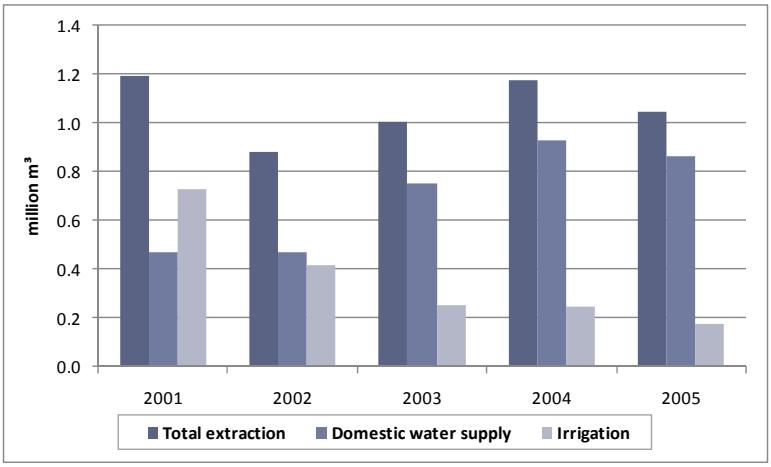

FIGURE 11: ANNUAL EXTRACTION RATES FROM THE PEGEIA LIMESTONE AQUIFER, CYPRUS

Given the local importance of the aquifer, the water table and salinity levels are closely monitored by the responsible authority, the Water Development Department (WDD) of the Ministry of Agriculture, Natural Resources, and the Environment. Furthermore, the WDD has undertaken several measures to reverse increasing exploitation trends, and address potential sea water intrusion and pollution risks. These include the provision of irrigation supply to local farmers from the Paphos Irrigation Project, and the development of sewage collection and treatment schemes. Through the first measure, which dramatically reduced abstractions from individual boreholes, public authorities achieved a considerable decrease in extracted water quantities, and almost managed to limit groundwater usage to domestic water supply alone (Figure 11). However, the rapid development of the area considerably affects demand for potable water supply and increases the vulnerability of the aquifer, raising the question of how to achieve sustainable water management without compromising economic growth.

Thus, and according to local stakeholder views, potential water management strategies for the area need to be oriented towards:

- Development of additional water supply sources, with the aim to substitute groundwater use in the domestic sector;
- Improvement of efficiency in water use in the domestic sector and in irrigated agriculture, as part of the overall policy for water conservation;
- Regulation of abstractions from the private boreholes that are still operating in the area;
- Broader mobilization of local citizens and actors as part of the overall effort already undertaken in Cyprus for the development of a new water culture among professionals, water users and citizens.

The **development of water supply sources** as alternative to groundwater extraction is a policy objective actively pursued by local authorities.

The Municipality of Pegeia, in collaboration with the WDD, has initiated the process for the construction of a sewerage network and wastewater treatment infrastructure. In addition to pollution prevention, treated wastewater could be further used for crop irrigation, especially during drought. Furthermore, the WDD has initiated procedures for the construction of a desalination plant to meet the drinking water needs of the Paphos district; the introduction of desalination will improve the reliability of freshwater supply in the town of Paphos and the areas in its vicinity, and alleviate the pressures exerted on surface and groundwater bodies.

Associated issues related to cost recovery do not seem to raise concern, as it is widely recognized that further development would require expansion of the infrastructure base; water charges are affordable in the area, and even if full recovery is achieved, the share of household income spent on water services would remain below the affordability threshold of 1.5%. On the other hand, many hotels and tourist units are assessing the option of developing their own desalination facilities, given the severe impact of the accentuated drought of the past few years, and the frequent supply interruptions that impact on tourism-related activities.

Suggestions of local stakeholders however, focus more on small-scale decentralized solutions to meet the increasing demand. Rainwater harvesting, as well as the construction of small interception dams are often cited as a potential solution. Water recycling and reuse at the neighbourhood level to meet municipal and garden irrigation demand is also an option that gains momentum among citizens.

Suggestions also concern the reduction of losses in the drinking water distribution network, which are currently estimated in the range of 30 %. Taking into account the example of the Limassol Water Board, which embarked on a leakage reduction programme to reduce losses to only 15%,

similar initiatives could be examined, depending on feasibility and agreement on how the corresponding costs could be shared among authorities and citizens.

BOX 12: COST RECOVERY AND TARIFF SETTING IN CYPRUS

Currently, the average annual per capita expenditure for water services in Cyprus is approximately 120 €. The average size of a household in Pegeia is 2.76 persons (according to the last Population Census 2001), which means that the average annual water bill is roughly 360 €.

Full recovery of financial costs for drinking water supply would require a 30% increase of bulk water rates; this would mean that the annual water bill in the area could rise to as much as 500 €, which is not however unaffordable. Bulk water rates for potable water supply are reviewed periodically in order to recover full operating costs, depreciation, working capital and debt servicing in excess of depreciation. Changes to water tariffs by the Water Boards, Municipalities and Village communities are difficult, especially uniform domestic water tariffs since these depend on local conditions.

In agriculture, current irrigation tariffs encourage the cultivation of high water consumption crops. Increasing the tariffs to cover the full average unit costs would make many crops, such as citrus, unprofitable. Furthermore, expensive surface water supply could lead to excessive use of local groundwater supplies. This would result to saline intrusion and further degradation of aquifer reserves; it would also further increase the inequality among farmers supplied by the Government Water Works and those relying on individual (private) boreholes. In this regard, decision-makers are reluctant to raise tariffs of irrigation water for political and economic reasons, since this could also discourage irrigated agriculture and lead to further urbanization.

Water conservation and **improvement of efficiency in water use** are core components of the National Water Policy of Cyprus. Measures range from awareness campaigning to financial and fiscal incentives and legislative mandates concerning the entire range of water use sectors, with particular focus on crop irrigation and domestic water usage.

In the above context, the WDD has embarked on a Strategic Plan, providing financial incentives for the promotion of technological adjustments aimed at water conservation in the domestic sector (Box 14). Furthermore, the pertinent legislation also includes mandates and different forms of sanction for wasteful water use. For example, the "Water Conservation (Special measures)" Law of 1991 applied within Water Board areas, Municipalities and Village water supply areas, states that "*any person using water through a hose for washing sidewalks or streets, verandas and vehicles is guilty of a criminal offence and could be imprisoned for up to 3 months and or be fined up to 1000 € or both. Policemen or other licensed persons (WDD personnel) having grounds to believe that a person is committing such an offence could issue a fine of up to 110 € in lieu of taking this person to court".* These provisions, however, are mostly applied in times of drought and limited water availability.

Despite the significant resources invested in developing local awareness and informing of available policy initiatives, these were not well known to local citizens. Proposed measures encompass a broader range of responses, including:

- The increase of volumetric charges, to achieve adequate recovery of water service costs; this in turn raises the question of how additional costs will be allocated to consumers. Suggestions include increased tariffs for the hotel sector and for large scale water users.
- Introduction of seasonal water rates, to account for the costs of infrastructure aimed at meeting peak (tourism-induced) water demands.
- Introduction of mandates for regular water audits for large consumers (e.g. hotels) or cases where there is "excessive" water use. Water audits, already compulsory in many countries facing water shortage problems, could be the solution for the identification of improvements, installation of water saving equipment, early identification of leakages and awareness enhancement.
- Additional incentives for conservation in the home and in tourist installations, such as further rebates or tax exemptions for the installation of water saving equipment.

Although crop irrigation does not presently contribute to groundwater overexploitation, stakeholder proposals also concerned the change of cropping patterns, given that no further improvement is feasible in applied irrigation methods (Box 13).

BOX 13: THE "IMPROVED ON-FARM IRRIGATION SYSTEMS" PROGRAMME OF CYPRUS

The promotion of efficient irrigation methods (micro-irrigation) in Cyprus started as early as 1965, through the "Improved on-Farm Irrigation Systems" Project. Incentives, such as subsidies and long-term low interest loans towards the purchase and installation of improved irrigation systems, encouraged farmers to adopt such systems.

The grant amounted up to 15% of the total cost of the on farm irrigation system with the remaining provided in the form of a soft loan. Farmers were convinced to use improved irrigation systems through extensive field demonstrations. As a result of a successfully implemented program (subsidies, long-term low interest loans and enhanced demonstrations), the total flood-irrigated area declined from 13,400 ha in 1974 to 2,000 ha by 1995. Over the same period, the application of micro-irrigation increased from 2,700 ha to 35,600 ha.

Currently, there are few margins for further improvement in irrigation efficiency. The overall success of the project was such that almost all irrigation water is currently applied through modern on-farming irrigation systems. Nowadays, on-farm irrigation systems comprise 90% micro-irrigation, 5% sprinkler irrigation and 5% surface irrigation.

BOX 14: INCENTIVES FOR URBAN WATER CONSERVATION IN CYPRUS

The Water Development Department of the Ministry of Agriculture, Natural Resources and the Environment of Cyprus, has embarked on a Strategic Plan, in order to ensure conservation and rational water use. The Plan foresees financial incentives for the promotion of technological adjustments aimed at reducing use of drinking water for urban uses that do not necessarily require potable water quality. Incentives include subsidies addressed to households, commercial establishments, municipal buildings etc., connected to the public water supply system, for:

- Borehole drilling for garden irrigation (€700). The grant is subject to a well permit and inspection of the site after permit issue and before drilling;
- Installation of on-site grey water reuse systems for lavatories and garden irrigation. The currently offered subsidy is €3000 for households; in all other sectors, a grant is provided covering 40% of the installation cost up to the amount of €7000. In all cases, an approval needs to be issued by the Sewerage Board of the respective area and the installation needs to comply with the standards defined for greywater reuse;
- The connection of existing boreholes and wells with lavatories (€700). The grant is provided subject to application, inspection and provision of technical advice by the WDD;
- Introduction of hot water recirculators (€220).

Overall, the estimated potential water savings can reach 50% of drinking water demand. In 2008 and in 2009, the budget allocated annually for these incentives was 2.0 million € (1.5 million € for the grants and 0.5 million € for accompanying awareness and promotion campaigns). The impact of the three first measures is portrayed in Figure 12.

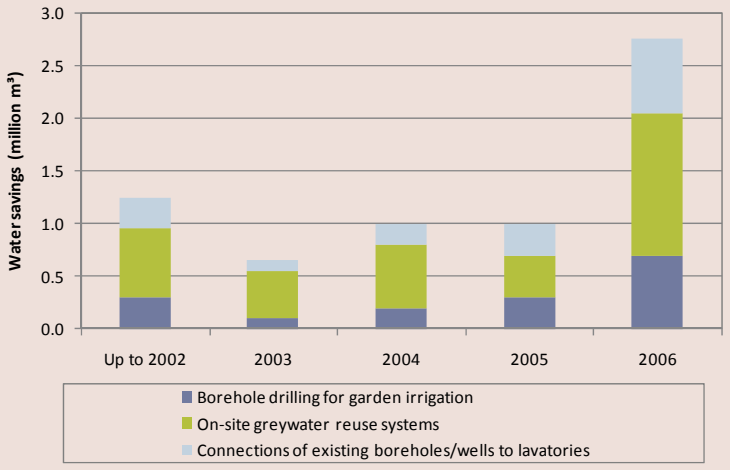

FIGURE 12: IMPACT OF INCENTIVES FOR URBAN WATER CONSERVATION IN CYPRUS

Legislation aimed at the **protection of groundwater resources from overexploitation** is summarized in the Wells Law (Cap 351), which requires the issuing of the relevant permits by the corresponding District Officer for borehole drilling. However, as the authority is vested within a body that does not have the technical capacity to assess the potential for further groundwater exploitation in relation to sustainable extraction limits, the Law has resulted in the existence of a large number of boreholes and wells

that are not properly assessed in terms of environmental impact. Furthermore, and with regard to compliance to the extraction limits defined in permits, authorities and citizens often point out that supervision and control are "relaxed", especially concerning private boreholes; in addition, penalties and fines imposed in cases of overabstraction are relatively low.

Based on the above perspective, options towards the regulation of groundwater abstractions mainly focus on private borehole monitoring and extraction control, and on the enforcement of stricter penalties and fines for overabstraction. Questions arise as to the feasibility of such measures; the monitoring of the large number of private boreholes operating throughout the country would require significant technical and human capacity. In turn this would incur high financial and social cost, without necessarily having tangible effects in the near future.

For the particular case of Pegeia, and as groundwater is solely used for drinking water supply (domestic and tourism sectors), suggestions also include measures aimed at reducing groundwater usage for domestic purposes. In addition to the aforementioned forms of encouragement for conservation measures in the home and in tourist units, policies could also foster the construction of small-scale desalination schemes for the large hotels of the area (i.e. schemes for encouraging large consumers to shift from public water supply). Appropriate incentives could comprise the increase of tariffs currently faced by the hotel sector, so as to render desalination an economically attractive option. Other forms of fiscal and financial instruments (e.g. low interest loans) could also be applied. Such changes could also be effected through regulation (i.e. mandatory development of individual desalination supply for new and existing establishments).

Awareness campaigns on water saving are an everyday reality in Cyprus, as there is strong need to rationalize and curtail water use to meet available supply during drought. Furthermore, the WDD, within the framework of the WFD implementation process, has initiated public participation processes on the draft River Basin Management Plan. Means employed involve presentations, public meetings, dedicated questionnaires and information sharing on the outcomes of the WFD analyses.

However, all these initiatives towards public participation do not seem to reach water users at the local level. In this regard, locally targeted responses could entail

- Awareness campaigning, focusing also on policies and water conservation initiatives at the local level;
- Enhanced information sharing through specifically targeted local meetings and public hearings at the local level. Information disclosure would be more effective if non-technical terms are used, so that information, actions taken and proposals are easily

understood by citizens lacking a scientific background on water management issues.

Finally, efforts to establish deliberation processes, through citizen panels, could be of significant benefit to local decision-makers, as they would give citizens the opportunity to freely express their views on issues of local importance and become better informed on the scope of current decisions and incentives offered.

THE CASE OF TUNISIA

Efforts towards water mobilization in Tunisia have played a dominant role in the regulation of water resources and in the attenuation of the socio-economic impacts of droughts experienced during the last 15 years. However, despite the significant development of surface water supplies, groundwater resources are still overexploited, particularly for meeting local irrigation needs. Gradually, and as in several areas groundwater abstractions exceed the average rate of replenishment, productive aquifers and water tables have become depleted, whereas sea water intrusion is also observed in several coastal aquifers.

TABLE 20: AVAILABLE AND EXPLOITED GROUNDWATER RESOURCES IN TUNISIA (DATA FOR THE YEAR 2000)

Region	Available Resources (million m³)	Exploitation (million m³)	Rate of exploitation (%)
Northern	386	405	105
Central	236	262	111
Southern	118	113	97
Total	**740**	**780**	**106**

In 2000, the annual renewable groundwater resources of Tunisia were estimated at 740 million m³ (Table 20). Their rate of exploitation through equipped wells and boreholes is estimated at 106% (i.e. 780 million m³). Groundwater exploitation schemes were mainly developed during the last 20 years; in 1980 the total exploited volume was equal to only 395 million m³ (97% growth).

The reduction of groundwater abstractions to sustainable levels is inherently linked to agricultural water use; in this regard, local stakeholders consider that potential strategies need to address the following specific objectives:

- Tighter regulation and control over groundwater abstractions, especially from individual boreholes;
- Enhancement of efficiency in irrigation water allocation and use, which would lead to a reduction in the use of freshwater resources, groundwater included;
- Promotion of alternative water supply sources, such as treated wastewater, for crop irrigation;

- Strengthening of coordination among institutions involved and integration of policies, including the development of community management and the enhancement of user involvement.

The **monitoring of groundwater abstractions**, both public and private, is undertaken by the CRDAs. Authorisations for borehole drilling and the corresponding permits are provided by the CRDA if drilling depth is less than 50 m; otherwise, the drilling permit needs to be issued by the Ministry of Agriculture. No limits for borehole drilling are imposed unless there is clear evidence that the water table has been overexploited. An inventory of groundwater abstraction points has already been developed at the regional level.

There is however clear evidence that the enforcement of the corresponding penalties and fines in case of overabstraction from existing boreholes is rather limited, mostly due to social reasons. Furthermore, easy access to groundwater leads to the drilling of illegal boreholes, which cannot be easily controlled by the corresponding authorities. It therefore becomes evident that regulation and control over groundwater abstractions can only be achieved indirectly by applying a mix of:

- Economic instruments, aimed at discouraging groundwater use;
- Institutional reforms, shifting responsibilities to communities and empowering them to manage groundwater exploitation and use, especially outside irrigated perimeters where alternative supply is not available. There would be requirement for a legal establishment of public property rights for groundwater.

Economic instruments can entail the reform of irrigation water pricing policies with the aim to increase groundwater use costs, either by introducing abstraction charges, internalizing resource costs associated with groundwater overexploitation, or by indirectly increasing the cost of groundwater exploitation, e.g. through an increase of the energy prices for water pumping. As these reforms could prove difficult to implement, the objective could be further pursued through surface water supply charges, where surface water supply is available. It should be ensured that irrigation prices are not lowered significantly, in order to not encourage water waste, or that the reform is complemented with other policies, aimed at improving efficiency in irrigation water allocation and use.

Along the same lines, the engagement into voluntary schemes to reduce groundwater abstractions in areas facing overexploitation problems can also be a promising option. Voluntary schemes can involve compensation payments for the loss of agricultural income, and could also be applied as a contingency measure during drought, when there is increasing need for conserving strategic water reserves.

The Government of Tunisia, within the framework of an overall strategy for promoting water saving, is taking specific measures to enhance efficiency in irrigation water allocation and use, in the form of financial assistance to those who apply improved irrigation methods. Modern irrigation

techniques are currently applied in 70% of public irrigation schemes, and there is a significant effort for reinforcing awareness and training through appropriate campaigns and initiatives (Box 16).

BOX 15: IMPACT OF FULL COST RECOVERY FOR IRRIGATION WATER PROVISION IN THE GOVERNORATE OF NABEUL, TUNISIA

A study concerning potential impacts that may arise from the implementation of the full cost recovery principle was recently undertaken for irrigation water supply in the Governorate of Nabeul, Tunisia. Its main results were the following:

- Water charges do not have a major impact in the majority of exploitations.
- The economic value of water in irrigated agriculture has decreased by 12%.
- For the time being, the structure of water tariffs does not consider resource costs. Only components linked to financial costs are included. Future reforms should also consider recovery of costs for rehabilitation and capital costs for equipment, estimated through the amortization of capital investment.
- A programme to adjust irrigation water prices was applied since the beginning of the 1990s, aimed at reaching cost recovery and eliminating subsidies. Since 2000, water is provided at a relatively high price, which incorporates only the costs that are directly associated with water exploitation.

However, the implementation of the National Agricultural Policy for the wider cultivation of cereals and fodder crops is also based on the introduction of preferential tariffs, which can generate a subsidy of about 50%, depending on the irrigation practices.

Presently, the comparison of water costs vs. other farm inputs varies from 7% (fruit trees) to 19% (citrus), corresponding to an average of 10%. This is currently considered acceptable, but it also depends on external economic conditions: there is a continuous increase in the cost of other agricultural inputs, and the market price of strategic crops, such as potatoes, remains constant. However, farmers react strongly vis-à-vis tariff increases, because the decisions are made at the local level and do not consider international market conditions. In this regard, policy makers try to effect pricing reforms when the social and political conditions allow.

Especially with regard to groundwater, and taking into account the degradation of water quality in water tables, 85% of the farmers think that surface water is cheap, although groundwater exploitation costs are currently 40% less than surface water.

The results of undertaken policy measures (encouragement towards water saving and change of cropping patterns, rationalization of water tariffs, efficiency improvements in hydraulic infrastructure) are expected to become evident after 2010, through a decrease in irrigation water consumption. Furthermore, a change in the allocation of available supplies is to be expected, in accordance to economic and social considerations.

BOX 16: FINANCIAL INCENTIVES FOR WATER CONSERVATION IN AGRICULTURE IN TUNISIA

Forms of financial assistance addressed to farmers who install water saving equipment in Tunisia are important. Grants range between 40 and 60% of the equipment and installation cost, corresponding to an overall amount of 700 €/ha. Extension services are provided by CRDAs and UNAP (National Union of Agriculture and Fishing). In addition, there is a reduction of 10% of custom taxes on the equipment and tax exoneration on consumption and added value (TVA), and an increase of 50 to 60% of the allowance granted to GDAs (Agriculture Development Groups). Presently, the share of irrigated land equipped with modern irrigation systems is estimated at 70% of the public irrigation schemes.

The shift towards less-water intensive crops, such as cereals, is promoted through subsidies in irrigation water tariffs: farmers can obtain 1500m³ per ha free from the CRDA. Taking into consideration the potential for increasing prices of cereals in the international market, farmers are gradually convinced to shift to the above crops. Furthermore, the Government doubled the prices of wheat starting from the 2008 production, but there is still need for training and promotion campaigns.

Incentives are also provided towards the wider use of treated wastewater. In more detail, water is provided to farmers at 0.02 TD/m³ compared to 0.05 TD/m³ for groundwater and 0.1 TD/m³ for surface water. The implementation of reuse schemes is fully financed by the Government. Equipment and seeds of fodder crops are also subsidised. Quality control is undertaken by the veterinary service of the CRDA and the Ministry of Health. However, most farmers are not willing to shift to treated wastewater because of its odour and its quality. The limited acceptance of the public to consume products irrigated with treated wastewater remains a very important obstacle.

Wastewater reuse is considered extremely important in the effort to meet the increasing demand in agriculture, industry and tourism, as projected water needs cannot be satisfied by freshwater resources alone. Estimates based on current urban growth patterns and change in land-use project that a total volume of 480 hm³ of treated wastewater will become available in 2030. This volume represents 10% of the total mobilized resources and can allow the irrigation of 100,000 ha. However, reuse can only be possible and beneficial if:

- Specific standards are set for effluent quality, depending on the type of crop irrigated;
- Funds are provided for the development of conveyance networks from the wastewater treatment plants, which in their majority are located near urban centres, to irrigation perimeters, separate distribution networks at the perimeter level, and facilities for interseasonal storage. The significant capital investment for infrastructure development cannot be recovered from the users, as this would render the use of other, cheaper, water supply sources (namely groundwater) preferable.

- Training of farmers and extensive awareness campaigning to improve acceptability both by farmers and the general public.

Currently, the artificial recharge of overexploited water tables with treated wastewater has not been extensively developed. Experiments and assessments indicate that for this measure to be applied, the quality of treated wastewater should be improved through tertiary treatment, to eliminate all risks of contamination and further quality deterioration of available groundwater supplies.

Encouragement of community groundwater management is promoted at both the regional and national level; efforts are being undertaken to promote the sharing of responsibilities and the participation of all users through the Agricultural Development Groups. However, it is also broadly recognized that real involvement of users in the decision-making process and in the day-to-day management would require a long and resource-intensive process for building human and technical capacity. In this regard, initiatives towards further strengthening the role of Agricultural Development Groups need to address awareness, training and education, but also the introduction of legislative reforms to create the appropriate enabling environment that would foster their effective implementation.

Urban Water Management and Pollution Prevention and Control

The two INECO Case Studies dealing with urban water management are associated with water quality degradation problems stemming from rapid population growth and urbanization. In addition to land use changes, the lack of sewerage infrastructure to serve rapidly developing areas and the pressures originating from other economic activities (industry and agriculture) affect both the natural environment and socio-economic development.

The exacerbation of these issues has motivated efforts of central and regional authorities to develop infrastructure for wastewater management and introduce incentive-based policies to address water pollution issues. As however commonly underlined by most stakeholders, the efforts undertaken remain incomplete; pertinent case-dependent reasons concern deficient legislation enforcement, inadequate funding, limited capacity, limited awareness of the public and lack of commitment of polluters to implement water pollution mitigation measures. These issues are further discussed in the following paragraphs, on a case-by-case basis.

The case of the Barada River Basin, Syria

The Barada River Basin, where the capital of Syria, Damascus, is located, faces severe environmental degradation; the pollution of the river and its tributaries from domestic and industrial waste and effluents and non-point pollution sources, the reduction of rainfall and the use of the main river springs for drinking water supply have led to potentially irreversible environmental damage and impacts on local economic activities.

A DRAINAGE PIPE DISCHARGING IN THE RIVER, 1200 M FROM THE BARADA SPRING, ZABADANI AREA, FEBRUARY 2008

The intensity of problems faced has motivated many efforts of the Syrian Government towards infrastructure development, environmental legislation enforcement, and enhanced monitoring of river water quality. New legislation has been introduced for tanneries, one of the most water-consuming and polluting industrial sectors of Syria. Specifically with regard to the tanneries (and other industries) located in wider Damascus area, the proposal concerns their relocation to the industrial city of Adra, where the new wastewater treatment plant servicing Damascus has recently been built. Issues have however arisen concerning the provision of water supply and wastewater services to the units that choose to relocate, and the sharing of the corresponding costs (Box 17).

BOX 17: THE INDUSTRIAL RELOCATION PROGRAMME IN DAMASCUS, SYRIA

Recently, the Government of Syria has launched a relocation programme addressed to tanneries located in Damascus, as their continued presence in the city causes environmental degradation of a very high indirect cost borne by citizens and the Government.

The proposal concerns the transfer all units to the industrial city of Adra. The main problem faced in the implementation of the programme concerns the sharing of costs for the relocation.

If funding remains under the responsibility of the tanning industry, this would pose an additional economic burden, affecting the competitiveness of the sector. Tanneries are facing financial difficulties in meeting their relocation costs to Adra (purchase of new land, equipment transfer, equipment renewal etc.). In this regard, the representatives of the sector consider that the Government should have a more active role in the development of the industrial city, by covering part of their relocation costs, in order to ensure that the competitiveness of the sector is not compromised.

On the other hand, the Government argues that relocation costs can be covered by the industries themselves, if they sell their properties in Damascus city, where land prices are higher than in Adra. To further facilitate relocation, the Damascus Governorate authorities have agreed to fund the development of required wastewater treatment facilities.

According to the perceptions of local stakeholders, current and past policy efforts underpin the need to develop integrative strategies towards enhanced environmental protection; effective approaches could rely on the development of new tools, such as the polluter-pays principle and cost recovery, but also need to include incentives for adopting environmentally-friendly practices, technology improvement and for fostering the modernization of the industrial sector. In this context, alternative responses should primarily aim at:

- Discouraging environmentally damaging behaviour, such as the discharge of untreated industrial waste that may impact on water quality and the environment in general;
- Provide incentives for industry to conserve and recycle water and treat produced wastewater; and
- Assist businesses to improve environmental performance and invest in technologies that favour minimum water use and maximum recycling.

On the other hand, the environmental degradation of the Barada River is also linked to other activities: the uncontrolled application of fertilizers and pesticides and the lack of facilities for sewage collection and treatment and the poor maintenance of the sewerage network. In this regard, strategic planning is also needed to address regulation in the use of agrochemicals, and the rehabilitation and expansion of existing infrastructure. Along this direction, supporting and enabling instruments, such as enhanced awareness and stakeholder involvement, institutional reform and capacity building are also needed for more efficient and sustainable water management.

With regard to **industrial pollution prevention and control**, the stricter enforcement of the existing legislation on discharge standards is an option in line with the overall policy directions. On the other hand, it is considered that the introduction of stricter standards (for emissions but also for technologies in specific industrial processes) will impose an additional economic burden on the industrial sector if it is not combined with other (economic) incentives. The designation of protected areas along the Barada River, in order to protect vital ecosystems and/or abstraction points, can also be considered applicable.

In order to facilitate compliance to emission standards, especially for small and medium enterprises, the Government of Syria has launched a programme for relocating polluting industrial activities in a new industrial area, outside of Damascus (Box 17). However, the incentives provided are not considered adequate by the users; additional motivation, as suggested by industrialists, can be provided through preferential prices for water, electricity and wastewater treatment in the designated industrial zone.

BOX 18: ENFORCEMENT OF WATER-RELATED LEGISLATION IN SYRIA

The Syrian Water law Nr. 31 of 2005 established a "Water Police", with the main aim to monitor compliance, identify violations, and submit these to the relevant court of justice. In 2007, 242 violations were submitted to the relevant Court for the Barada River Basin. The total number of violations reported in the same year was 2000; however, most of these involved minor violations and were fined accordingly. New amendments to the Water law Nr. 31, published in early 2008, introduced stricter regulations by eliminating a number of extenuating circumstances. This is expected to have a significant impact in reducing violations and events of non-compliance.

However, it can be argued that the environmental law is still inadequately enforced, as a result of (a) legislative limitations, and (b) lack of environmental awareness. Most manufactories discharge contaminants to the sewerage system or simply to land and rivers without treatment, free of charge and without penalties being enforced. In addition, the spatial dispersion of micro- and small-scale industries hinders the effective control over discharges.

The main problems associated with its implementation are the overlaps of responsibility between government bodies. Furthermore, it should be noted that the Government provided a grace period for industries to improve their environmental performance, which ended in December 2006. However, many public industries still do not have a wastewater treatment plant. Some units are in the process of reorganisation and therefore the possibility that they will be closed down is rather high. In this regard, the installation of a wastewater treatment plant is not a priority, a fact that encourages non-compliance in the private sector. The new industrial city in Adra cannot accommodate all industrial units, such as tanneries or marble processing industries, which need a huge quantity of water that cannot be provided by the current infrastructure. In this regard, these polluting industries remain in Damascus and its surrounding areas and their wastewater is discharged untreated to the riverbed.

The key issue for ensuring the environmental protection of the River and its tributaries without compromising industrial growth is the **encouragement** of businesses towards environmental protection. To that end, voluntary agreements with specific (polluting) industrial sectors can provide appropriate incentives on two levels: (a) ensuring compliance with existing legislative provisions and (b) providing further incentives for industries to reduce emissions to levels below the standards. Motivation provided can be in the form of grants, low interest loans or tax rebates, continuous training of personnel on improved practices or through ecolabelling schemes.

The current agricultural practices are not considered major contributors to the degradation in river water quality; programmes for the **rationalization in the use of agrochemicals** should be further examined in relation to the goals of the national agricultural policy and analysed as to their impact on agricultural production and rural employment. Indirect taxation on agricultural inputs (fertilizers, pesticides and herbicides) is unlikely to

produce concrete results, as it would require strong regulatory capacity to ensure that the increased production cost is not transferred to the final consumer. However, encouragement can primarily be achieved through information campaigning, awareness raising and training of farmers in rural areas on best management practices in agriculture. Voluntary programmes could also be developed to promote organic farming in specific regions, which exhibit significant water quality deterioration and increased nitrate concentrations in groundwater.

Current pricing policies are aimed mostly at recovering the operation and maintenance water service costs. In 2007, the Syrian Government implemented a reform of water tariffs with two primary aims:

- Reinforcing incentives provided through water tariffs, by applying considerably higher rates for increased household consumption;
- Assuring that new charges are affordable and guaranteeing access to water services for the poor (the rate charged for the first, "social" block is lower than the one previously applied).

It is obvious that capital costs for infrastructure development cannot be adequately recovered through current pricing schemes, as this would result in a significant increase of water tariffs and sewerage charges, unaffordable by some social groups. However, it is clear that water tariffs should at least recover operation and maintenance costs, in order to secure the technical sustainability of the system. Currently, rural wastewater treatment schemes are funded by the State, with support from international donors. Flexibility and transparency could also be enhanced through the establishment of a "revolving fund" for the development of such systems.

The multiplicity of authorities and actors involved in urban planning and the issuing of permits for industrial activities is a significant impediment for the development and effective implementation of coordinated policies for water pollution prevention and control. Given the intensity of the problem, there is need to pursue concerted management and integration of functions among all Ministries involved. This can be achieved through the establishment of Inter-ministerial committees, for the better coordination of actions among authorities.

Similarly, there is need to enhance the knowledge base on water quality and quantity issues; it is therefore proposed to develop the corresponding inventories on platforms that are shared by all authorities involved in authorization and monitoring. Along the same lines, regular campaigns targeting specific categories of users (e.g. tanning industry) and the general public need to be implemented in order to raise awareness on (a) pollution prevention, and (b) the need to pursue the protection of the river through governmental policies but also through citizen initiatives. Finally, there is need to develop and empower Water User Associations, in order to support the enhanced involvement of water users in the decision-making process.

The progressing water quality degradation experienced in the Seybouse River Basin is attributed to the discharge of domestic and industrial effluents from the cities and industries along the banks of the Seybouse River and its tributaries, and at the uncontrolled disposal of solid waste. Areas located downstream of industrial hotspots are most vulnerable; the exacerbation of problems raises significant concern among local and national authorities dealing with water management in the region.

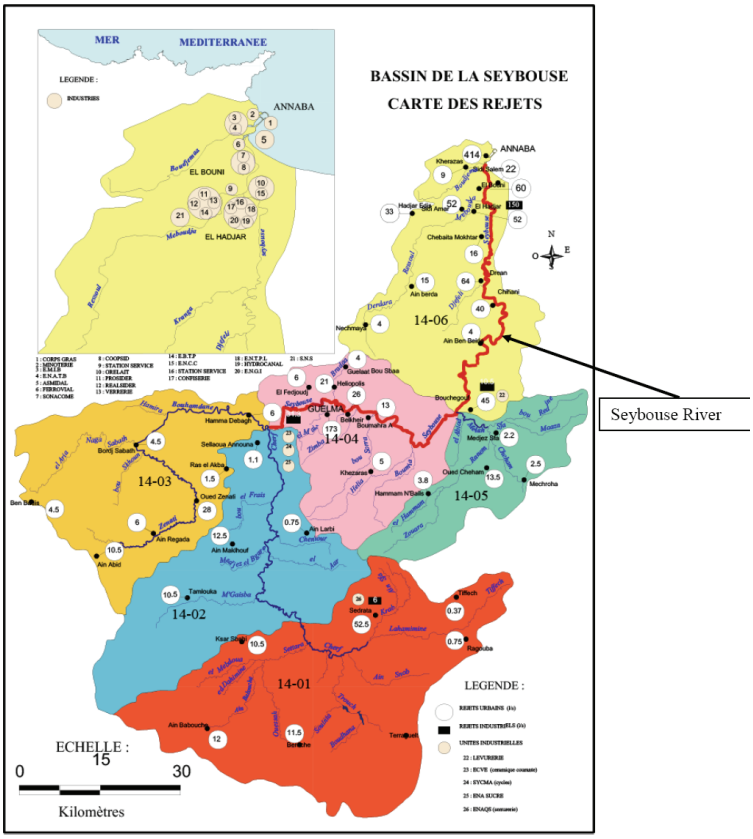

FIGURE 13: LOCATION OF MAIN POLLUTION SOURCES IN THE SEYBOUSE RIVER BASIN, ALGERIA

In an effort to address the issue, the State has initiated a programme to address pollution of domestic origin; the programme, expected to be completed by 2012, involves the construction of sewage collection and treatment schemes in all major urban areas, but has been considerably delayed. Furthermore, policies also need to focus on industrial pollution: of the 86 major industrial units currently operating in the region, only 8 have their own wastewater treatment facilities. Lack of data and knowledge inhibits integrated policy development: presently there is no clear picture of the total volume of wastewater produced by each industry and of the actual pollution loads produced and discharged by each. For addressing the lack of relevant data, a project was launched by the Ministry of Environment in 2009 for industrial water pollution sources.

In this regard, local stakeholders consider that an integrated effort to address water quality degradation in the area needs to also incorporate the following objectives:

- Control and minimization of pollution from industrial effluents;
- Long-term sustainability of water systems, including those that are under development;
- Enhancement of environmental awareness and civic engagement, and improved collaboration among the different actors and stakeholders involved in water management in the area.

With regard to **pollution generated from industrial activities**, units currently have to obtain discharge permits and comply with specific standards concerning the quality of effluents. Furthermore, there are areas that have been designated as protected in the vicinity of vulnerable ecosystems or drinking water abstraction points. Plans and programmes are pursued for the restoration of environmentally degraded lakes, rivers (perennial or temporary) and for the prevention of future water quality degradation.

Penalties and sanctions for the violation of discharge standards are applied by the ANPE and Environmental Directorates. As these authorities operate at the local level, the system is considered adequately decentralized to allow effective control of polluting industrial units and implementation of the corresponding legislative provisions of the Decree of September 2007. However, the situation is problematic, as the relevant Decree does not appear to be clear enough when it comes to implementation aspects. Furthermore, problems arise from the lack of knowledge and information; activities for data collection, effective monitoring of water quality and identification of pollution hot-spots have just been initiated. In this regard, potential responses can include:

- The introduction of technology standards for particular industrial processes, complementary to the existing discharge standards;
- The implementation of pollution charges, proportional to the amount of pollution generated;
- Instruments to further encourage the industrial sector towards the adoption of more environmentally friendly practices and cleaner production concepts, in order to avoid undermining competitiveness and to ensure further development according to the broader economic policies and goals.
- Reinforcement of the capacity of the pertinent authorities to enforce legislation; the building of the capacity of the water police to monitor discharges and enforce the corresponding sanctions is considered crucial towards that end.

Pollution charges can in fact be introduced under the current legislative framework; however, the problems directly related to their implementation are: (a) the delay in the definition of the corresponding

legislative decrees and (b) the lack of knowledge on pollution loads/discharged volumes, as mentioned above. Furthermore, additional provisions need to be introduced with regard to the use of the revenue generated from these charges; it is noted that charges would be more easily accepted if revenue is earmarked and re-allocated for investments in environmental protection (locally, in the River Basin, or at national level).

Further incentives to the industrial sector can entail the wider application of voluntary schemes. Voluntary agreements concerning compliance to existing standards are already promoted by the Algerian Government, but their implementation in the Seybouse River Basin is still limited. Cited reasons include the lack of relevant information and inadequate incentives. In this regard, the initiation of a dialogue with industrial parties could promote a better understanding of the true obstacles faced, and identify those incentives that would better promote voluntary schemes.

Direct financial aid to specific industries for developing end-of-pipe systems could be provided through dedicated funds of the Ministry of Water Resources or the Ministry of the Environment. The grant can represent a share of the cost of the wastewater treatment unit, and should be provided after an in-depth assessment of environmental impacts and costs by the local administrations or agencies. Alternatively, financial and fiscal incentives could be introduced (e.g. tax rebates or reduction of water tariffs and charges).

With regard to relocation, it is notable that there have never been efforts to relocate specific industries to a designated area in order to develop a collective wastewater treatment scheme. Relocating industries and developing collective wastewater treatment schemes for specific sectors is not feasible for the moment, due to the high costs entailed and further considerations with regard to employment.

The key problem for water pollution prevention and control is closely related to the lack of data, knowledge and regulatory capacity. Effective monitoring, development and maintenance of the corresponding inventories and empowerment of local authorities to enforce legislation are all prerequisites for successful policy implementation.

The **adequate recovery of the financial water service costs** does not appear to be an issue of concern. As there are considerable needs for infrastructure development, most new schemes are financed by the State; recovery of these costs cannot be achieved without compromising the affordability of water tariffs, especially for low-income households.

In this regard, water tariffs are designed with the following purposes: (a) achieving financial equilibrium, with State-aid, (b) ensuring social solidarity and equity, and (c) providing incentives towards water conservation, by incorporating volumetric charges. However, it is broadly acknowledged that there is little knowledge of the current costs associated with water service provision in different areas (Box 19). In this context, it is generally argued that an assessment of current and future water service costs needs

to be urgently undertaken in the next years, in combination with an in-depth appraisal of the current tariff system and its economic and social implications at the local and national levels.

BOX 19: CURRENT FRAMEWORK FOR THE RECOVERY OF WATER SERVICE COSTS IN ALGERIA

Water consumption in Algeria is metered at the household level in the majority of cases, except for some specific situations and regions, where metering is undertaken per building block. The average rate of persons/connection is around 7. Water supply is provided by national structures. Water service operators charge the final customer at a price set by Law in accordance to the level of consumption and the type of use.

Funds for the development of water-related infrastructure are provided by the National Treasury. These are further allocated to the Ministry of Water Resources or to municipalities, depending on the type of investment (e.g. storage reservoir distribution network expansion, etc.). A major issue concerns the large percentage of unpaid water bills, which can even reach 40% of the total.

It has however been noted that there has never been a comprehensive approach and analysis of water service costs and their recovery; furthermore, the centralization of the system provides little flexibility to water service providers. Subsidies and cross-subsidies among users and regions are not well known, and potential tariff reforms could meet resistance by the general public if they cannot be correctly justified.

During the past years, there has been **increased awareness** of the fact that the pollution of the Seybouse River is becoming a major problem. In terms of infrastructure, this has resulted to the launch of the programme for the construction of sewage treatment plants in urban areas, in an effort to meet sanitation goals and eliminate domestic pollution. However, the approach required for the prevention or the elimination of pollution of agricultural or industrial origin is not as straightforward.

In this regard, significant efforts have been developed by the ANPEP (National Association for the Protection of the Environment and Water Pollution Abatement) through extensive awareness campaigns targeting the general public, organization of conferences with the aim to promote innovative technologies for wastewater treatment, etc. Along these lines, initiatives undertaken by the ABHCSM were aimed at:

- Fostering dialogue, by organizing workshop sessions with industries and local administrative authorities;
- Establishing a closer collaboration with local universities and research teams, to propose and undertake specific research work adapted to the local problem.

Additional efforts are being pursued to develop the established forum by engaging the different institutions dealing with hydraulic infrastructure and environmental issues in the River Basin, and reinforcing the role of associations and NGOs dealing with environmental protection. These

initiatives could be further enhanced through the official establishment of permanent fora or Advisory Committees, public hearings, etc.

The case of the Bahr Basandeila Canal, Egypt

The Basandeila area is located in the Dakahlia Governorate, and has a total area of 5739 feddans. The cultivated area is estimated at 5524 feddans, representing 96.3% of the total area. The total population of the region is currently around 45,000 inhabitants. Currently, the region faces serious problems affecting mostly the quality of drinking water supply and having impact on population health. Water pollution is primarily due to the discharge of industrial and municipal effluents without prior treatment. The problem is similar (in terms of causes and impact) to the overall water quality problems experienced in the River Nile and its distribution network.

Currently, 84% of the total population of the area is connected to the sewerage network. 15% is served by septic tanks, while 1% of the total population discharges its sewage to open drains. Although sewerage coverage is acceptable, the current capacity for sewage treatment is inadequate. In fact, the share of the wastewater generated by the community that receives acceptable levels of treatment prior to discharge is only 27%. Furthermore, the peak volume of wastewater produced corresponds to 364% of the total capacity of wastewater facilities. It is additionally estimated that only 2% of all the manufactories that need to implement wastewater treatment is actually equipped with the corresponding facilities.

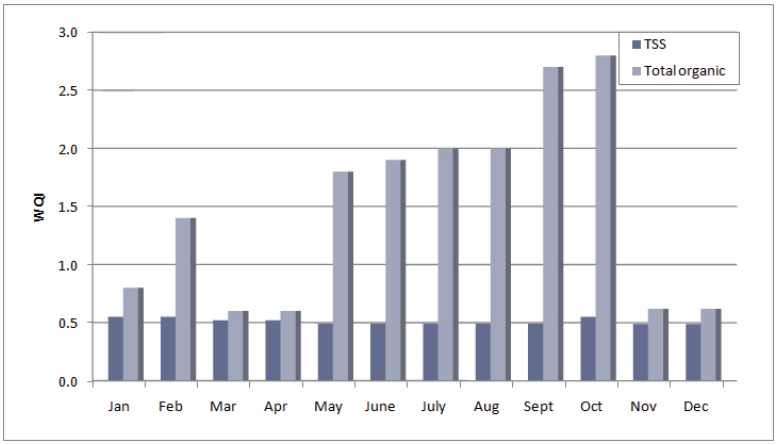

Figure 14: Water quality index for the Bahr Basandeila Canal

The degradation of surface water quality has impact on population health. With regard to health incidents linked to inadequate water treatment and lack of sanitation, only in 2007 there were four outbreaks (typhoid, diarrhea and gastroenteritis), each represented by more than 200 cases. Incidents were more acute during the summer. Overall, and despite the current efforts to provide safe drinking water through the installation of purification stations, it is estimated that only 65% of the total population has access to safe drinking water. The local water utility regularly performs the tests required according to existing regulations. However, only 80% of

the total tests of treated water per year comply with the applicable standards.

In the above context, policy objectives that can be considered of relevance comprise the control over the discharge of industrial effluents, the regulated use of chemical fertilizers & pesticides, commitment among water users to implement pollution mitigation measures and the reliable provision of water supply and sanitation services in the area.

Overall, and not only with regard to the Bahr Basandeila area, efforts and pilot actions towards industrial pollution prevention and control can primarily concentrate on:

- The development of voluntary agreements, which have never been introduced or considered in the study area. In the Damietta branch, the major water pollution sources comprise the Talkha Fertilizers Factory, the High Serw Drain and the High Serw Power Station. It is noteworthy that industries would be willing to participate in an eventual voluntary scheme, if they are advised to its importance as a potential tool for water quality improvement.
- The designation of protected areas, especially in the vicinity of drinking water abstraction points, where specific polluting activities should be prohibited. The measure can be combined with an effort to relocate industries to industrial sites, and develop collective wastewater treatment schemes. Similar efforts are being pursued in many areas of Egypt.
- Additional economic incentives that can be provided through the Environmental Fund, from where funds from different sources is made available for environmental protection projects. Regarding the water sector, the fund provides soft loans to industrial firms for pollution abatement projects, such as recycling and reuse of treated effluents, as well as for setting up small-scale pilot demonstration projects.

Currently, and with regard to the overall National Policy for water pollution abatement, legislative efforts concentrate on the reform of the system for effluent charges.

Effluent fees are about to be increased fifteen-fold, according to a proposal awaiting legislative approval. It is worth noting that the driving principle behind all reforms and efforts is that the strict enforcement of regulations would mean very large investments by industry and municipalities. In this regard, enforcement is currently considered unrealistic and even counterproductive; efforts mostly concentrate on providing the appropriate combination of incentives to the industrial sector to comply with standards, rather than enforce these, regardless of wider socio-economic implications and costs.

BOX 20: EFFORTS TOWARDS INDUSTRIAL POLLUTION ABATEMENT IN EGYPT

Currently, discharge permits for industrial premises are obtained from the Ministry of Health and Population (MoHP), which also periodically checks conformity to the terms of the permit.

In case that violations are identified and there is no immediate danger for human health, the industry is given a 3-month grace period to comply with standards. All discharge to the Nile, irrigation canals, drains, lakes and groundwater requires obtaining a discharge license from the Ministry of Water Resources and Irrigation. Licenses can be issued only for the discharge of effluents that meet standards and each license specifies the quantity and quality permitted to be discharged.

Fines are levied for unlicensed discharges and licenses can be revoked if industrial facilities fail to comply with standards after a grace period of 3 months. However, in spite of the considerable efforts undertaken, the actual enforcement for cases involving public facilities (state-owned industries and municipal wastewater), which are the majority of all pollution sources, is almost non-existent due to: (a) lack of funds to comply with standards and (b) other economic and employment considerations.

As Environmental Impact Assessment is gradually being introduced, major industries are being visited due to non-compliance with wastewater treatment regulations. Compliance Action Plans (CAPS) are being agreed upon to obtain a grace period for compliance.

Pollution from agrochemicals, and especially fertilizers, does not seem relevant for the Bahr Basandeila area, as the corresponding water quality parameters do not show significant contribution of agriculture to water quality degradation. However, there is particular concern over the excessive use of agrochemicals.

The overall approach is based on the building of management practice systems (i.e. combination of management practices), including structural works, such as waste treatment lagoons, terraces, sediment basins, fences to prevent run-off from the field, and agronomic measures, such as prescribed grazing, nutrient, pest and residue management etc. The main concern is how farmers can be encouraged to adopt such systems. In this regard, the introduction of voluntary or compensation schemes can be considered a promising option. Economic incentives can involve sharing of the corresponding costs with the local government or the water utility. The key consideration however concerns education, training and awareness on best management practices, through information and education programmes, awareness campaigning on environmental issues and how they impact on own quality of life, and broader community support. It should be noted that voluntary schemes have not been widely implemented yet.

To that end, an additional option for the protection of the canal could involve the introduction of organic farming. The country has a well-developed and still rapidly growing organic sector. About 24,548 ha of land are under organic management, accounting for 0.72% of the country's total

agricultural area. Organic production presently concentrates on about 500 farming enterprises. Major obstacles to that end can comprise the lack of education and training, to overcome the traditional practice of intensive cultivation on a relatively small agricultural area with a high rate of pesticide and fertilizer use.

A major issue of concern in the Bahr Basandeila area and the Dakahlia Governorate is the quality of drinking water supply and the reliability in its provision, as there are frequent interruptions. Ensuring access to water supply and sanitation is a national policy goal; however, in small urban centres and rural areas similar to Basandeila, the **sustainability of water systems** is questionable if they are not further subsidized by the State. Full recovery of costs would have a vast impact on individual bills and may lead to serious social problems. It is estimated that recovery of operational costs only would require an increase of about 300% in water utility revenues. In this regard, all costs related to the rehabilitation and expansion of drinking water supply networks are provided through State funds.

BOX 21: COST RECOVERY FOR MUNICIPAL WATER AND WASTEWATER SERVICES IN EGYPT

Municipal water and wastewater services in Egypt are heavily subsidized by the Government. In the municipal areas outside of Greater Cairo and Alexandria, the subsidy level is almost 75%. Similarly, irrigation is heavily subsidised by as much as 77%. It can be argued that the overall policy towards agriculture has contributed to the selection of non-efficient cropping patterns and even to water waste.

Water pricing for households and industry is aimed at the recovery of Operation and Maintenance (O&M) costs, whereas the recovery of investment costs is often treated separately.

Overall, operational costs account for about 65% of the total cost for the provision for water and wastewater treatment, in addition to a share of 20 % for distribution/network maintenance. It is broadly considered that water delivery charges are relatively low when compared to those applied in other countries, particularly in the Middle East and North Africa. Households connected to the public sewerage network pay modest fees, ranging between one-third and one-fifth of the corresponding operation and maintenance (O&M) costs.

The tariff structure consists of two flat components: a fixed charge and a volumetric charge. The fixed charge is calculated for the minimum consumption volume. Volumetric charges are applied according to metered consumption. Households are charged at L.E. 0.23/m^3. When the consumed volume is less than 30m^3/month, households are charged L.E. 0.30/ m^3.

The current development strategy is based on improving operational economies and maintaining water and sanitation projects by ensuring the adequate cost recovery levels, through the development of appropriate cost-sharing mechanisms for these services.

Although tariff increases for generating adequate revenue to ensure the technical sustainability of the system cannot be fully considered, there are

options for improving cost recovery at the level of water service provision. A maximum level of tariff increase that would be tolerable is 25% of the current tariff. Furthermore, and despite the fact that presently all decisions related to water tariffs are under the control of the Government, there can be possibilities in differentiating among customers (e.g. depending on household income) and generate cross-subsidies, thus alleviating pressures from the poorer households.

Another important issue that requires further attention is accountability in water service provision and disclosure of all information related to potable water quality. Currently, complaints by customers regarding the provision of drinking water supply and sanitation services are submitted to local authorities and the People Council and not directly to the operators. Usually however, there is a positive reaction, depending on financing ability. Possibly a more direct approach would facilitate communication and allow more immediate response to technical and quality problems.

BROADER CONSIDERATIONS TOWARDS THE IMPLEMENTATION OF INCENTIVE-BASED POLICIES

Following from a detailed presentation of emerging policy needs in the local case study context, this chapter deals with broader considerations towards the implementation of alternative policies for water stress mitigation.

As depicted in Figure 15, water policy approaches for mitigating water stress can follow three main pathways, depending on local conditions, current status of water resources development, available financial resources and social and political acceptability.

FIGURE 15: ALTERNATIVE POLICY APPROACHES FOR COPING WITH INCREASING WATER STRESS

The first approach refers to what is commonly known as the traditional, hard-path solution to address water scarcity and pollution issues: it entails the development of additional (large-scale) infrastructure to address increasing demands and pollution loads. The implementation of such solutions, which normally entail very high costs for the users and the State, depends on technical feasibility, acceptability of externalities (e.g. downstream ecological impacts), cost sharing mechanisms and affordability. It further implies that other communities become affected and share water issues with those that face water stress, and requires the development of management capacity at larger territorial scale, thus leading to reduced control over local water resources.

The second approach entails the increase of productivity in water use, by enhancing the efficiency of water use practices (e.g. through leakage reduction programmes, wastewater reuse, water saving equipment etc.). In

terms of pollution this would mean adoption of cleaner production practices and of pollution prevention measures. The main consideration lies in the fact that a change of practices is also capital intensive, and is not always affordable by all water uses. Thus, mechanisms to share costs across water use sectors are required also in this case, in order to ensure that low-value uses are not excluded and the additional cost remains affordable. Public subsidies and encouragement, at least in the initial phases are required, to initiate technology uptake.

A complementary approach refers to the segregation of water use sectors, targeting primarily new (or high-value) uses, by requiring these only to adopt more efficient (and more costly) alternatives. Examples include desalination for tourist resorts, golf course irrigation and industry, long-distance transfers for urban water supply, higher connection fees and mandatory standards for new urban developments etc. Questions relating to this approach concern efficiency as well as equity among use sectors and individual users. However, this alternative is often accepted as second-best solution.

A third approach would entail the elimination or relocation of specific water uses; such solutions usually face strong social and political opposition and require alternative forms of compensation to promote acceptability among the different user groups.

Following from these policy approaches, mechanisms for fostering the development of new water cultures and shared values regarding water use are required for enhancing the ability of the society to adapt to the conditions imposed by aggravating physical water scarcity and stress. Change of property rights, civic engagement and responsibility, and enhanced stakeholder involvement and participation are all governance challenges requiring institutional innovation and new conceptual thinking.

In the above context, the following sections of this chapter summarize how stakeholders from the different Case Studies perceive alternative policy approaches towards the mitigation of the selected water management issues. Emphasis is given to identifying the applicability and acceptability of alternative policy approaches and ways through which these could be effectively integrated with local policies already in place. The chapter is divided in two main sections: the first section deals with more case-specific issues, such as incentives for water saving or improvement of the environmental performance of the industrial sector. The second section addresses issues common to all case studies, and relating to enhanced regulation, cost recovery and cost sharing for infrastructure development, water management framework, decentralization and private sector involvement, and ways of enhancing public participation in decision-making.

ANALYSIS OF CASE-SPECIFIC ISSUES

DEMAND MANAGEMENT FOR WATER SCARCITY MITIGATION

The increase of productivity in water use, incentives towards water saving and mechanisms for phasing-out specific, water intensive and low value uses are of particular relevance to case studies dealing with increasing water stress at the river basin level or with groundwater overexploitation (Damour River Basin, Lebanon, Oum Er Rbia Hydraulic Basin, Morocco, Pegeia, Cyprus and Tunisia).

In all the above contexts, alternative policies for demand regulation and management are increasingly being pursued; efforts are mainly targeting the agricultural sector, with the exception of Cyprus, where most measures for water saving in irrigation have already been fully applied. Subsequent sections discuss the views of stakeholders on alternative approaches towards (a) the provision of (additional) incentives for efficient water use, and (b) mechanisms for addressing drivers of water demand and eliminating specific water uses that exert significant pressure on the public water supply system and/or vulnerable water resources.

ENHANCING EFFICIENCY IN WATER USE

In addition to the direct provision of grants and financial incentives for the implementation of improved technologies at the user level (e.g. drip irrigation systems, on-site recycling and reuse), demand management can also be fostered through:

- Incentives provided through water tariffs that involve high charges for excessive water use;
- The introduction of dedicated taxes for those who continue to waste water; revenues could be redirected to finance new user investments in water saving;
- Introduction of mandatory water saving standards for new developments and/or new irrigation schemes.

With regard to the above proposals, most stakeholders that collaborated for the development of the **Damour River Basin Case Study in Lebanon** would not accept an increase of water tariffs justified solely by the need to provide disincentives for excessive water use. The appropriate response is perceived to lie in a progressive increase of water tariffs in combination with additional incentives for adopting new technologies. Along the same lines, the levying of dedicated taxes, in order to secure funding to support those who invest in water saving, receives reluctant support. Some support is also indicated towards mandatory standards in new developments and irrigation projects; particularly in the latter case stakeholders advocate a different approach, including extensive technical assistance and training of farmers.

Demand management forms the core of current water management policies in the **Oum Er Rbia Hydraulic Basin** and in Morocco in general.

With agriculture accounting for more than 80% of water demand, efforts to cope with increasing water stress focus primarily on irrigation methods, systems and distribution network efficiency, choice of crops and water reuse.

The potential for the enhancement of the added value of water used for crop irrigation has been demonstrated through various local and international research initiatives already undertaken in the area. Agreement however on the prioritization of instruments that would enable a shift in current irrigation practices is not universal; for example, despite the support given to the current policy of subsidizing efficiency improvements, several water managers believe that grants and State-aid should not be the only instrument employed to that end, as a reform of water pricing policies could also incentivize users towards water saving and should in fact be pursued.

The integration of regional water management plans to national policy priorities for water management and agriculture receives significant attention. Different cropping choices should be developed by the State, for the country as a whole, taking into account market conditions, solidarity among the different regions, profitability for individual users, and the current capacity of the agricultural sector. Similarly, free trading of water use rights, although positively regarded by some parties would need regulation, so that adequate access to the resource is guaranteed at all times, and that the interests of small-scale farmers, who constitute the majority, are not compromised. Mandatory technology standards are also favoured, particularly for new irrigation projects, but also for new urban developments.

The issue of equity, particularly with regard to the impact of choices made for small-scale farmers and subsistence agriculture, receives particular attention. Although State aid guarantees that even small-scale farmers can receive funding for improving their systems, it is often the case that inequalities are created. Examples include the inability to fund the initially required investment, before the grant is received, the limited knowledge of offered opportunities, the lack of training on improved irrigation practices etc. It is also pointed out that failure to universal application can compromise societal and environmental objectives. For example, in public irrigation perimeters, water allocation is performed according to the area irrigated. In this regard, farmers who decide to invest in converting their traditional irrigation systems will be able to meet the needs their crops or even increase their agricultural output. At the opposite side, farmers who have limited financial means will find themselves with lower allocations than their crops water requirements. Deficits would be compensated through groundwater abstractions, thus contributing to the depletion of local aquifers, or through a reduction of irrigated area, and thus of agricultural income.

It is therefore strongly advocated that water policy objectives should be supported through training, education and awareness. Further to this, the establishment of Water User Associations and the building of the capacity required at the users' level could ensure that the interests of small-scale farmers are adequately represented, and that barriers to the effective implementation of water management policies are identified and addressed in a timely and effective way.

Cyprus has a long tradition in incentives towards water saving; the modernization of irrigation methods has been fostered through the wide implementation of innovative financing mechanisms. Similarly, considerable grants are available by the State for the introduction of water saving methods in the home, commercial establishments and hotels.

Dedicated taxation and mandatory water saving standards, at least for new developments, are broadly accepted by local stakeholders. On the other hand, the penalization of excessive water use through very high water tariffs is debated; encouragement is generally considered more effective as an increase of water tariffs could compromise affordability households of lower income, whereas high income households would be unaffected. As financial aid would be more effective and powerful, the current policy of providing specifically targeted grants for water saving is far more acceptable. Despite being acceptable, mandatory water saving standards are also debated as experience has sometimes proven that enforcement is difficult. In this regard, other incentive-based mechanisms need to be prioritized to complement a similar approach.

In **Tunisia**, it is generally believed that margins to reduce water use in agriculture are limited, particularly with regard to crop choices. A potential increase of water tariffs to discourage water waste or the levying of taxes as means to raise revenue for financing technology shifts receive limited acceptance from the majority of stakeholders; there is much concern over the affordability of water-related charges, as well as widespread belief that all efficiency improvements should be financed through other sources of funding (e.g. the general budget).

PHASING-OUT OF SPECIFIC WATER USES IN STRESSED AREAS

As outlined above, an extreme solution to the mitigation of water stress issues and induced conflicts over water allocation could lie in the elimination or relocation of specific water uses, through the offer of appropriate incentives.

The exacerbation of water stress in **Cyprus**, as a result of the continuing and prolonged drought, has brought forward a similar debate focusing not only on low-value uses (such as banana cultivations) but also high-value uses that exert significant pressure on the water supply system, but can afford individual water supply through desalination (e.g. hotel clusters and irrigation of golf courses). Discussed mechanisms for bringing about similar changes include:

- The offer of compensation to the users in question for shifting to other, less water consuming or more economically efficient activities;
- The increase of the corresponding water charges, so that water users are forced to develop other alternatives.

In general, stakeholders note that a combination of both mechanisms would be the most preferred option. Depending on the specific characteristics of each case, compensation measures are preferable in the case of low-income agricultural activities. The second mechanism is supported for the tourism sector; it is broadly accepted that hotels should pay more and eventually be required to become independent of the public water supply system. The cost for the development of individual desalination plants is considered affordable, and the solution fair, given (a) the acute water scarcity faced and (b) the high income generated from tourism activities.

A similar discussion in **Tunisia** revolves around agriculture; compensation for abandoning the cultivation of low-value, water intensive crops, but in line with the framework of the National Agricultural Policy, is preferred. It is generally considered that efficient water allocation policies require a strong social component, so that the interests and resources that have already been invested in water uses that cannot be sustained would not be compromised.

Improvement of the environmental performance of the industrial sector

The need to introduce tighter effluent (or technology) standards as a means to enhance the environmental performance of the industrial sector has been widely supported by stakeholders involved in the case studies for the Barada River Basin, Syria, the Seybouse River Basin, Algeria and in Egypt, where industrial pollution is a major concern and threat to local ecosystems. However, such policies would have significant economic impacts on industrial activities; industries would face higher compliance costs and technical challenges, requiring appropriate capacity (economic, technical and managerial).

In this regard, key considerations towards the introduction of tighter standards entail the:

- Affordability of the corresponding compliance costs and potential impact on the competitiveness of the industrial sector;
- Development of incentive-based mechanisms to compensate users who invest in pollution prevention (grants, soft loans etc.);
- Assessment of the capacity of the industrial sector to address requirements for improved environmental performance, and ways through which current efforts towards capacity building could be enhanced;

- Earmarked taxation addressed to polluters, as a means to provide financial aid to users who invest in environmental friendly technologies;
- Relevance of other soft instruments for reinforcing efforts towards environmental protection (e.g. eco-labelling, raising societal awareness etc.).

In the **Barada River Basin, Syria**, there is strong differentiation of opinion among policy makers concerning the affordability of compliance costs to stricter emission/technology standards in the industrial sector. It is broadly considered that these would be affordable for major industries and those that address the local market only, as the competitiveness of the sector would not be compromised. The case is however different for the majority of small and medium scale enterprises, which would probably not be able to afford advanced wastewater treatment or industrial process change. In this regard, the transition of the industrial sector should be helped through grants and soft loans, particularly for those who cannot afford compliance, but with regulation and specific conditions. Equally important are equity concerns; environmental compliance costs would be passed on to the market prices of end-products, thus negatively affecting small and medium enterprises (SMEs) and favouring large businesses due to economies of scale. In this regard, it would be more equitable to oblige all industries to adopt specific practices depending on their size, so that the competitiveness of SMEs is not affected.

The imposition of dedicated taxes to those who continue to pollute the environment and the use of the generated revenue to finance investment for those who reduce pollution is not acceptable. It is perceived that revenues will not be enough to have notable effect. Instead, it is supported that other measures need to be prioritized before such instruments are considered, such as: (a) restoration of water courses and aquifers; (b) strict enforcement of environmental laws; (c) validation and updating of data on water quality and availability and on pollution sources, as the significant current discrepancies would not allow the accurate assessment of environmental damage.

In addition to the economic dimension of the issue, it is widely considered that industry does not have the technical and the managerial capacity required. Technical change (rehabilitation, modernization of equipment, change of processes) also needs to be pursued through development of expertise, implementation of dedicated training programmes, and transfer of know-how from private companies and other countries, more experienced in the field. Eco-labelling and award schemes are also regarded positively, as they would allow signalling efforts towards environmental protection to society, at least in the early stages. Such programmes would however be effective only if combined with intensified efforts to raise societal awareness. Stakeholders positively regarding such schemes point out the role of mass media in enhancing public

understanding of the wider benefits to the environment and consumer health.

In the case of the **Seybouse, Algeria**, stakeholders in their majority perceive that tighter effluent standards would be affordable by most industries. However, subsidies, grants and other financial incentives would be helpful and could assist faster, enhanced compliance without compromising competitiveness. In this case, earmarked environmental taxation is widely accepted as a means for raising the revenue required to provide financial assistance to those who decide to invest in improved environmental performance and cleaner production.

Despite the above, the capacity of the industrial sector is seriously questioned; transfer of know-how and technology needs to be pursued through the design and implementation of medium to long-term training programmes, financially supported by the State. Such programmes could involve the organization of seminars, dedicated courses, workshops and exhibitions, as well as mobility grants for the exchange of staff. Additional support could be provided through bilateral partnerships and international cooperation programmes with other countries, well advanced in the field. For providing additional incentives to the industrial sector, tax reductions and rebates could be offered to industries that participate in such initiatives. Suggestions also include the upgrading and the establishment of (additional) public institutions (training schools and centres) offering courses to managers and decision makers on advanced technologies and water-related issues.

Eco-labelling and award schemes are also viewed positively, as they would allow signalling efforts towards environmental and consumer protection to society. However, there is almost unanimous consensus that such programmes would be fully effective only if combined with intensified efforts to raise societal awareness on the corresponding benefits. Again, the role of mass media in promoting such initiatives is underlined. Wide promotion of best practices through the establishment of dedicated awards, dissemination of successful projects, and extensive advertisement of benefits to consumers would further mobilize the industrial sector. Civic awareness could also be enhanced by involving City Committees and Municipal Boards in the overall process, through the implementation of laws and regulations on the protection of consumers, and the establishment of consumer associations. The latter could further foster awareness campaigning and represent the views of consumers and the society at large.

Water quality degradation issues in the Dakahlia Governorate, **Egypt** but also throughout the country, are linked to excessive pollution loads of agricultural and industrial origin. Although industry is not considered the primary water pollution source in the Bahr Basandeila area, relevant issues receive significant attention by the majority of local stakeholders. It is generally perceived that there is need to enhance the weight given to

environmental protection, by enabling industries to comply with the pertinent legislation, whereas at the same time efforts should also be made for developing the capacity required for enforcing the relevant legislation, without compromising wider socio-economic interests.

Overall, tighter effluent standards are considered affordable by the majority of industries; capacity constraints are not widely noted. However, forms of financial assistance, as well as other means of support (e.g. training programmes, managerial support) are perceived important, in order to facilitate compliance and at the same time safeguard the competitiveness of the industrial sector, especially with regard to SMEs and public industries. The application of dedicated environmental taxes is also perceived as an appropriate mechanism for raising the funds required for the provision of grants and subsidies to aid those who invest in pollution reduction.

The implementation of award schemes to signal efforts for improved environmental performance to society are perceived as equally important. However, and despite the considerable efforts undertaken in the past few years, there is need to further invest in raising societal awareness on the wider benefits of cleaner industrial production, stressing also the role of mass media, primary education and civil organizations in the endeavour.

Analysis of cross-cutting issues

The command-and-control approach as a means to regulate individual water abstractions and discharge, mechanisms and principles for recovering existing and new infrastructure costs, ways of enhancing effectiveness and efficiency in water service provision, and stakeholder involvement are all pertinent to the entire range of analysed water management issues.

This section provides an overview of the perspectives of local stakeholders on the above significant cross-cutting issues and instruments for the enhancement of the existing water management frameworks, relevant to the scope and policy needs of each Case Study.

Perspectives on the command-and-control approach

In all cases, water management issues are caused or exacerbated by the existence of impact factors, such as individual abstractions of groundwater and uncontrolled discharges into water streams, on which it is difficult to exert proper control. The acceptability of potentiating command and control regulatory measures (e.g. ban on water abstractions; police control of discharges) is high in all Case Studies. However, additional considerations may arise from the:

- Lack (or ineffectiveness) of procedures for licensing discharge and groundwater exploitation:

- Limited empowerment and capacity of public authorities and/or lack of political commitment, resulting also from socio-economic considerations and concerns;
- Inherent difficulties in enforcement, due either to the dispersion of industrial activities or to the large number of private boreholes operating in specific areas;
- Social acceptance, particularly in the case of groundwater, where effective control meets fierce opposition from owners of traditional, customary access rights.

Alternatively (or additionally), environmental taxes could be levied to those who continue to pollute or to overexploit groundwater resources. Similarly, some of the difficulties cited above could be addressed through the development of collective systems for wastewater collection and treatment or individual water supply. In the latter case, and where feasible, the main question lies in how costs will be shared among polluters and the society. Partial socialization would promote acceptability and affordability; on the other hand, full cost recovery would internalize (part of) the environmental costs associated with current practices.

Subsequent sections outline considerations on the above; results are presented separately under each theme (discharge of industrial effluents and groundwater abstraction), so as to facilitate cross-case comparison and ensure relevance and consistency.

REGULATION AND CONTROL IN THE DISCHARGE OF INDUSTRIAL EFFLUENTS

Enhanced regulation and control over the discharge of industrial effluents is of particular relevance to the case studies of the Barada River Basin, Syria and of the Seybouse River Basin, Algeria; in both these Case Studies, industry is considered the primary contributor to water pollution and quality degradation.

In the case of the **Barada River Basin, Syria** the effective implementation of command-and-control regulatory approaches for individual discharge onto water streams or onto land is advocated as a priority solution for mitigating different causes contributing to the environmental degradation of the Barada river.

Overall, it is believed that the State has the means necessary to identify pollution sources and the political will to enforce the pertinent legislation on polluters. However, the following dimensions have also been underlined:

- The needs of communities and enterprises are not well known; efforts are required to fill data gaps so as to allow more informed decision-making, as well as the elaboration and enforcement of regulations;

- Regulation needs to be complemented with wider dissemination of traditional and religious beliefs for the protection of water sources, so as to raise societal awareness on water-related issues;
- There are often some problems in enforcement, due to the uncontrollable nature of the problem; these should be addressed in an integrated way, by also developing other alternatives.

The alternative of developing collective schemes for wastewater treatment as a means of controlling individual (dispersed and numerous) discharges is part of a policy already pursued by the Syrian Government, through the programme developed for the industrial city of Adra. As such, similar initiatives are broadly supported, at least for industries located inside or in the vicinity of Damascus. It is however stressed that in other cases (e.g. remotely located industries) other more cost-effective solutions need to be examined, even if these are temporary. It is generally argued that the cost of such systems should be primarily shared between water authorities and users. Cost recovery levels need to be examined on a case-by-case basis and private investors should generally be charged at full cost (as opposed to State-owned industries).

Similarly to the above case, in the **Seybouse area, Algeria** stakeholders stress the pertinence of potentiating command-and-control regulatory measures; there is however limited confidence that the relevant authorities are sufficiently willing to enforce existing regulations on polluters. The main cited reasons are that no concrete action has been yet undertaken despite the fact that the legislation exists, implementation problems “on the ground”, and lack of awareness among water managers and authorities given that no major crisis has yet emerged. In light of these implementation problems, stakeholders recommend the empowerment of institutions dealing solely with the enforcement of environmental legislation (e.g. water police).

Given recent institutional reforms, financial compensation forms for environmental damage are broadly accepted, but it is also argued that effective regulation requires an action plan at the local level, involving all actors and especially the Water Police and the Police of Urban Planning and Environmental Protection. The definition of such taxes as well as the elaboration of other pollution abatement and prevention measures could also be the task of a dedicated Committee, whose members would be selected by all water users (businesses, farmers, fishermen) and the State. Along the same lines, and as these have already been introduced in the pertinent legislation, special-purpose environmental taxes and charges are broadly accepted; it is however perceived that an agreement is needed for setting more fair charges (currently a lump sum is paid by all industries, independently of the pollution generated).

It is further underlined that there is need to inform users on the legislation and regulations in force, and to have dedicated facilities (laboratories) to analyse effluent samples and compare results to national and international

discharge standards. In the case of significantly polluting industries, there should be regular monitoring to ensure compliance. The need to enhance the knowledge base and develop a nation-wide database for individual discharges and abstractions is also considered first priority.

Command-and-control approaches towards environmental protection receive support by the majority of local stakeholders in the **Bahr Basandeila area** and in the **Dakahlia Governorate, Egypt**. The vast majority further underlines the capacity and willingness of the State to develop and implement such approaches. Rather reluctant support is provided to taxes as means of compensating for environmental damage incurred by specific activities: it is considered that this would require an in-depth assessment of the current situation and it would probably incur significant economic burden to low-income groups and activities.

Overall, the alternative of developing collective schemes for industrial (and domestic) wastewater treatment is accepted. It is also considered that the costs for the development of these schemes need to be partially socialized, as this would provide incentives to individual users to join and maintain affordability. On the other hand, few parties consider that it would not be socially equitable to subsidize the development of such schemes, and that connections need in several cases to be charged at full cost, particularly in the case of high-income industries.

At local level, the mitigation of industrial pollution issues could be effected through the relocation and/or the phasing out of specific, low-value and highly polluting industrial activities. Appropriate incentives could entail the offer of compensation or other forms of financial aid. On the other hand, a potential increase of water and pollution charges could be put into practice. Both alternatives are viewed equally positively by the interviewed stakeholders, implying that potential policies could employ both approaches to effectively incentivize water users. However, and in accordance to responses received to similar questions, the raising of water or pollution charges for specific industrial activities also receives some opposition, due to socio-economic concerns and reluctance towards potential incentives that could be offered through pricing policies.

REGULATION OF GROUNDWATER ABSTRACTIONS

Mitigation of water stress issues in the **Damour River Basin, Lebanon**, would require, among other measures, the protection of local aquifers, which are currently being overexploited to meet water needs especially in the downstream areas of the Basin. The stricter enforcement of regulations is both pertinent and desirable; however, it is also considered that the State and public authorities do not have the capacity and the willingness to effectively regulate current practices. This is further attributed to the general belief that efficiency and transparency in the overall operation of the system are lacking in the majority of cases.

The introduction of taxes as means of "compensating" environmental damage and reinforcing civic responsibility is widely accepted. This would however require an in-depth assessment of the current situation, strict control and efficient monitoring by the Government, improvement and enforcement of law and regulations, and ensuring that violators pay the corresponding fines.

As alternative water supply sources are lacking in several areas, the acceptability of developing collective schemes is high; almost all stakeholders that consider the alternative acceptable, also agree that the cost of these connections should be partially socialized (i.e. funded through cross-subsidies or by the government), so as to maintain affordability, and provide additional incentives to individual users to connect instead of using their individual boreholes.

Similarly to the above case, the enhanced regulation of individual groundwater abstractions in **Tunisia** is broadly supported; the enforcement of current and/or stricter regulations by public authorities is considered feasible to a large extent. However, the development of collective water supply schemes is much more broadly supported. Corresponding costs would need to be partially socialized in order to maintain acceptability and affordability, considering also that additional incentives should be offered to users, so as to substitute individual (private) with collective supply.

In **Cyprus** the effective implementation of command-and-control regulatory approaches for individual groundwater abstractions, combined with a simplification of the overall framework for the issue of groundwater abstraction permits is seen as an appropriate way of mitigating groundwater overexploitation. However, in areas with numerous, already operating, private boreholes the exercise of proper control requires strong regulatory capacity and sufficient financial and human resources to regularly monitor adherence to permit conditions.

A potential ban of groundwater abstractions in vulnerable areas is very positively regarded. However, efforts towards better educating water users and fostering civic engagement are considered of equal or greater importance. Opinions are diverse on the empowerment and willingness of the pertinent authorities to enforce regulations. Stakeholders perceive that the acute water stress problems faced today are urging State authorities to act in order to protect strategic groundwater reserves, freshwater supply and income from tourism activities. Capacity and political willingness are also questioned by several groups: reservations are based on the fact that the lack of alternative water supply is forcing farmers in many areas to use their boreholes in order to secure a minimum level of agricultural production and protect permanent crops.

Forms of sanction for the violation of groundwater abstraction permits, including taxes and fines proportionate to the level of generated environmental damage, are broadly accepted. However, as the valuation of environmental damage is always subjective, such charges are unlikely to

completely discourage excessive groundwater use. It is further noted that strict liability rules act as disincentives only when users are aware of the relevant sanctions beforehand; in this regard, it is essential that water users become well aware of the provisions of the relevant legislation, and of their rights and obligations.

The development of collective systems for freshwater and/or recycled water supply have been widely applied in the past, and stakeholders regard positively a similar alternative to individual groundwater supply, as this would allow rationalization of water use and more effective control. In their majority, relevant costs should be partially socialized, especially in the case of remote locations where the development of distribution networks could be very costly. On the other hand, it is also commented that the cost recovery principle should be universally applied; gradual transition, involving a partial subsidy during the first years and full cost recovery afterwards is suggested.

Although groundwater overexploitation is not the focus of the corresponding Case Study in the **Oum Er Rbia Hydraulic Basin**, the regulation of individual groundwater abstractions in agriculture was an issue that was extensively discussed with local stakeholders. Decision-makers of the area stress two dimensions of the issue: first, groundwater exploitation cannot be easily regulated and controlled, due to easy access to the resource; thus policies should emphasize on demand management and surface water management, rather than control of groundwater extraction. Second, the development of collective systems, and their management through Water User Associations would be an effective way of mutual control among users. The solution needs to be analysed on a case-by-case basis, focusing mostly on areas that currently face significant groundwater degradation or quality problems, such as the Tadla aquifer system. Connections of individual users to such systems are bound to be progressive, and incentives need to be provided through the partial socialization of costs for their development, so that users are incentivized to join, at least at the beginning.

Infrastructure development and financial sustainability - Cost recovery issues and cost sharing principles

In most Case Studies it has become apparent that enhanced sustainability in water management requires maintenance, improvement and often expansion of the existing infrastructure base. In this context, and given the significant costs entailed in combination with the need to maintain affordability, at least for low-income users, issues that were set forth to all stakeholders concerned:

- Ways of allocating costs among different water use sectors (households, industry, tourist sector and agriculture);
- Transparency, fairness and equity of the current system for cost recovery, and ways through which these can be improved;

- Water pricing as a means to achieve recovery of costs for water service provision and the financing of the water system;
- Willingness to accept an increase in water tariffs, provided that this would mean an improvement in water services provided;
- Willingness to accept an increase in water tariffs to ensure that current levels of service are maintained despite increasing water stress;
- Potential differentiation of water tariffs according to the type of use, with the aim to generate cross-subsidies among different water user categories.

In the **Damour River Basin, Lebanon**, infrastructure development is advocated as one of the main requirements for achieving mitigation of water stress and improved provision of water services. In this regard, cost recovery goals and cost sharing principles are of significant concern, due to the high costs entailed not only for the construction, but also for the expansion and proper maintenance of current networks and the limited financial resources of municipal authorities.

The most broadly accepted principle for cost sharing is their allocation on the basis of the quantities used by the different users. This, however, would require the installation of water meters, at least in households; appropriate provisions would also be needed for ensuring access to water services for poorer water users. Further to this, local stakeholders argued that currently the administrative costs for the management of different public services are very high; therefore, more efficient allocation of financial resources could ensure the funding of water systems, at least to a certain degree.

The current system for the recovery of water service costs and for the definition of water tariffs is evaluated negatively in terms of transparency; suggested ways for enhancing transparency and understandability include:

- Enhanced cooperation between municipalities (public sector) and users (private sector)
- Detailed and understandable invoicing;
- Control of financial operations of water service providers;
- Information sharing on financial issues through media and municipal publications;
- Transparent and comprehensible studies on water service costs;
- Compulsory metering for all water users.

Similarly, the fairness of the current cost recovery system is also debated; current water tariffs are perceived as high compared to the quality of water services provided (frequent water supply interruptions). Along these lines, most stakeholders would be willing to pay higher water tariffs provided that there is clear improvement of water services and that the stress problem on the natural resource side is alleviated.

Full cost recovery through water tariffs is not considered appropriate. This is probably due to the concern that full cost recovery would impose a significant economic burden on water users (infrastructure development has not been completed in the area, and the current municipal and governmental policy is to subsidize water services, mostly due to socio-economic and political reasons). Most local stakeholders would however, prefer to pay for water directly, as customers of water services, rather than indirectly, through general taxation. The main arguments supporting this view were related to: (a) the fairness in the allocation of costs, as every consumer would pay according to the cost they incur to the system, (b) the lower complexity and (c) the increased transparency and efficiency.

Cross-subsidization between high and low income uses has been indicated by most respondents as a socioeconomically justified alternative. High income uses (e.g. tourism and industry) should pay more than households, or even be required to develop their own water supply and sanitation facilities. However, when it comes to irrigation, farmers argue that crop production costs are very high, and that additional water charges would create significant economic burden on an already poorly supported sector.

Issues relating to cost recovery for the operation, maintenance, rehabilitation and expansion of water-related infrastructure receive significant attention in the **Oum Er Rbia Hydraulic Basin, Morocco**. In line with current policy objectives, it is supported that operation and maintenance costs for all water-related infrastructure should be recovered by the users, according to the overall costs they incur to the system. However, capital intensive projects, such as additional hydraulic infrastructure or significant network expansions and rehabilitation programmes, should be funded by the State. Mechanisms to that end can involve direct funding by the State or use of revenue from water-related charges paid to the Hydraulic Basin Agencies. The different use sectors should be approached differently, depending on the income they generate and their relative ability to pay. In particular, it is supported that water for tourist establishments and for the irrigation of golf courses needs to be charged differently from water used in other, primary economic sectors, such as crop irrigation and energy production. Even in the agricultural sector, a distinction would be preferable, depending on the type of crop, but also on the outputs (farming vs. cultivation of high-value export crops). In general, however, the sharing of costs on the basis of the quantity consumed is perceived as the more equitable alternative.

Views concerning the fairness, equity and transparency of the current cost recovery systems are diverse: the current framework for drinking water supply and sanitation is considered both equitable and fair. However, overall, the system is perceived as partially transparent: users know which expenses are covered by each tariff component, but have limited knowledge on how the different charges are in fact calculated, in relation to the condition of infrastructure and water consumption. The overall

framework can be improved, if effort is invested in sharing information among decision-makers, water service operators and the users. Particularly in the case of agriculture, it is noted that it is very difficult to accurately meter the volumes used by individual farmers; however, the situation has much improved from the past, as in several areas (e.g. the Tadla) farmers are charged with almost the actual cost for water service provision.

Full financial cost recovery (including infrastructure development costs) from the water users is not universally accepted; partial financing through the general budget is required, particularly for supporting infrastructure development in basins that face more difficult water stress situations than others. It is also, however, stressed that important subsidies are already in place for the agricultural sector and that these need to be lessened as much as possible; the approach is not equitable for the other use sectors that bear the largest part of the cost, either through their respective water-related charges or through general taxation.

Although the current water management policy of **Cyprus** is oriented towards demand management, additional infrastructure development for the introduction of non-conventional water supply sources (increase of desalination capacity, wider implementation of water recycling and reuse schemes) remains one of the main responses for coping with increasing water stress and attenuating the impacts of droughts. Current mechanisms for cost sharing, especially with regard to hydraulic infrastructure, were defined several years ago; they involve the allocation of costs for joint infrastructure (i.e. infrastructure for supplying both domestic and irrigation costs) on the basis of the quantities supplied to each use sector. Furthermore, and in line with the WFD implementation requirements, the Government is gradually pursuing the achievement of full financial cost recovery for bulk freshwater supply provided to both sectors.

Despite the already established policies, there is great diversity of views on the objectives and mechanisms that need to be applied at the local and national level for recovering the costs entailed in the rehabilitation, operation and maintenance of existing and for the development of new infrastructure. For example, stakeholder responses on cost allocation span the entire range of potential alternatives; several consider that the equitable way of distributing costs would be according to the relative consumption share of each major water use sector. Others comment that proportionality principles need to be adjusted to address national economic development priorities for specific water use sectors (tourism, agriculture, etc.). Several stakeholders also underline the need of differentiating between water use in households and in economic sectors; in the latter case, principles for cost allocation need to take into account the income generated from the specific uses and the broader direct and indirect benefits (social, economic and environmental) to the local society.

On the other hand, there is overall agreement on the objectives and principles for the definition of water tariffs, at least at the local level. It is

generally considered that full cost recovery through water tariffs is the appropriate and fair way for financing water services. The current framework for the definition of water tariffs is overall viewed as transparent enough, and that water bills paid are seen as appropriate for the water services received; enhancements could involve the regular publication of information concerning the calculation of the applied water rates, so that required data can be retrieved from those concerned.

Willingness-to-pay is high, both for improved water services and for ensuring that the current level of water service can continue despite increasing stress on the natural resource side. However, in the latter case, it is also supported that costs for coping with increasing water scarcity should not be passed on to residential users; instead, they should be allocated to the major water consuming economic sectors (e.g. tourism and agriculture), according to the benefits accrued and broader socio-economic considerations.

Along the same line, it is believed that some users need to be charged more than others, according to their relative ability to pay and/or the externalities they are producing. It is broadly accepted that the tourist sector should pay more, and eventually be required to provide its own water supply. Similarly, industrial and commercial premises need to be charged in a different way, taking into account the pressure they exert on the natural system and their water demand.

In **Tunisia**, the development or expansion of existing infrastructure in irrigated agriculture is not considered of primary importance; however the improvement of the recovery of financial costs and the offer of further incentives through water tariffs are considered important in terms of groundwater conservation and infrastructure sustainability.

Sharing of water-related costs on the basis of the quantities consumed by each sector is primarily considered the equitable way for cost allocation; however, state subsidies for water services are also regarded positively. Despite the above consideration, cross-subsidies among different uses are well accepted; it is generally believed that some uses (e.g. tourism or industry) should be charged more than others, taking into account their increased ability to pay. An increase of water tariffs to support improvement in the current level of water services or for maintaining current water service levels despite increasing water stress is not considered relevant.

The current framework for cost recovery is negatively evaluated in terms of fairness and transparency. It is argued that water tariffs should incorporate costs relating to water production and development of new projects/infrastructure, that there is need for more explanations and transparency in the calculation of the different water-related charges, and that the latter should be related to the volume of water used in a straightforward way.

The development of infrastructure to serve both the rapidly expanding metropolitan area of Damascus and the rural area surrounding the **Barada River** is necessary for the mitigation of the significant environmental pressures exerted in the area (discharge of untreated domestic effluents, abstraction from springs and wells to meet water needs etc.).

Opinions of stakeholders are rather diverse with regard to the way that financial costs should be shared among the different user categories. Several perceive that these need to be differentiated according to the type of use, with high income uses (tourism and industry) bearing the most significant share of the cost. Others believe that costs need to be allocated proportionally, according to the quantity used and the pollution loads generated.

Full cost recovery through water tariffs is undesirable: significant investment is required for the development of water-related infrastructure, and the full recovery of the corresponding costs through water tariffs would impose great economic burden on water users. However, the majority of respondents perceive that the direct recovery of costs through water tariffs and according to the volume consumed is the fairest option. A reasonable increase of water-related charges for supporting improved quality of water services would be acceptable; on the other hand, half of respondents would not be willing to pay more for sustaining the current level of water services despite increasing water stress.

The current system for the recovery of water service costs is negatively evaluated in terms of fairness and transparency. Cited reasons concern: (a) the limited reliability of consumption metering (need for proper maintenance, replacement of water meters with digital ones and on-time registration of consumption); (b) the unclear invoicing of customers, as it is not evident which costs are recovered from which component of the water bill; and (c) the application of the same water rates in different areas (e.g. metropolitan and rural areas of Damascus) despite the significant differences in the quality of water provided.

Significant investments are currently being implemented in the **Seybouse River Basin, Algeria**, for the construction of sewerage networks and wastewater treatment facilities. The current framework for cost recovery is negatively evaluated, and a comprehensive evaluation of water service costs is completely lacking.

Stakeholders from the Seybouse broadly disagree with full cost recovery through water tariffs; instead, it is supported that the costs relating to maintenance, improvement and expansion of the infrastructure base should be shared between the different public authorities (municipalities, River Basin Agency, Ministry) and the consumers, in order to ensure the affordability of water-related charges. Sharing issues should be based on an agreement among all those concerned. It is however also argued that costs allocated to consumers should reflect the real cost of water supply

and sanitation services provided. The allocation of costs between different water uses should be done according to their consumption and the use of the resource, considering local conditions (climate, water availability etc.), and social cohesion principles. In addition, the generation of cross-subsidies among different water use sectors (e.g. industry and agriculture vs. households) is broadly accepted.

The transparency of the current cost recovery system is also strongly debated. Several stakeholders underline the need for providing more information regarding the calculation of the different charges and the use of generated revenue, especially for the taxes included in the water bill. An additional problem is related to the metering of water consumption, as it appears that there is little information on the process and that meter reading is often unreliable. Installation, regular inspection and on-time reading of water meters should not be only undertaken for households, but also for public buildings and in irrigation water supply in order to ensure proper maintenance and prevent water theft.

Although full cost recovery through water tariffs is not accepted, stakeholders prefer to be charged as customers, rather than to pay for water services indirectly through the general income tax. It is generally acknowledged that this would ensure higher sustainability of the system while at the same time it would provide incentives towards water saving. Currently, water tariffs do not reflect real costs and do not correspond to the quality of services provided to customers; potential tariff increases should be followed by significant improvement in the quality of services provided (e.g. elimination of water supply interruptions, higher efficiency of operators in billing, sound management and financial transparency) and disclosure of pertinent information to citizens.

The issue of cost recovery through water tariffs and water-related charges has started receiving increasing attention in **Egypt**. However, there are significant concerns associated with affordability, feasibility and social impacts that would arise from a reform of current mechanisms for cost sharing, particularly in relation to the recovery of capital costs for infrastructure development and in agriculture. The country's water supply charges are relatively low, when compared to other countries of the Middle East and North Africa. Emphasis is currently placed in the development of cost-sharing mechanisms for sewage and wastewater treatment schemes, especially in rural areas. The overall strategic goals are to improve operational economies, and ensure the proper maintenance of water and sanitation projects.

In the above context, the recovery of capital investment is treated separately from the recovery of operating costs. For example, and with regard to irrigation water provision, capital costs are recovered for mesqa level investments according to a formula that requires repayment of the full capital cost, excluding interest, over a period of 10 to 20 years. Pump

costs are fully recovered during the initial 5 years. The overall subsidy on capital investments is 60 to 75%.

Overall, it is perceived that full cost recovery through water tariffs is unattainable, as its impact will be vast on individual bills, thus causing significant societal problems.

DECENTRALIZATION AND PRIVATE SECTOR INVOLVEMENT

The integration of functions and the coordination of activities among the different institutions dealing with water management issues, and the development of the capacity required to deal with rapidly emerging problems, are identified as horizontal challenges, not limited to the water sector of one or two countries alone. Additional reforms in water management could focus in the provision of water supply and sanitation services, in order to enhance effectiveness, technology uptake, and management efficiency in the further decentralization of water management operations or in the increased involvement of the private sector. In most cases considered, efforts towards decentralization of water service provision, better coordination of water management activities and enhancement of the knowledge base on water-related issues are well under way. However, there are cases where these efforts remain incomplete or need to form part of wider reforms on institutional organization. Horizontal issues considered of relevance to all Case Studies concern:

- The evaluation of current water and sanitation undertakings, in relation to meeting current demands and securing environmental protection;
- Margins for improvement, without considering complex (and time consuming) organizational transformations;
- Scope for further potential contribution and involvement of the private sector, addressing also the controversial issue of enhanced private sector involvement in the provision of water services.

In **Lebanon**, the outdated institutional framework for water management and the evident deficiencies in the development and provision of water services underline the need for a more professional water management system, able to implement required technologies and offering enhanced management skills and capital provision. Stakeholders of the Damour River Basin indicate that current water supply and sanitation undertakings cannot adequately respond to their task and emerging challenges. Private sector involvement is seen as alternative to the current framework of water service provision, particularly when considering that experiences from other sectors (energy, telecommunications and transport) have been very positive. Given the sensitivity of water-related issues, stakeholders demand transparency of procedures and strict control of all operations by the government or independent regulatory authorities. Potential tariff increases that would result from the (partial) privatization of water services

also raise opposition and concerns, although the corresponding benefits are well acknowledged.

Morocco is a country with significant involvement of the private sector in the provision of water services, especially in metropolitan areas. Furthermore, the devolution of responsibilities for water management at the Hydraulic Basin level, through the Water Law 10/95 has given impetus to the better coordination and implementation of regional water management plans. Both initiatives have been evaluated very positively by local stakeholders and decision-makers.

Overall the current level of water supply and sanitation services in the domestic sector is perceived as high, in the cases of areas served through concession contracts or the National Office for Drinking Water Provision (Office National de l'Eau Potable-ONEP). Nevertheless, in other smaller towns and villages, where the task still remains in the hands of the local administration, there is need improvement. In this case, it is highlighted that there is strong need for providing the technical and human capacity and the financial assistance required for the modernization of the water sector or for expanding private sector involvement.

Particularly with regard to drinking water supply and sanitation services, it is noted that the intervention of the ONEP has in many cases resulted in significant improvement in water services provided. The outsourcing of water services to the private sector is generally well accepted, as it is considered that private firms, with long experience in the field, have the managerial skills and know-how to modernize water systems, as manifested through the numerous public-private partnerships. Nonetheless, it is underlined that private sector involvement needs to be examined on a case-by-case basis; the alternative is not accepted for irrigation water provision where it is perceived that the solution lies in the stronger cooperation of authorities with water user associations and the allocation of responsibilities for the operation and maintenance of the corresponding facilities to the latter.

The water sector of **Cyprus** is significantly developed, both in terms of infrastructure (new technologies are broadly implemented and promoted) and in terms of institutional organization (in their majority, water services are provided by independent institutions, under the regulation and control of the State and local authorities). Successful public-private partnerships have also been implemented in the past, through BOT schemes for desalination and individual contracts for infrastructure development; these efforts are still being pursued for meeting several policy priorities (e.g. development of sewage collection and treatment schemes), and for enhancing management skills and facilitating technology transfer, where these are required.

Despite the progress made, current water supply and particularly sanitation undertakings in the area of Pegeia are negatively evaluated, given that sewage collection and treatment schemes are still under

development in the area and that water scarcity is becoming more and more severe throughout Cyprus. It is generally perceived that there is significant delay and that network developments cannot keep up with the rapid development in the area; furthermore, decentralization and on-site or neighbourhood water reuse needs to be promoted instead of traditional, centralized systems. However, the progress of the water sector is broadly accepted; despite the rather slow implementation of technological innovations, significant institutional reforms and organizational transformations do not emerge as necessary. Private sector involvement is accepted and viewed as necessary for improving the quality of water services, but it is not necessarily considered of first priority.

The main directions and goals of the National Water Policy of **Tunisia** emphasize on the need for demand management and introduction of alternative water supply sources, focusing primarily on irrigated agriculture. Although it is apparent that a more professional water management would be required to foster implementation of advanced technologies and enhance the effectiveness of water management operations, the current framework is also positively evaluated. Views are diversified on whether there are margins for improvement, taking into account the constraints of the current institutional framework. The involvement of the private sector is rather well accepted; given current efforts and initiatives for the re-organization of the two main public water service providers, there is good evidence that the enhanced contribution of the private sector would facilitate capacity building and technology transfer, both in terms of water service provision and in terms of groundwater management and resource protection.

In the **Barada River Basin, Syria**, stakeholders perceive that current water service operations can be supported to respond to emerging challenges through enhanced cooperation, continuous training, involvement of stakeholders and enhanced application of new technologies. Institutional interventions would be required for simplifying bureaucratic procedures and introducing new standards; however, complex organizational transformations are not considered preconditions for improvement. The enhanced involvement of the private sector, as a means to improve efficiency and technical skills and enhance technology transfer, is also accepted. It is underlined nevertheless that any cooperation with private operators and companies should take the form of public-private partnerships with strong involvement of the State and that all relevant operations need to be closely monitored and controlled.

In **Algeria**, the required modernization of the water sector, especially with regard to water supply and sanitation, has been the subject of recent reforms. Recently, cooperation with foreign private companies has been sought in the case of the Algerienne des Eaux and the Office National d'Assainissement (ONA).

Despite undertaken efforts, current water supply and sanitation undertakings are evaluated negatively, especially with regard to their ability to address the emerging challenges (rapid population growth, water quality degradation, etc.). Although there are views that management should remain at the State level, the involvement of the private sector is judged positively overall. Reservations are mostly related to the fact that the Algerian private sector does not yet have the resources and capacity required to respond to such tasks. It is further noted that subcontracts, concessions or other forms of public-private partnerships should be subject to regulation by the State and strict terms, especially with regard to performance, environmental compliance, setting of water tariffs and capital investment.

The recent reform of the institutional framework in **Egypt**, with regard to the provision of water supply and sanitation services is globally perceived as an important reform towards the devolution of responsibilities in water service provision. The Holding Company for Water and Wastewater (HCWW), and its subsidiary companies, through the Presidential Decree No 135/2004, are established as publicly owned but financially autonomous utilities. Overall, and although recent, it is considered that this decentralization will give new impetus and assist towards more professional management of water systems.

Further to the above, important efforts are being implemented towards the establishment of Water User Associations, to allow collective management of irrigation systems and infrastructure. The effort, as noted by all stakeholders, requires strong investment in training and capacity building, but has yielded results in many demonstration projects undertaken throughout the country.

ENHANCED STAKEHOLDER INVOLVEMENT AND PUBLIC PARTICIPATION

Stakeholders who collaborated in the INECO Case Studies unanimously agree that stakeholder involvement and public participation are key requirements in the process of developing effective and comprehensive water management policies; the added value of participatory efforts lies in making diverse interests and views widely known, and in the fostering of civic engagement towards environmental protection and demand management.

However, perceptions on the ways through which stakeholder involvement and participation could be fostered are extremely diverse; expectations of decision-makers, users and individual citizens vary to a significant degree, depending on their awareness of the true problems, the intensity of water management issues faced and the impact of these in everyday life.

In relation to the above, the issue was further analysed by focusing on mapping stakeholder views on how public participation is perceived by the different groups. Furthermore, the identification of factors that impede public participation, even when the relevant framework has been

introduced, was considered relevant. Causes can include lack of trust in the process, limited access to information to allow the development of informed views, and lack of awareness.

The reviewed Case Studies display significant variety in the perceptions of stakeholders as to how stakeholder involvement and public participation could be promoted and enhanced, as seen in the subsequent paragraphs.

In the **Damour River Basin, Lebanon**, stakeholders underline the importance of participatory approaches in promoting democratic management and accountability, as well as cooperation between decision-makers and water users concerning the identification of significant water management issues and solutions. Furthermore, enhanced public participation and involvement are critical for improving civic responsibility in matters of environmental protection and resource conservation. Local and national debates on water-related issues would be useful to allow people to express their views and develop the sense of "own responsibility".

Manifesting commitment towards pursuing these initiatives, stakeholders underline the need for: (a) training on different water management issues and alternative solutions, (b) organization of awareness campaigns, and (c) cooperation with public authorities to implement sustainable solutions, such as adaptation of the agricultural sector, demonstration projects for water recycling and reuse, development of infrastructure projects, etc. However, citizens remain doubtful of the willingness of decision-makers to seriously consider the outputs of participatory processes, and often support the view that some stakeholders are given more weight than others during the decision-making process.

Enhanced stakeholder involvement and public participation in the **Oum Er Rbia Basin, Morocco** are perceived as the cornerstone of good governance, integration across policies affecting water management and for ensuring commitment from all parties to ensure the success of undertaken efforts. Public participation is broadly perceived as open and transparent dialogue on all aspects concerning water management, among users and their associations, decision-makers, elected representatives, and the general public. Both at national and at regional level, involvement is envisaged not only for a specific subject/project, but also during the planning process, the elaboration of new legislation, the definition of levies and water-related charges. In the case of agriculture or rural supply, it further extends to the development of partnerships for the management, service and maintenance of facilities, and also entails the organization of users through associations (professional and civil), so as to ensure their representation in the decision-making process.

Overall, local stakeholders from the area demonstrate their confidence that outcomes of participatory processes would be considered by decision-makers, stressing the role of the Basin Agencies for the strengthening of means to ensure successful representation of all user groups. Efforts

should be made towards inclusiveness, and involvement of farmer associations, trade associations and groups that have not yet participated in dialogue processes. The representation of farmers receives much attention: the floor needs to be opened also towards individual land owners and farmers who live from agricultural activities, and not limited to higher level decision-makers or representatives.

The enhanced involvement of stakeholders and citizens in decision-making is a policy objective strongly pursued by all State and local authorities involved in water management in **Cyprus**. Public participation and civic engagement are not only perceived as a regulatory requirement imposed by the Water Framework Directive, but are also considered a requirement for raising awareness on the current water management crisis. Strategies towards public participation are currently in status of implementation; however user perceptions on the deficiencies of the followed approach provide recommendations on how these processes could be further strengthened.

Overall it is argued that there is need of pursuing more deliberative processes that would give citizens a true opportunity to express their views on water management decisions and policies. Such processes first need to rely on enhanced awareness and improved access to background information regarding available resources, limitations, real costs of water provision, impact of current practices, as well as proposed mitigation strategies and their implications, costs and effects. Despite the fact that information on water-related issues is readily available for public consultation and comment, most stakeholders (citizens in their majority) comment that only a small amount of this information is actually understandable. This is considered a major impediment to enhanced involvement and awareness on local environmental issues, as well as to broader behavioural change for water conservation and reinforcement of civic responsibility. It is therefore supported that efforts should be made to share information in a non-technical way, which would allow individuals to form their own views and become more involved and aware of how water management problems affect people, the economy and the environment. Carefully scheduled, open and inclusive public hearings are proposed as a means to share information and offer opportunities for discussion and exchange of views; other suggestions include awareness campaigning, wider use of the mass media and the internet, dedicated local information desks etc. Concerted efforts to allow broad access to information could enhance current water management processes: the articulation and consideration of informed views, diverse interests and public scrutiny over decisions taken would improve the effectiveness of adopted responses and improve their acceptability among the different social groups.

A significant component of policies towards demand management and promotion of water reuse in **Tunisia** concerns the empowerment of Agricultural Development Groups, which would allow the representation of

farmers in decision-making and enhance technical capacity for community management of irrigation supplies. The above needs are almost unanimously accepted; however, stakeholders do not trust that the outcomes of participatory processes would be considered by decision-makers and incorporated in planning. It is also widely recognized that current efforts need to be strengthened; proposals address the stronger involvement of the general public and water users, the reinforcement of the role of NGOs in pursuing inclusive processes and awareness campaigning towards water conservation. The emerging key requirement is the disclosure of information on significant water management issues; except for decision makers, only few stakeholders have sufficient access to relevant data and information.

In the case of the **Barada River Basin, Syria**, public participation again is perceived as a key factor for the development of comprehensive and integrated management policies. The representation of water users through trade unions and associations can help in identifying problems at the early stages, and at developing win-win solutions, likely to be easily adopted by water users and the society at large. Stakeholders note however that it could prove difficult to enhance public involvement, due to the different levels of awareness among the diverse social groups. Despite the significant expectations from participatory processes, stakeholders that collaborated in the development of the Case Study were not confident that public participation outputs would be considered by policy makers. They further pinpoint the need for transparency, honesty in approaching the different groups and willingness to try to integrate diverse views in a constructive way.

Access to relevant information on water management issues is recognized as precondition for informed decision-making and stakeholder involvement. It has been commented that information and data provided are often inaccurate and inadequately describe the significance of the problems and their impact range. In this regard, the enhancement of the knowledge base and the effective dissemination of information to decision-makers and to the general public are of considerable importance.

The forms of public participation envisaged by the different stakeholder groups that collaborated with INECO for the **Seybouse River Basin, Algeria**, Case Study varied to a significant degree, ranging from enhanced awareness to more open and democratic water management. Suggestions towards the latter included:

- The enhancement of the role of NGOs and consumer associations in decision-making through their representation in basin committees and/or in the decision board of water management agencies.
- The organization of open debates on water-related issues and ensuring representation of all stakeholders in decision-making.

- The development of mechanisms for control over water management decisions and operations.

A commonly underlined factor is the need to raise awareness among all levels of society, in order to enhance civic responsibility towards water use and pollution prevention. Concerning access to information, significant lack of data, limited or no access to information and lack of transparency are broadly cited. Although information and communication systems have been established in the area (the ABHCSM regularly publishes information on the Seybouse on its web site), it is also noted that relevant, reliable and comprehensive information should be provided at all levels and to the general public, in other regions and on a variety of water management issues. Ideally, data collection and management should be the responsibility of one institution; relevant information should be disclosed through the internet and the mass media, so as to also reach the general public.

Even at the small level of the **Bahr Basandeila area, Egypt**, public participation is broadly supported; local authorities underline its importance for sustainable water management and reinforcement of civic responsibility and engagement. Stakeholders stress the need to further involve user associations and local authorities in decision-making processes, to share information on planned projects and reinforce public education initiatives, through training and the mass media. Despite the above, there is some reluctance on whether the outcomes of participatory planning would be considered by traditional decision-makers, whereas there is also belief that the interests of some stakeholder groups receive more weight than those of others in the decision-making process.

Further to the above, and in line with current broader national policy objectives, stakeholders underline the need for: (a) training of users and user associations on new technologies; (b) organization of intensive awareness campaigns and fostering of public education initiatives and (c) cooperation with public authorities for demonstrating and implementing sustainable solutions in the agricultural, domestic and industrial sectors.

TOWARDS MORE EFFICIENT AND EQUITABLE INSTRUMENTS IN MEDITERRANEAN COUNTRIES – CASE STUDY EVIDENCE & BROADER PERSPECTIVES

Evidence from the analyses presented in the two chapters portrays that the wider implementation of economic instruments is constrained by affordability, political acceptability and technical capacity. Affordability is an important constraint, but rather tends be overemphasized. A distinction needs to be made between collective affordability, namely, the capacity of a community to devote a certain share of its income on water, from individual affordability, which particularly concerns lower incomes. While the former is mostly a matter of gradual implementation, the latter usually implies a design of pricing policies aimed at what the local society perceives as "fair cost sharing", even if this means lower incentive potential. Also, an important aspect concerning collective affordability is the cost of capital. The interest rate paid on capital is by large a more important cost driver than operational efficiency. Therefore, the issue of how to allocate the economic risk of investments is the most critical aspect to regulate. But the reality of Mediterranean countries seems to show that affordability (at least collective affordability) is not as critical as generally perceived: investing in a more efficient water management system and preventing the overexploitation of resources is feasible and could be well acceptable, provided that tariffs are designed accordingly. Instead, political acceptability emerges as a more critical issue.

Thus, it can be supported that two aspects emerge as priority for water policies in the countries considered in this report. The first is how to address the still dominant self-supplied (or at least unregulated) model of using the resource, either concerning water use or discharge into water courses, which is leading to a generalised problem of resource depletion and overuse. Modernizing the water management system requires investing in water supply, treatment and wastewater reuse facilities. It further requires the empowerment of institutions to monitor and enforce legislation where appropriate; however, evidence also from the INECO Case Studies, demonstrates that regulation is not enough. Encouragement towards more efficient practice (not only in the form of direct financial support but also through capacity building initiatives) and community education are fundamental aspects of successful policies, broadly acknowledged by stakeholders.

Therefore, it can be argued that full cost recovery and economic marginal cost pricing is not necessarily the most effective solution. In turn, priority should be given to: (i) a sound infrastructural policy, for which debt can be repaid; in this phase, a recourse to fiscal or semi-fiscal approaches to water pricing seems more promising than full cost recovery based on volumetric pricing; (ii) discouraging overuse of resources, not only by introducing and enforcing taxation and economic instruments, but also by promoting cooperation among users and reinforcing institutions at the river basin

scale, for fostering inter-use water sharing. Nevertheless, and despite the chosen path, transparency emerges as the main issue; users need to be informed on the impacts of the choices made and on the information used to support these. Transparency is further linked with civic engagement: water conservation strategies, requiring self-regulation, can only be successful when there is broad societal awareness and information-sharing on decisions taken.

In this perspective, water pricing is a key instrument, provided that (i) it is designed in a way that is functional to priority targets and (ii) it is accompanied by "political confidence", transparency and disclosure of information on the true cost of water services and how its components are in fact shared among the society (i.e. including externalities associated with water quality degradation and resource depletion). Public participation, stakeholders' involvement and more openly debated strategies for improving management of water services are considered fundamental tools in this respect.

CONCLUDING REMARKS

In an Integrated Water Resources Management framework, integration does not occur only in terms of viewing the water cycle in a holistic way, but also lies in the integration of different sectoral policies (not restricted to water management alone), of institutional functions and of stakeholder interests and perspectives.

The INECO Case Studies described throughout this document highlight exactly this integration challenge: in water management there is no universal agreement about the problem and the solution; water management issues affect and are affected by diverse interests that are often in conflict with each other. In this regard, technical solutions cannot solve problems alone, despite the innovation they may be offering. "Socio-economic scarcity"[4] can only be addressed through broader changes aimed at developing adaptive capacity.

Most countries of the Mediterranean Basin, including those that were the focus of the INECO Case Studies, are shifting towards new water management paradigms; gradually, sustainability concepts are being embedded into national policies and increasing efforts are made to address both the water-related causes of management issues and other policy drivers that contribute to their exacerbation.

Evidence from the INECO Case Studies reveals that incentive-based policies have an important role to play in this effort; decision-makers, water users and citizens are becoming increasingly aware of their importance in encouraging behavioural change and technology uptake, and in raising the financial resources required to support water management operations. The key premise is however that these need to be embedded with traditional values and adapted to the local socio-economic reality.

Either as means of encouragement or as disincentives, economic instruments do not operate alone; they require a transparent framework and procedures to enable their successful implementation. Furthermore, as they often need to be integrated with other policies (for example, economic support for changing cropping patterns is intrinsically linked to agricultural policies), their implementation touches upon a wider set of policies, decision-makers and professionals. It thus requires a multi-disciplinary, multi-faceted and multi-sectoral approach, not restricted to water and authorities dealing with water alone.

In this regard, and as often outlined in numerous regional analyses available in the pertinent literature and from the INECO Case Studies, other

[4] Socio-economic scarcity refers either to the economic inability of a society to develop water resources and infrastructure or to the lack of societal capacity to adapt to the conditions imposed by physical water scarcity and stress (Turton and Ohlsson, 1999; Appelgren and Klohn, 1999).

enabling instruments are equally (and often more) important in supporting transition. Enhanced sustainability of water management systems can be supported by community action, engagement in voluntary programmes, environmental stewardship, enforcement of environmental regulations, institutional reform and enhanced transparency and accountability.

Sustainable water management (i.e. a way of managing water resources that does not entail the surpassing of a carrying capacity threshold – natural, technological, social, institutional or economic) implies giving answers to the questions outlined in Box 22. These questions, although related to the economics of water also incorporate the multiple dimensions of water stress that arise both from economic and non-economic sphere (Green, 2003), acknowledging that some demands or impacts are not to be evaluated in terms of economic efficiency, but rather in terms of social justice, ecological soundness, political and social acceptability, etc.

BOX 22: SUSTAINABLE WATER MANAGEMENT –QUESTIONS

Current water allocation patterns and sustainability of water systems:

- Do existing water resources support all environmental functions that the community considers fundamental?
- What are the (explicit and implicit) costs that the current allocation of water resources causes to some stakeholders? Are these costs recovered, is their allocation fair and acceptable?
- How does the society cope with the related disputes and governance issues? Are existing water institutions (property rights allocation, decision-making systems) able to guarantee that a solution is found without basic requirements being violated?
- Is the system able to sustain and reproduce itself, and guarantee that the same patterns can be continuously replicated?

If some demands are unsatisfied (in terms of quantity or quality):

- Is it possible and economically efficient to increase the availability of water-related environmental functions through artificial means?
- Is the related cost affordable? Is the allocation of this cost equitable and/or fair?
- Is it possible to shift part of the costs from most vulnerable actors in a way that is acceptable for other users?

Source: Massarutto, 2006

The potential policy pathways for transition towards more sustainable water management have been the subject of numerous guidance documents; many of these have addressed the water management challenges faced in countries of the Mediterranean Basin, by providing recommendations on how to build capacity, reform the water sector, introduce new instruments and technologies, etc. The significant resources invested in the field are helping towards the development of a new conceptual thinking for coping with water stress issues, which takes into account the social, environmental, economic and cultural value of water.

As demonstrated however through individual Case Study work, what is most needed towards sustainable water management is the enhancement of the capacity of institutions, authorities, groups and individuals to make informed choices and transform these choices into desired actions and outcomes, commonly referred to as empowerment. Towards this end, the social experiment of INECO attempted to enhance local capacity towards constructively engaged IWRM; through participatory processes and dialogue, the project brought different actors at the table to share their views and discuss alternative solutions and their implications.

While the mitigation of local problems is largely the job of the local society, INECO tried to reveal the value and significance of alternative ways of formulating and implementing action for problem mitigation. The success and impact of this experiment is to be judged by local stakeholders; however, it is our belief that the mutual learning process developed in the course of the project has managed to lead to a better understanding of the societal and institutional changes required for sustainable water management, of how these are currently perceived in each region analysed, and of how future research could be better oriented to address local policy needs.

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