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II MEETING: THE APPLICATION OF ECONOMIC INSTRUMENTS IN WATER AND SOLID WASTE MANAGEMENT

GLOBAL REVIEW OF ECONOMIC INSTRUMENTS FOR WATER MANAGEMENT IN LATIN AMERICA

WORKING PAPER

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(Original Document in English)

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1 Summary

This report has been initiated to support discussions among participants in the Regional Policy Dialogue of Latin American countries (11th - 12th February 2003) on the importance and applicability of economic instruments in the context of water management.

Economic instruments have gained particular attention in recent years as an important tool in environmental policy. Their advantages encompass the creation of incentives for behavioral change, the generation of revenue for financing further environmental investments, the promotion of technological innovation and additional effects such as the strengthening of institutional capacity and information availability. The paper presents a typology of economic instruments in water management in section 4 and associated examples of implementation from European Union (EU) and Organization of Economic Co-operation and Development (OECD) countries in section 5.

Water withdrawal or abstraction taxes are levied on the direct abstraction of water from natural sources. This instrument can be used to address water scarcity problems and to internalize environmental and resource costs into the (economic) decisions of water users. It can combine revenue raising purposes with an incentive function. The calculation of the tax can be either volumetric and based on metered abstraction, or linked to abstraction permits. Tax rates may reflect relative water scarcity and thus be subject to regional or even seasonal variation. They may also vary between ground and surface water as in the Netherlands, where the tax applies to groundwater abstraction only in order to promote the use of surface water.

Observed effects of the tax include a decrease of water consumption and leakage (Denmark) and, in addition, a strengthening of institutional capacity and improvement of data availability (Germany).

The main function of water prices is to finance water supply infrastructure. Ideally they may also aim at internalizing external environmental costs and providing an incentive to use water rationally. They are often composed of fixed and volumetric (consumption-dependent) components. Section 5.2 presents the French and German water pricing systems.

Similarly, sewerage charges, which are levied on indirect discharges of used water to the sewer, mainly fulfil a financing function. They can be seen as an implementation of the polluter-pays principle if they incorporate sewage treatment costs. The charge is often based on metered water consumption, although there are alternative systems e.g. in Austria. The systems differ in the relative contributions from fixed components and volume-based charges. Denmark has an initial connection fee that covers the costs for connection to the sewerage system. Three other case studies are presented in section 5.3 (Germany, Austria and France).

Section 5.4 makes an attempt to compare household bills for water supply and sewerage services in order to evaluate how the different systems ultimately affect users. Additionally, data are presented on the relative affordability by relating annual charges to income measures.

Effluent charges are based on the pollution load or on the volume of waste water discharged into natural water bodies. The calculation of the charge rates requires adequate measurement of the quantity and quality of the discharged water. Effluent charges are a means of implementing the polluter-pays principle. Revenues can be earmarked to finance measures to improve water quality or the restoration of polluted water bodies. The charge may be designed to provide incentives for pollution abatement. The cases reviewed in section 5.5 are those of Germany, Denmark, France and the Netherlands. The systems differ in their main objective: the Danish and German effluent charge have an incentive focus while the French and Dutch charge emphasizes the revenue-

generating function. The systems also differ in the calculation methods applied and in the substances included in the charge.

Subsidies in water management come in different shapes and analyzing subsidy systems thus is a complex task. Subsidies are government interventions that can be direct, through monetary payments to certain user groups, or indirect in the form of tax concessions, discounts or preferential procurement policies. They may represent distorting signals by favoring environmentally unfriendly choices over environmentally friendly ones. On the other hand, subsidies may also create incentives for users to change their behavior towards environmentally friendly conduct or to induce investment in environmentally friendly production techniques. If subsidies are made in return for environmental benefits they can be regarded as an internalization of external costs. There is also a distinction between subsidies for measures that are required by the law and subsidies that promote measures which are not mandatory.

Section 1.1 first presents some examples of subsidies related to environmentally friendly farming, for instance payments made to farmers who are subject to restrictions of fertilizer use in water protection zones. Secondly, the case of New Zealand is introduced which removed all agricultural subsidies in 1984, including the effects following the removal. Finally, some subsidies directly related to water management are presented, such as financial support for the building and upgrading of water plants, and water price discounts.

The creation of transferable rights (tradable permits) for water use and discharge are a possible way to deal with allocation issues. According to economic theory, in a perfect market the trade of water rights will lead to the optimal allocation of water from shared resources. As there is no experience in the EU with tradable water permits, the cases of Australia and Chile are reviewed in section 5.7.

Environmental liability laws have the function of internalizing and recovering the costs of environmental damage through legal action. By establishing that polluters have to pay for the damage they cause, environmental liability provides an incentive to control and prevent pollution. In the case of damage occurred, it allows for the compensation of victims. Environmental liability is only applicable where one or few responsible actors can be identified, and is thus not suitable to address diffuse pollution from multiple sources. In section 5.8 the case of the 1999 Swedish Environmental Code is presented. The Swedish law was reviewed in reaction to a perceived lack of tools to deal with infringements of the law. Furthermore, an introduction to EU environmental liability legislation is given, including a summary of the main provisions of the proposed Directive on environmental liability.

In addition, section 5.9 introduces the German Water User Associations, which are self-financing institutions for the construction and finance of water infrastructure. All those who benefit, or can expect to benefit from the association, are involved in the establishment of an association. These Water User Associations are an approach to integrated and participatory water management. Their financing scheme through members' fees is also discussed.

The European Water Framework Directive (WFD) is presented in chapter 6, as it is one of the first environmental policy Directives of the European Community that explicitly draws on economic instruments for achieving its objectives. The purpose of the WFD is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. Economic approaches integrated into the Directive foremost include the polluter-pays and the cost-recovery principles.

This report intends to assist in the identification of economic instruments appropriate for application in the Latin American water management context. Section 7 therefore briefly reviews

the situation of water management in Latin America and isolates some of the main obstacles or challenges to the successful implementation of economic instruments characteristic for the region. The main challenges faces by Latin American countries are

- Institutional and administrative challenges
- Human resource constraints
- Financial challenges
- Lack of data
- Social challenges

However, a number of water charging systems are already in place, although their effects are often limited by inadequate enforcement and insufficient coverage of users. Section 7.3 singles out some relevant factors that are necessary prerequisites or useful tools for the successful implementation of economic instruments:

- Capacity building
- Decentralization
- Spatial Organization
- Integration
- Participation
- Earmarking of revenues
- Public education programs
- Transparency
- Autonomy of decision making

Section 7 finally attempts to build a bridge between the presented experience from European and OECD countries and the Latin American situation, and tries to point out in which respect Latin American countries may benefit from EU and OECD experience.

The main conclusion of the report is that there is a rich experience with economic instruments in European and other OECD countries that can be drawn upon. However, economic instruments

require substantive administrative capacities before they can be successfully applied and administered.

2 Background and Introduction

This paper on the role and importance of economic instruments in the context of water management is prepared for the second Regional Policy Dialogue on the Environment, an initiative of the Inter-American Development Bank on 11th and 12th February 2003 in Washington D. C.

Economic instruments have gained particular attention in recent years as an important tool for reinforcing and implementing environmental legislation, while simultaneously contributing to sustainable development. Their advantages, when well adapted to the specific conditions of each case, encompass the provision of incentives for behavioral change, the generation of revenue for financing further environmental investments, the promotion of technological innovation, and the reduction of pollution at least cost to society as a whole.

This report has been initiated to further discussions among participants in the Regional Policy Dialogue on the importance and applicability of economic instruments in the context of water management. It provides an overview of the available international literature and information on the application of economic instruments on water management, with particular analytical emphasis on the European experience. Tradable permits and liability for damage to the water environment will only be treated briefly.

The main objectives of this paper are to:

- give an introduction to the possible uses of economic instruments in the field of water management;
- provide practical examples of experience with economic instruments in water management mainly in European and other OECD countries;
- demonstrate the constraints and impediments to their introduction;

- assist in the identification of appropriate instruments in the Latin American context.

The report is structured as follows: Section 1 and 2 have given a summary of the report and the background against which it is set. Section 3 provides a brief description of the functions of economic instruments. Section 4 gives a taxonomy of economic instruments in water management, introduces the available instruments and defines their areas of applicability. Section 5 describes practical examples of experience with economic instruments in water management in European and OECD countries. Section 6 introduces the European Water Framework Directive and looks at how the use of economic instruments is supported and promoted by European legislation. Section 7 finally gives a brief evaluation of the current situation in Latin American and Caribbean countries and assesses which instruments described in the international literature and practiced in other countries are potentially attractive for replication in the region.

3 Functions of Economic Instruments in Water Management

The use of economic instruments (EI) in environmental policy has a number of advantages (Klarer, McNicholas and Knaus, 1999) that has made them indispensable tools in many European and other countries across the world. Through EI the environmental or social costs can be incorporated into the prices of goods, services or activities that give rise to them, thus sending price signals to users or consumers which can reduce inefficient and wasteful use of resources and foster optimal allocation. EI are an important means of implementing the polluter and user pays principle, as they make the polluter pay for the damage he causes rather than society as a whole. Moreover, they have the potential to be more cost efficient than traditional command-and-control instruments as polluters are given more flexibility with regard to the way in which they achieve given targets. By raising costs of pollution or resources, EI can also steer economic activities towards a more eco-efficient use of resources, thereby promoting innovation and competitiveness.[1] Finally, economic instruments may be capable of addressing diffuse pollution, an area where traditional command-and-control instruments often fail.

Economic instruments for environmental management can be classified according to the principal objectives they aim to fulfil. The following paragraphs will indicate the main functions EI can have, and provide a basic typology along which the different EI used for water management can be classified.

[1] The argument of increased competitiveness is based on the Porter hypothesis. It is supported in part by theories of competitiveness that posit that any regulation that requires a company to re-examine its production process generates a probability of innovation in that process that may benefit overall competitiveness and reduce or even eliminate costs of compliance (Environmental Law Institute, 1999).

Incentive Function

In cases where the primary purpose of an economic instrument is to create the necessary incentives for behavioral changes, the mechanism can be categorized as an incentive based instrument.

Incentive taxes are levied with the intention of changing environmentally damaging behavior and without the primary intention to raise revenues. In contrast to regulations, charges, e.g. on emissions, can provide a continuous incentive for improvements in abatement technology. The incentive function can, however, only develop its potential, if rates are set sufficiently high for stimulating the source to invest in emission abatement. The success of such a tax can therefore be determined by the extent to which initial revenues from it fall as behavior changes (Speck and Ekins, 2000).

Fiscal and Financial Function

When the primary aim of an environmental charge or tax is not to create incentives but to raise revenue, the relevant distinction lies in whether the revenue is earmarked or simply added to the general government budget. If the purpose of a tax is merely to gain money for the national budget, the economic instrument can be categorized as a fiscal environmental tax (Riza, 1996). A charge (or tax) fulfils a financing function if the revenue is allocated for specific environmental purposes (earmarked), e.g. if the money raised from water supply charges is spent on the costs of public water management. While it is argued that the economic rationale for such schemes is weak, they may nevertheless play an important role in enhancing the acceptability of the taxes and charges in question in public opinion, and in providing funds for the environmental

expenditures.[2] A problem with financing related public services through earmarking is that the level of finance for public services may have to adjust to changes in revenue, rather than to changes in demand and needs (see Box 1 on earmarking).

Box 1: Earmarking of Revenues

In practical implementation, earmarking can take a number of forms:

- The simplest form is that revenues raised are recycled back to the group that paid. Usually, different formulae are used for raising and disbursing revenues. Such 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.
- More complex is the French model of raising "*redevance*" (see section 5.3.3) which are recycled grosso modo back to those who contributed to the revenue of the *Agence*. In fact, those who contributed have a moral claim on their contribution and can expect a subsidy when it is their turn to make pollution control investments. Such systems can be useful to spread the burden of heavy investments, especially in the context of comprehensive investment programs implemented over a long period of time. Depending on the degree of solidarity among the water users within a river basin area, such schemes can either work for the basin as a whole or be segmented according to sectors or regions.
- Beyond these possibilities, earmarking can be relaxed so that money does not go back to those who paid, but is used instead to finance typical governmental functions, such as water and groundwater monitoring, modeling, research and technical development, or information disbursement. In this case, earmarking produces a double-dividend. Firstly, because of the incentive function on the revenue side, and secondly, by financing activities that are beneficial to the environment.

Earmarking has economic advantages and disadvantages and can be politically useful.

- Earmarking can, if badly designed, favor capital-intensive investments over others because of the availability of capital. Similar to the Averch-Johnson effect it can thus lead to over-investment;
- Earmarking should not be used to subsidize activities that have significant negative externalities but used only to compensate for positive externalities (external benefits) that cannot be captured through the market or regulated prices or charges;
- Experience has shown that earmarking is useful to raise political acceptance for the introduction of economic instruments;

[2] Source: http://www.mst.dk.

- Over time, earmarking tends to be relaxed, so that first general water management functions are financed and later the revenue from originally earmarked charges is treated as general revenue and becomes part of general taxation.

Contrary to the arguments of public finance, earmarking has proven to be a useful tool in environmental policy.

Soft Functions

On top of the intended and designed functions outlined above, economic instruments can have additional effects like for example capacity building within the administrating authority or improvements in implementation ("soft functions"). Kraemer (1995c) identified several soft functions in relation with the German water abstraction tax. Some of these are:

- It provided the environmental ministries in the *Länder*[3] with a source of finance which they either control directly, or have relatively strong claims on in competition with other ministries. It thus helped to build up personnel capacities needed in water resource management;
- It created a need for continuously updated information and documentation on water abstraction and water uses. This provided an opportunity to strengthen the information bases for administrative purposes;
- At the same time, it introduced into the relationship many elements of control and enforcement usually associated with revenue raising. It thus helped to formalize communications between the administration and water users and to increase the frequency of feed-back. This also strengthened the administrations' position in cases of conflict.

The presented functions of economic instruments are not mutually exclusive and, as section 4 will show, most instruments fulfil more than one function. Charges designed to recover the costs of a service can raise the customer's awareness of its value and may thus cause a more careful or

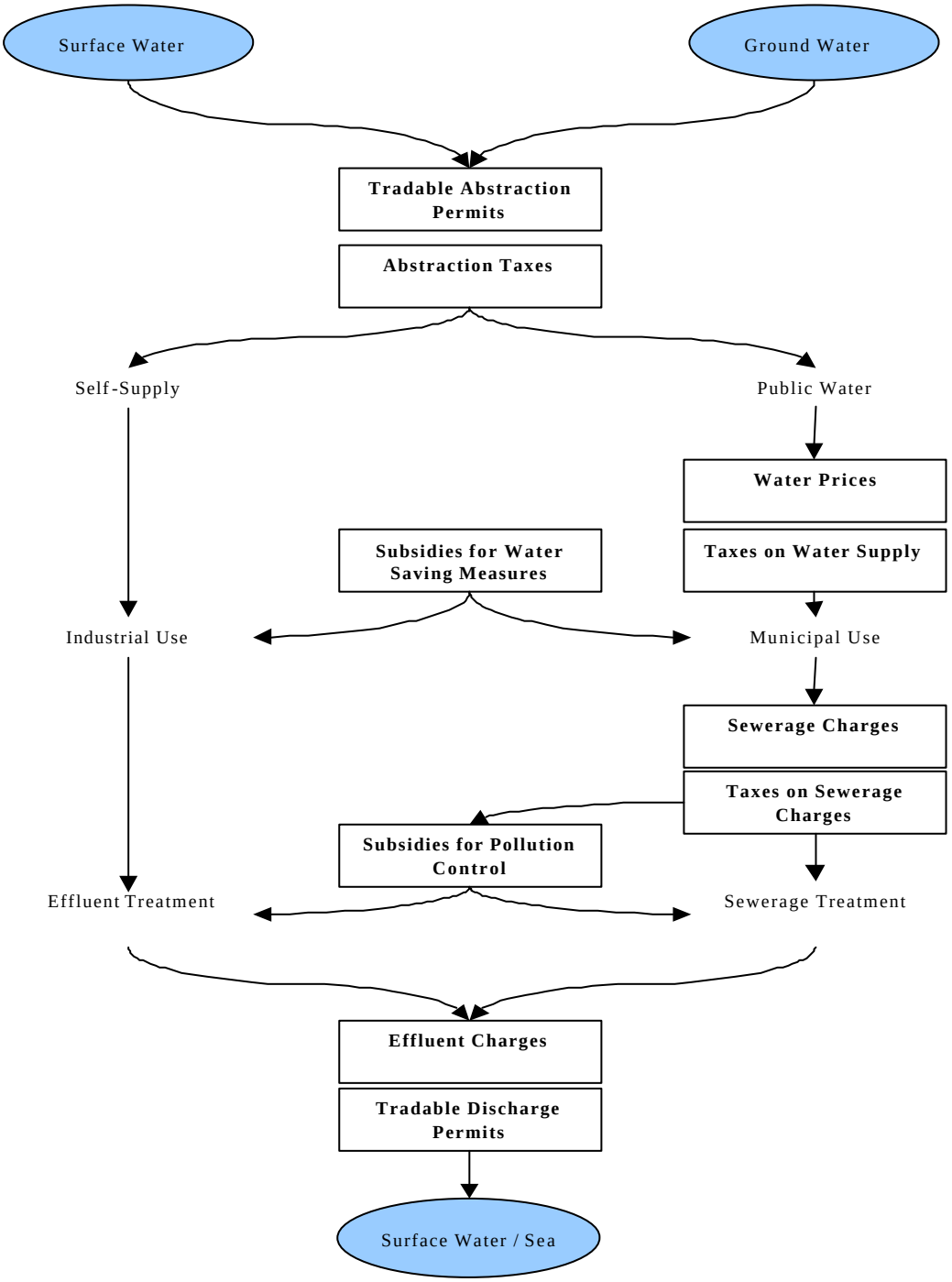
[3] Germany is a Federal Republic with 16 States, the so-called Länder.

economic use. On the other hand, taxes introduced primarily to provide an incentive to change behavior will also raise revenue.

4 A Taxonomy of Economic Instruments in Water Management

Figure 1 positions the respective economic instruments along the water cycle.

Figure 1: Economic Instruments for Water Management (adapted from Kraemer 1995b)



4.1 Water Withdrawal Taxes

A water withdrawal tax is a certain amount of money charged for the direct abstraction of water from ground or surface water (Roth, 2001). In some cases only ground water abstractions are charged to reduce the price differential between surface and groundwater abstraction, while in others, both ground and surface water abstractions are taxed, however often at different rates.

Besides their revenue-generating function, water withdrawal taxes can act as incentive measures. Effective water withdrawal taxes can induce a change in user behavior resulting in lower water demand and a reduction of water leakage. If the tax is set to reflect marginal costs of water abstraction, it enhances the cost effectiveness of the service provided. In general, water abstraction policies should consider both surface and groundwater in order to limit negative effects that more efficient pricing for one source of water will have on the other (European Commission, 2000a).

In many countries, revenues generated by abstraction charges are earmarked for explicit water management purposes, so that the proceeds from the tax are indirectly returned to those liable to pay. Water withdrawal taxes may be set to reflect the relative scarcity of water and may vary by regions.

4.2 Water Prices

The instrument of water pricing has the primary goal of financing water supply infrastructure. According to the European Commission (2000b), water prices should be set at a level that ensures the recovery of costs for each sector (agriculture, households and industry) and to allocate costs to those sectors (avoidance of cross-subsidies). Water prices should in principle

relate to three types of cost – direct economic costs, social costs, and environmental costs. The estimation of each type of costs involves a different set of problems (Kraemer and Buck, 1997):

- *Direct economic costs*: Full recovery of the economic costs of water services will require that water prices include (1) the costs of operation and maintenance of water infrastructure, (2) the capital costs for the construction of this water infrastructure, and (3) the reserves for future investment in water infrastructure.
- *Social costs*: With respect to water services, the direct or indirect social benefits (for instance in the field of public health) vary largely with respect to the specific contextual settings. Calculating these costs and comparing them across cases is, therefore, not a feasible task, which prohibits their incorporation into a comparative study.
- *Environmental costs*: The environmental costs of a certain economic activity are generally not reflected in the prices established at the market-place, but appear as so-called externalities. Conceptually, the non-inclusion of negative environmental costs in price mechanisms can be discussed under the heading of subsidies. In practice though, there are great difficulties linked to the establishment of benchmarks for costs caused by environmental degradation, and to the inclusion of these costs into market-based mechanisms. Still, the principle of full cost recovery requires taking these costs into account. Given the methodological problems involved in calculating environmental externalities, the inclusion of an environmental component into water prices will be backed by political rather than economic arguments.

In addition to their financing function, water pricing policies often fulfil an incentive objective as well. Water prices which represent full costs (economic and environmental costs) provide price signals to users resulting in a more efficient water use and generate the means for ensuring a sustainable water infrastructure (Huijm, n.y.)

4.3 Sewerage and Effluent Charges (Indirect Emissions)

Sewerage charges are tariffs paid for the discharge of used water. A sewerage charge is the amount of money paid for indirect discharges, that is domestic sewage or effluents discharged

into the sewer system (European Parliament, 2001). Foremost, sewerage charges have the objective of providing environmental authorities with financial resources for water management activities (financial function). Furthermore, these charges may fulfil an incentive function and are in accordance with the polluter-pays principle by internalizing treatment costs into the decision process of users through adequate price signals (Kraemer and Piotrowski, 1995).

4.4 Water Pollution Charge

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 water body (not a sewer). Pollution charges are an important step towards the realization of the polluter-pays principle even if their calculation is not based on estimates of damage costs. By levying a charge on pollution, a clear signal is given that society is no longer willing to bear the costs of pollution and that at least part of the costs of the damage caused has to be recovered directly from polluters (Roth, 2001). Pollution charges may set incentives in terms of pollution abatement promotion. In cases where the revenue generated by the charge is earmarked for measures to improve water quality, a pollution charge additionally fulfils a financial function for the improvement of water quality.

Designing optimal pollution taxes that minimize the total cost of pollution (damage costs plus control costs) is a difficult task, as it requires the existence of a reasonable data-base and information on pollution damages. The exact calculation of taxes requires information about the exact quantity and quality of the discharged waste-water (Kraemer, 1995a).

4.5 Subsidies

The OECD (1996) defines subsidies as "government interventions through direct and indirect payments, price regulations and protective measures to support actions that favor environmentally-unfriendly choices over environmentally-friendly ones". This definition includes direct subsidies in the form of direct payments by the government to certain users, and indirect subsidies. Even in the absence of "explicit monetary transfers" one can speak of (indirect) water subsidies if the system of water prices in place does not adequately reflect all costs involved in producing that service. Thus the effective implementation of the principle of "full cost recovery" in the formation of water prices in turn would eliminate water subsidies (Kraemer and Buck, 1997). This conceptual perspective highlights the close relationship between water subsidies and water pricing practices. Further indirect subsidy schemes include tax concessions or allowances, guaranteed minimum prices, preferential procurement policies and cross-subsidization.

Generally, subsidies can have two main objectives: either they are instituted to compensate users for a cost they incur in response to a required action or a prohibition, or subsidies are constructed so as to set the necessary incentives for achieving a certain desired, but not required, action.

Subsidies can be of a fiscal nature and paid out of public funds or can take the form of parafiscal cross-subsidies through redistribution between urban areas. From an environmental perspective, a subsidy consists of the value of uncompensated environmental damage arising from any flow of goods or services (Barg, 1996). As environmental damage is usually not included in water prices, subsidies *de facto* often exist.

Subsidies are a type of economic instrument that may lead to inefficient situations (OECD, 1991). However, they can create the necessary incentives for stimulating a change in user behavior towards environmentally friendly conduct or induce investment in environmentally

friendly production techniques, thereby mitigating or eliminating negative effects. In some cases, like flood alleviation for example, subsidies may provide a relatively cheap option for governments, especially considering the reduction in losses that may be achieved through adequate flood proofing (Otter and van der Veen, 1999). There is, however, a danger that over the longer term, resources may be channeled to problems that are no longer high priority.

When the government grants payments in return for an environmental benefit, subsidies are a form of internalization of external benefits.

4.6 Tradable Permits

If disagreement exists over the allocation of water from shared resources among segments of the population, a potential instrument is the creation of transferable rights to use/pollute water and the creation of efficient markets on which the rights can be traded. The rationale behind water allocation through tradable rights is that in a perfectly competitive market, permits will flow towards their highest value use (Tietenberg, 2000). Permit holders that gain a lower benefit from using their permits (for example due to higher costs) would have an incentive to trade them to someone who would value them more. A sale will result in a situation of mutual benefit: the benefit the permit holder reaps from selling his permit will exceed the benefit he derives from using it, while the buyer gets more value out of the permit than he has to pay for it.

When discussing tradable permits systems relating to water, three fundamentally different fields of application can be discussed (Kraemer and Banholzer, 1999):

- *Tradable water abstraction rights* for quantitative water resource management. These water rights can be permanent and unlimited (property rights to the water resource) or temporary and limited (transferable rights to use water without right of abuse);

- *Tradable discharge permits*, or tradable water pollution rights, for the protection and management of (surface) water quality. Such pollution rights can relate to point or to non-point sources, and trades can even be arranged among different kinds of sources;
- *Tradable permits to use or consume water-borne resources*, such as fish or the potential energy of water at height or the kinetic energy of water flowing.

Further distinctions can then be made within each of these fields of application. In relation to tradable water rights, distinctions can be made regarding the "intensity" of trading, which can be permanent or temporary (seasonal) or even one-off. With regard to water pollution rights, further differentiations can be made in relation to the polluting substance (or class of substances) in question (Kraemer and Banholzer, 1999).

Several prerequisites must be fulfilled for the successful implementation of a tradable permit system. First of all, property rights must be well-defined and specified in the unit of measurement (Kraemer, Interwies, Kampa, 2002). As a second point, water rights must be enforceable to secure the net benefits flowing from the use of the water rights for the rights holder. In the ideal case, transferable water rights should be separate from land use in order to create exposure to the opportunity to realize higher valued alternatives (Pigram, 1993). Finally, an efficient administrative system must be in place to ensure market working (Armitage, 1999).

Situations in which the conditions may not be adequately met include the possibility for market power, the presence of high transaction costs and insufficient monitoring and enforcement (Tietenberg, 2000). However, even in the presence of these imperfections, tradable permit programs can be designed to mitigate their adverse consequences.

4.7 Liability for Damage to Waters

Environmental liability systems intend to internalize and recover the costs of environmental damage through legal action and to make polluters pay for the damage their pollution causes. To that extent environmental liability laws are a fundamental expression of the polluter-pays principle. The intention of environmental liability laws can be twofold: first of all they aim at inducing polluters to make more careful decisions about the release of pollution according to the precautionary principle and second at ensuring the compensation of victims of pollution. While liability systems assess and recover damages ex post, they can nevertheless provide incentives to prevent pollution, as long as the expected damage payments exceed the benefits from non-compliance.

For liability to be effective, there needs to be one or more identifiable actors (polluters); the damage needs to be concrete and quantifiable; and a causal link needs to be established between the damage and the identified polluter (European Commission, 2000c). Thus, liability is not a suitable instrument for dealing with pollution of a widespread, diffuse character where it is impossible to link the negative environmental effects with the activities of certain individual actors.

The instrument of environmental liability, therefore, conveys several advantages[4]:

- Liability rules control pollution through the decentralized decisions of polluters to act in their own interest. Polluters will control pollution up to the point where the marginal pollution damage equals the marginal cost of control, thereby minimizing their total costs for compensating victims and controlling pollution;

[4] Source: http://www.eeb.org.

- The provision that polluters must pay for the damage they cause provides great incentives to avoid environmental damage. The higher the anticipated payment in case of a damage, the higher the incentive for taking preventive measures (precautionary principle);
- Environmental liability laws constitute a significant step towards the application of the polluter-pays-principle;
- Environmental liability will also be reflected in prices and is thus an important contribution towards realizing the principle of “ecologically honest prices”.

4.8 A Classification

Table 1 summarizes the economic instruments discussed in this section with respect to their main objective and classifies them along the scheme set out in section 3.

Table 1: Classification of Economic Instruments

Instrument	Economic Instrument	Advantages	Disadvantages
Incentive Instruments	*Water abstraction charges;*	Adjustment of price signals to reflect actual resource costs; encourage new technologies; flexibility; generation of revenue that can be used for water management activities;	Low charges/prices have a minimal impact on user/polluter behavior and can lead to resource-over-utilization
	Pollution charges;	Same advantages as water abstraction charges; polluter-pays principle	Same disadvantages as water abstraction charges
Fiscal instruments	*Subsidies for environmental R&D, tax differentiation*	Induce a more Eco-friendly behavior at any rate; easily understandable	Rely on measurability of single components; regional aspects are difficult to consider; high monitoring costs
	Pollution taxes	Encourage the development of cleaner techniques; leave the choice to sources between paying taxes or investing in cleaner technology; fulfil an additional incentive function	Low willingness to accept by the public and the target group concerned
Financial instruments	*Water prices; sewerage charges*	Are in accordance with the user-pays principle; May convey an incentive function in addition to financing or cost-recovery by reflecting the true costs of a product or service;	
	Financial subsidies	Popular with recipients, promote desirable activities rather than prohibiting undesirable ones	Require funding, may lead to economic inefficiencies, may encourage rent-seeking behavior
	Earmarked taxes or charges	Reduce the opposition to the tax as those liable to pay benefit from the revenue in turn	Rely on the measurability of single components; regional aspects are difficult to consider
Liability rules	*Liability legislation*	Assess and recover damages ex-post but can also act as prevention incentives; provide strong incentives	Require an advanced legal system; high control costs; burden of proof

based on OECD, 2001a and 1998; Stavins, 2000; UNEP, 2002

5 Economic Instruments in the EU and the OECD

The following chapter complements the description of economic instruments for water management by providing examples of their application in European and other OECD countries. To each instrument, a number of case studies or boxes will exemplify interesting practices and highlight the respective functions the instruments fulfil.

5.1 Water Abstraction Taxes

In the following section, three examples for the implementation of a water abstraction tax are presented (The Netherlands, Germany and Denmark). Abstraction taxes often combine an incentive with a revenue raising function. In many cases, the tax rate is volumetric, that is based on metered abstraction, which is necessary to provide an adequate incentive to save water. As the comparison of the two examples from Germany shows, abstraction tax schemes may differ in whether the tax is levied on the actual amount of abstracted water, or whether it is linked to abstraction permits, so that the maximum amount of water for the abstraction of which a permit has been given is taxed. The incentive structure imposed by the latter system is slightly different and can cause water users to review their water needs and consider the potential for water savings and for increasing the efficiency of their water use.

By differentiating tax rates, the relative consumption of ground water and surface water may be influenced. The abstraction of small quantities of water is often exempt from the tax, and there can be exemptions or reductions in the tax for farmers or industry in order to limit the impact of the tax on their competitiveness.

In Denmark and the Netherlands, the revenue of the tax is fed into the general government budget. The levy may be part of a green tax reform and compensate for a reduction in other taxes (income tax in Denmark). In the case of Germany, the taxes tend to be at least partially earmarked and the revenue is often spent on environmental subsidies, such as compensation payments to farmers for restricted land use.

5.1.1 The Netherlands

In the Netherlands, the water abstraction charging scheme comprises two different taxes: one tax that is charged by the provinces and an additional national levy on groundwater abstraction.[5] In our example, the focus will be on the national charge.

The national *groundwater abstraction tax* (GAT) was introduced in 1995 as one of several "green taxes". The tax has a two tiered aim: First of all, it was intended to have an incentive effect and to reduce groundwater use in favor of surface water use by narrowing or eliminating the price differential between ground and surface water. Ground water is cheaper in the Netherlands due to lower treatment costs and constitutes 70 percent of the country's water supply. Secondly, the tax has a revenue raising function and was partly initiated to increase the national tax yield. In 1992, a further increase of the fuel tax was suspended, in light of the adverse effects an additional increase in fuel prices would have on energy intensive industries. To compensate the general budget for resulting forgone revenues, the GAT was instituted (Mostert, 2000).

[5] The provincial tax on the commercial use of groundwater is a revenue raising tax, which generated a revenue of 20 mil. Euro in 2000. The revenue is earmarked and used for groundwater research and pollution abatement (source: Speck, 2000).

The Dutch groundwater abstraction tax is a national tax and is set by national law. The revenue generated by the tax goes into the general government budget. The tariff is set per cubic meter and its level is mainly determined on the basis of political considerations (Mostert, 2000). In the year 2000 the tariff per cubic meter was at 0.16 Euro[6] for public water supply companies and 0.12 Euro for other users. The tax generated a total revenue of 163.4 million Euro (Speck, 2000): The revenue is administered and collected by the Ministry of Finance and the Central Environmental Tax Unit in Rotterdam.

Several exceptions to the general GAT obligation exist: companies abstracting less than 40000 cubic meter per year and the use of pumps with a capacity of less than 10 cubic meter per hour are exempted; furthermore, the draining of building sites is exempted if less than 50.000 cubic meter per month are extracted for less than four months a year; skating rinks and draining and mining capacities at depths greater than 500 meters; and emergency extractions (for example fire) are exempted. Finally, there exists an exemption for the use of groundwater for rinsing reusable packaging.

Besides direct effects in form of water price changes, the tax influenced the industries competitive structure on two levels. On the one hand, it influenced competition between industries supplied by water industries as opposed to those abstracting for themselves and on the other hand, between those abstracting ground water and those abstracting surface water (the tax favors the latter) (Ecotec, 2001).

In most cases, the price differential between groundwater and surface water abstraction is not sufficiently narrowed by the tax to make groundwater abstraction less profitable than surface

[6] All currencies have been converted into Euro in accordance with the standard conversion tables.

water abstraction. The large number of exceptions also limits the scope of environmental effects related to the introduction of the tax. However, it is believed that the determination of the tax rate on the basis of metering did have an incentive effect, and that some water-saving investments have been made in response.

Box 2 summarizes the information about the Dutch groundwater abstraction tax presented above.

Box 2: The Dutch Water Abstraction Tax

1. Objectives of the tax:

- To raise revenue (financing function) and provide incentives for water saving;
- To raise revenue for fiscal reform and to protect the scarce groundwater resources of the Netherlands, which are the source of 70% of its water supply;
- To reduce the price differential between ground and surface water.

2. Specific tax base:

- *Groundwater*: extraction by water works or other entities

3. Tax rate (2000):

- Water companies 0.16 Euro/m^3
- Industry/ Agriculture 0.12 Euro/m^3
- infiltrated groundwater 0.025 Euro/m^3

4. Revenue collecting authority/ administration

- Administration and collection: Ministry of Finance and the Central Environmental Tax Unit in Rotterdam
- Monitoring of water abstraction by the water companies. Self-monitoring abstractors are subject to occasional verification by the water companies.

5. Exceptions

- Sprinkling and irrigating land (if less than 40.000m^3 per year is extracted)
- Draining of building sites (if less than 50.000m^3 per month is extracted for less than 4 month a year)
- Small pump capacity (less than 10m^3 per hour)
- Emergency extractions (e.g. fire)
- Extractions for skating rinks
- Draining and mining (at depths greater than 500m)
- The use of groundwater to rinse reusable packaging is exempt from the tax
- All surface water abstraction

6. Effect

- Competition between:
  industries supplied by water industries as opposed to those abstracting for themselves;
  those abstracting ground water and those abstracting surface water (favors the latter);
- Price differential between groundwater and surface water is not sufficiently narrowed to make groundwater abstraction less profitable;
- Limited environmental effect due to exceptions, but metering plays an incentive role and it is believed that water-saving investments have been made.

5.1.2 Germany

The introduction of water resource taxes on the abstraction of water from the natural environment in Germany followed at *Länder* level after earlier discussions at federal level in the 1950s and 1960s failed to bring about the imposition of a federal tax. Water resource taxes were introduced not as alternatives to command-and-control instruments but instead as complements to them. The water resource taxes fell in line with the general movement of environmental policy from direct regulation by prohibition and prescription towards the use of economic instruments as a means of regulating activity (Kraemer, Strübin and Hansen, 1998).

On 1 January 1988 Baden-Württemberg became the first German Land to establish a tax on water abstraction, namely the so-called "Wasserpfennig". Baden Württemberg established the tax in order to finance compensations to farmers for restrictions on fertilizer use in water catchment areas. Similar links exist between water resource taxes and environmentally motivated subsidies in the other *Länder*.

The case of Baden-Württemberg is exemplified in Box 3, as it has the longest experience with abstraction taxes in Germany, and as its regulatory framework has been copied by many other German *Länder.*

The case of Hamburg, which introduced a tax on water abstraction in 1989, will be presented as a second example as different regulating principles are applied.

Box 3: The Water Abstraction Tax in Baden-Württemberg

According to the water abstraction taxing scheme of Baden-Württemberg, the abstraction of small quantities (= 2000 cubic meter per annum) is exempt while a deduction of 50 percent is applied to abstractions between 2000 and 3000 cubic meter per annum.[7] Furthermore, the tax is not applied to water abstractions that do not require a license according to the federal Water Management Act or the Water Act of Baden-Württemberg, as well as in cases where specific exceptions have been granted. The tariff structure (see table below) allows for a differentiation according to the origin of water (surface or ground water) and its use (public water supply, heat pumps, cooling, irrigation, and other uses).

Water Abstraction Tax Rates in Baden-Württemberg:

	Surface water	***Ground water***
Use:	[in EUR/m^3]	[in EUR/m^3]
Public water supply	0.051	0.051
Heat pumps	0.005	0.005
Cooling	0.005	0.051
Irrigation	0.005	0.051
Other uses	0.020	0.051

Rebates of up to 90 percent are available for water-intensive agricultural, forestry, and industrial enterprises which might otherwise be affected in their competitive position. This rebate is conditional on taking all available measures to save water and to use surface water instead of ground water. Similar rebates can be granted in the public interest.

When the water resource tax was proposed in Baden-Württemberg, an annual revenue of about 81.8 million Euro was projected. This level was achieved in the first three years. Since then, the revenue has fallen to 71.6 million Euro and is now assumed to have stabilized. Part of the revenue goes to farmers in the form of compensation for land use restrictions.

Source: Kraemer and others, 1998a

While the tax in Baden-Württemberg is levied on actual water abstraction, in Hamburg a different scheme is applied by levying the charge on the quantity of water for which an abstraction permit has been given. Accordingly, different incentive structures emerge, as the following case study will exemplify (see Box 4).

[7] Originally in the Act amending the Water Act for Baden-Württemberg of 27 July 1987; now in Article 17a to 17f, Water Act for Baden-Württemberg (*Wassergesetz für Baden-Württemberg*) as amended on 1 July 1988.

Box 4: The Groundwater Abstraction Charge in Hamburg

The German Free and Hanseatic City State of Hamburg has enforced a ground water license fee since 1 July 1989. The fee is levied on the basis of abstraction rights held by water users, namely the maximum quantity of water a user is licensed to pump per year. In case the license is exceeded, the fee is set on the basis of the actual use. Exceptions are made for some abstractions that do not require a license according to the federal Water Management Act, for small quantities (< 10,000 cubic meters per annum) and for water used for heat pumps. A fee schedule is applied in the case of quantities between 10,000 and 20,000 cubic meters. Public water suppliers pay a reduced rate and, in addition, benefit from a blanket reduction of 65 percent.

Table 2: Groundwater Abstraction Fee Rates in Hamburg

Groundwater quality	'Good Groundwater' [in EUR/m^3]			High chloride groundwater near the surface [in EUR/m^3]		
	1989-90	**1990-93**	**1994**	**1989-90**	**1990-93**	**1994**
Public water supply	0.026	0.051	0.056	0.00	0.026	0.020
Other uses	0.051	0.077	0.087	0.026	0.051	0.051

Hamburg distinguished between public water suppliers and all other users and between "good" groundwater (that is from deep and relatively well-protected aquifers) and water from aquifers near the surface (less than 35 meters of depth) that might be polluted or affected by the tidal river Elbe (salt intrusion). When the fee was adopted, a first increase in the rates was already included. A second increase took effect on 1 January 1994. As of 1994, the blanket reduction for water suppliers was to be lowered to 60 percent.

The fee provided water users with a stimulus to review the water needs and their holdings of water rights, and to consider the potential for water savings and substitution. The "environmental effect" the fee was designed for was not primarily a reduction in water use but a reduction in the water rights held by users. Between 1989 and the end of 1993, more than one third of all water rights (103.8 million cubic meters) were renounced and thus made available for re-allocation for public use.

The legislation was revised on the basis of these results. The focus appears now to be shifting towards setting incentives to save water (rather than to retire water rights), both directly through rate increases, and indirectly through the decrease in the blanket reduction allowed for public water suppliers.

Source: Kraemer, Strübin and Hansen, 1998.

In general, two main effects can be discerned from the history of water resource taxation in Germany. First, there was horizontal policy learning: the *Länder*, acting in an area not regulated at the federal level, tried a variety of instruments, shared experiences and modeled their programs

after others. Second, as already outlined under Section 3.4, water resource taxation dramatically increased the capacity, competency and information resources of the *Länder* administrations involved remedying one of the key weaknesses that sparked the development of such taxes in the first place (soft functions) (Kraemer, 1995c).

5.1.1 Denmark

The Danish "tap water tax" is a tax on water abstraction that is fully passed on to users and added to their water bill. It was introduced in 1993 as part of a green tax reform for making a reduction in income taxes possible. The tax is initially levied on the water companies, which then, in turn, collect the payments from households, so that the tax is in effect paid by the ultimate users. Water companies must pay the tax on 90 percent of their abstracted water, independent of the actual amount of water supplied to customers. The tax thus provides an incentive for water companies to ensure a low level of leakage, in order to retrieve the costs incurred by the tax.[8] With the tax being fully passed on to households, it was further intended to fulfil a resource protection function by limiting water demand from households.

Households pay the tax on actual metered water consumption. Since 1 January 1999 it is mandatory to have a water meter installed. Before that date, the tax for households with no metering appliance was based on an assumed water consumption of 170 cubic meters.[9] This

[8] The tax is not levied on 100 percent of abstracted water as there is always a leakage, no matter how good the level of maintenance is.
[9] OECD, 1999b: A government declaration of 1996 imposes an obligation on water utilities to ensure that as of January 1999 all properties connected to the public water supply have a water meter installed. Furthermore, payment for water deliveries must be made via a combination of a fixed charge and a volumetric charge.

estimated consumption level was deliberately set high in order to provide an incentive for consumers to install water meters.[10]

In 1998, the charge per cubic meter of water supplied was 0.67 Euro (including 25 percent of VAT) and the total revenue generated amounted to 214 million Euro. Consumers pay the tax through their water bills where it is listed separately to make it clearly identifiable. The water companies then forward the revenue to the Customs and Tax Agency. The revenue generated by the tax is not earmarked for water management activities but instead constitutes an additional source of finance for the general government budget.

Several exceptions exist to the general obligation of paying the tax. Agriculture and industry can deduct the tax from their VAT liability and are thus exempted. Service sector businesses, however, are not entitled to a similar tax refund.

From 1989 to 2000, the Danish water bill doubled from about 1.60 to 3.36 Euro per cubic meter. About half of this increase can be attributed to this tax. The tax is believed to have led to an increased development of water saving appliances. Since 1994, total water consumption in Denmark has declined by 13 percent, while the leakage from water works decreased by 23 percent.

Box 5 summarizes the information on the Danish water abstraction tax.

[10] Source: http://www.mst.dk.

Box 5: The Danish Tax on Water Abstraction

Objective of the tax

- To allow for a lowering of income taxes
- To reduce water demand from households (environmental resource protection function)

Specific Tax base

- Piped water at delivery

Unit of measurement

- cubic meter (tax is imposed on metered water delivered to the customers; in cases where no metering is in place, a standard consumption of 170 m^3/ year is assumed)

Tax rate

- 0.67EUR/m^3 in 1998 (including 25% VAT)

Revenue collecting authority/administration

- Customs- and Tax Agency and its Regional Offices

Use of Revenue

- General Government budget (revenue raised in 98/99: 214 million Euro)

Comments and exceptions:

- Exceptions: Farmers and industry (most enterprises can deduct the tax from their VAT liability; excludes service sector businesses)

Effect

- From 1989-2000: water bill doubled, from about 1.60EUR/m^3 to 3.36EUR/m^3. The water tax is responsible for about half this increase, while the other half is due to increased water supply tariffs, increased sewerage costs and the waste water tax
- 13% reduction in water consumption since 1994
- Development of water saving appliances
- Leakage from water work decreased by 23%

Sources: Ecotec, 2001; Speck, 2000.

5.2 Water Prices

As section 4.2 outlined, water pricing policies generally address three distinct sectors, namely households, industry and agriculture. The water bill paid by users consists of several elements. For households it includes a charge for piped water supply and for sewerage collection and treatment. The following case studies will give an overview on the systems of pricing piped supply of potable water to households in Germany and France. Sewerage services will be treated in a distinct section (5.3) so that both components of water prices can be discussed in greater detail. For detailed information on the European experience with water pricing policies regarding the industrial or agricultural sector the interested reader is referred to the relevant OECD publications (OECD, 1999a, 1999c and 1999d)

As the cases of France and Germany show the most important aspects of pricing public water supply, and as there is already high variability in the systems within these countries, no additional case studies will be presented. However, in section 5.4 a more comprehensive comparison of European household water bills for both water supply and sewerage services will be presented.

Most European economies have an access rate to potable water supply of 100 percent. For the few European countries that fail to guarantee complete coverage, geographical characteristics and the presumed inefficiency of linking rural households to existing networks is generally the constraining factor (OECD, 1999d). Denmark is one of the few mature European economies that exhibit an access rate below 90 percent.

Tariff structures for domestic water provision vary significantly among OECD countries. However, the majority of countries relies on a combination of fixed and variable charges (OECD, 1999d) and in some cases on an additional connection fee. A general trend can be observed towards more economically viable pricing and the implementation of incentives for water

conservation. This trend manifests itself in a decreasing application of fixed-price and decreasing block-tariff structures and a move towards volumetric pricing and increasing block-tariff structures (OECD, 1999d).[11]

5.2.1 France

Administration

In France, the organization of potable water supply is under the responsibility of municipalities or groups of communities, while the role of the State has been limited to water law enforcement (OIEAU, 2002). Due to historical factors, there are still more than 36 000 *communes* in France nowadays with their elected municipal councils and mayors (Barraqué, 1999). There are altogether more than 15 000 undertakings for water supply, some of which are very small municipal water works serving one or two communes.

Due to the fact that local authorities, while enjoying strong political sovereignty, often have little economic power, they often choose to delegate service provision to varying extents to private operators. The delegation can either take the form of a lease, where the community makes investments and only entrusts the operation of installations to a private supplier, or of a concession, where the private company also builds the installations. The duration of a concession agreement may vary from 20 to 50 years, while the "lease" type contracts last from five to 20 years (OIEAU, 2002).

[11] An increasing block structure implies that supplementary units of water increase in price, while a decreasing block structure stands for regressive prices with increasing consumption.

Tariff structure and rates

There is no national tariff regulation. When the municipality is responsible for receiving a part of the price, as is the case with "lease" delegation, it has the ability to set rates on a yearly basis. In the event of the municipality being under contract with an outside operator (through a concession agreement), prices are set for the duration of the contract and not determined on a yearly basis. In both cases public participation in establishing tariffs is indirect, conducted by public officials responsible for public budgets. In addition, at a regional level, the Prefect can block price increases on the basis of public interest.

Charges mostly include a component calculated on the basis of metering. Tariffs structures fall into four basic categories (Buckland and Zabel, 2002):

- Two part tariffs with a flat rate: the consumer pays a flat rate which entitles him to consume a certain amount of water. Any excess amount is charged on a volumetric basis;
- Two part tariffs with no flat rate: in addition to a standard fixed rate, a volumetric charge is applied to actual consumption;
- Single tariffs: the consumer is charged purely on consumption (cubic meters);
- Fixed rate tariffs: the charge for water supply is independent of consumption.

Most undertakings currently use the two part tariff with flat rate (48 percent) (Buckland & Zabel, 2002). Since a law in 1992 banned all flat rates for services, fixed rates can still apply to meter rental and reading and thus continue to be found. Tariffs also may vary according to the type of water used, for example surface or groundwater, and there is a reduced VAT rate for drinking water.

Between 1991 and 1996, public water supply prices have increased by 31 percent. In 1996, the weighted average of volumetric rates and of the average fixed charge was equal to 1.23 Euro per

cubic meters of which the fixed charge made up for 20 percent[12] (OECD, 1999d). In 1998, the average volumetric charge was 1.30 Euro per cubic meter, no data is available on the fixed component for this year. In 2000, the average price paid by households for water supply was 151.54 Euro per year (Schönbäck and others, 2002).

Pricing principles

The water laws include a system based on the polluter-pays principle as well as a framework for water charges used to improve water quality and prevent deterioration (Hamada, Interwies and Kraemer, 2002). There is thus an attempt to achieve full cost recovery in water services, although there is some debate as to whether or not France achieves this target given the presence of subsidies.

[12] This figure was obtained by the addition of the average of different utilities' fixed charge elements to the average of their volumetric rates , transforming the former into a "volumetric-equivalent" by assuming a typical household consumption rate (OECD, 1999d).

5.2.2 Germany

Administration

According to Article 28 of the German Basic Law, municipalities are guaranteed self-governance on all local issues, including water supply, so that the provision of water services is the responsibility of municipalities. To date there are a multitude of institutional arrangements with the most common undertakings being municipal enterprises. Companies act like private companies but are in effect publicly owned by municipalities. Municipalities occasionally seek private input, capital or otherwise. The range of undertakings is as follows:

- *Regiebetriebe* and *Eigenbetriebe*: Municipal management and ownership;
- *Eigengesellschaften*: Companies subject to private law, where the municipality holds majority shares;
- Private companies;
- Inter-municipal associations: *Zweckverbände* and *Wasserverbände*;
- Water and ground associations;
- Individuals.

To date there are approximately 6000 undertakings, 96 percent community owned, 3 percent mixed ownership, 1 percent private. Drinking water quality and pricing is regulated by municipalities, often set by the local elected Town Councils. Local health authorities are responsible for the control of drinking water quality.

Tariff structure and rates

Charges for water services provision are predominantly based on metered water consumption and metering is extensive. 91 percent of the charges are related to volume and 9 percent are standing charges (Hamada, Interwies and Kraemer, 2002). Excessive water use is discouraged by some

companies through the use of progressive charges, that is through raising the charge rate as volume increases. Charges are established under the framework of the *Kommunalabgabengesetze* (Municipal Charges Laws, KAG) and are levied by the community owned utility or mixed enterprise, but not by private operators. Private companies must set prices according to private law. In actuality, these, too, are often set according to KAG formulae. Customers have an indirect role in setting tariffs via representation on local city councils and utility boards, regardless of the private or public legal status of the utility. VAT is charged on the services and locally elected town councils usually set rates.

In 1997, the price of drinking water was equal to 1.50 Euro of which the fixed charge constituted 9 percent[13] (OECD, 1999d).

Pricing principles

Public drinking water services are governed by the principle of full cost recovery. Water companies must ensure that water prices cover costs of supply, that customers pay for their consumption levels (user-pays principle), that tariffs are determined by cost structure, that there be a return on capital, and that the real value of assets should be maintained.

5.3 Prices and Charges in (Public) Sewage Collection and Treatment

Citizens pay for the provision of sewerage services in all EU Member States. Calculation of the charge is often volumetric and based on metered water consumption, although there are

[13] This figure was obtained by the addition of the average of different utilities' fixed charge elements to the average of their volumetric rates , transforming the former into a "volumetric-equivalent" by assuming a typical household consumption rate (OECD, 1999d).

alternative systems (Austria). In addition to the volumetric charge, there may be a fixed component that serves as a contribution to the investment cost of the initial connection to the sewerage system (Denmark's connection fee, France). The collection of sewerage charges most often aims at recovering the costs for operating and maintaining the sewerage system. Here the sewerage charging systems of four representative countries (Germany, Austria, Denmark and France) are presented. An overview is given in Table 4.

5.3.1 Germany

Administration and organization

In 1995 in Germany, around 72.5 million inhabitants (approximately 92 percent of the population), amounting to population equivalents of 117.4 million (including small commerce), were connected to sewerage systems, producing 9.9 million cubic meters per day of sewage, which in turn was treated in 10,390 treatment plants, 88.6 percent of it biologically (Rudolph and others, 1998). Sewerage services are a sovereign service in Germany and municipalities have to provide this service in order to maintain adequate living conditions for the local population (Buckland and Zabel, 2002).

As *Länder* Water Laws differ, various organizational structures for sewerage services have emerged in the Federal Republic of Germany. Sewage collection and treatment has traditionally been integrated in municipal administration, or has been independent only to a limited degree. The current trend is a move away from municipal operations included in the general budget *(Regiebetrieb*) toward separate municipal entities which operate on their own clearly defined budgetary allotments *(Eigenbetrieb*). In line with this trend, cities are increasingly gravitating toward forming private-law organizations (*privatrechtliche Organisationsformen*) to run their

sewerage systems, and accordingly toward shifting the infrastructure and personnel off their own budgets. This step has largely been motivated by growing financial problems and is due to the fact that revenue surpluses are not easy to produce in the sewerage sector.

Charge

In Germany, discharges of water to the sewerage system by households are subject to user charges. The charge is based on metered freshwater consumption, but in general municipalities are free to collect fixed contributions regularly (in some *Länder* even basic monthly charges) in addition to the volume-based charges (Euro per cubic meter, or in the case of rainwater Euro per square meter) (Speck, 2000).

Four basic principles guide the setting of charges (Buckland and Zabel, 2002):

- Charges are set in proportion to the services provided (metered consumption);
- Charges reflect the benefit a user derives plus the costs incurred in providing the service (charges for new connections are borne by the property owner);
- Charges should not differentiate between users;
- Charges should be set at cost recovery rate, that is revenue should not exceed costs.

In 1997, the average sewerage charge was 2.36 Euro per cubic meter of fresh water consumption. The collection of charges is set in the *Kommunalabgabengesetze* (Municipal Charges Laws, KAG) of the various federal *Länder* on principle of cost-recovery: the revenues collected by a particular community may not exceed the actual costs of the sewerage services, and conversely, the charges should be set at such a level that no deficit arises.

In recent years the unit prices for sewage treatment plants have been reduced due to a general downward trend in costs for construction and equipment, technological advancement, and the cost-cutting pressure of competition and rationalization. Further potential for limiting the

continued increase in costs and charges for sewerage services can be found particularly in the conceptual phase of construction or expansion projects of sewerage installations.

Revenue generation and use

In general municipalities are able to finance their investments in sewerage systems and operational costs through revenue from contributions and sewerage charges. A legal right to state or federal government subsidies does not exist.

5.3.2 Denmark

Administration and organization

Around 90 percent of the Danish population is connected to primary and secondary treatment of sewage. Since the 1970s the Danish municipalities are responsible for designing plans for sewage disposal and for financing them through municipal taxes and charges. However, Danish sewerage services are not exclusively carried out by municipal authorities as a significant portion of the sector is dealt with privately by property owners or by neighborhood community groups. The basic principle guiding the financial arrangement of sewerage services in Denmark is the proposition of economic neutrality or self-sufficiency (*Hvile-i-sig-selv*) which is equivalent to the cost-recovery principle. Costs and revenues may be balanced over several years so that revenues and costs may be accumulated over the years. Due to a generally slow progress in water resource protection since the 1980s the Danish government has demanded both a stricter application of the cost-recovery principle for capital and operational costs and an acceleration of investment in sewerage services.

Charge

The Danish sewerage charge consists of an initial connection charge plus a charge for sewage collection and treatment. Municipalities are free to establish calculation methods for tariffs and charges but must respect the cost-recovery principle (Rudolph and others, 1998).

- *Sewerage connection fee*. For households, the charge covers the connection to a double sewerage system consisting of a system for sewage discharge and one for gutter and runoff. For enterprises, the fee is calculated based on the area of the premises.[14]
- *Annual sewerage fee*. For the annual sewerage fee actual amounts of sewage are approximated by metered water consumption, as measurement and control of water usage is much easier. For households without meters, the fee is based on an estimated water use of 170 cubic meters. However, since 1 January 1999, all households have been obligated to install meters with only minor exceptions prevailing. In general, the fee should be the same for all user groups connected to the same system. A specific surcharge may however be imposed on enterprises, based on a pre-defined formula, which takes the content of certain pollutants (e.g. total amount of lead or phosphorus discharged) in the sewage into account.[15]

Charges can vary considerably between municipalities. The sewerage charge amounted to an average of 1.56 Euro per cubic meter in 1997 (Speck, 2000). Table 3 displays the development in average user fees over the period from 1995 to 1997. Developments prior to 1995 showed significant increases in the sewerage fees, attributable mainly to the implementation of the Action Plan for the Aquatic Environment. Compliance with the Plan necessitated a number of sewage treatment plants to undertake major investments, the costs of which were recovered through user fees.

[14] Source: http://www.mst.dk.
[15] The information is based on the following website: http://www.mst.dk.

Table 3: Average User Fees for Sewerage Services. 1995-1997 in EUR/m^3

Type of annual fee	1995	1996	1997
Sewage fee	1.37	1.42	1.56

Source: www.mst.dk

Revenue generation and use

The replacement costs of the Danish collection system amount to around 27 billion Euro in 1998 (Rudolph and others, 1998). The annual revenue generated by the sewerage charge amounts to around 590 million Euro (Speck, 2000) and is earmarked for the financing of sewerage and collective treatment plants. Since 1989, sewage discharge and treatment are fully financed through user fees.

Exceptions and comments

Since the 1980s, no direct subsidies have been provided for the Danish sewerage system. However, low interest loans are at times given for investment in sewage collection improvement or replacement. Since 1989 the Danish sewerage services are subject to the full VAT of 25 percent.

5.3.3 France

Administration and organization

In France, municipalities are responsible for sewerage services but are free to choose between self-provision (direct management) and delegation to private enterprises (see section 5.2.1). In a number of cases inter-municipal associations have been formed. The Municipal authorities are required to apply the principle of cost-recovery and to make no profit. Depreciation costs should

be reflected in their charges to ensure the necessary financial means for replacement and investment. There is no central regulatory authority responsible for sewerage charges, but municipalities are obliged to set tariffs themselves as well as fix delegation contracts with private providers. Private operators provide an estimated 75 percent of all customers with services and approximately 60 percent of all municipalities have chosen delegation of water services as their operational form (Hamada, Interwies and Kraemer, 2002). As a control organ, there exists an oversight committee, comprising national governmental institutions, to which parties can appeal in case of contractual abuse.

Charge

The consumption of fresh water forms the basis for the calculation of sewerage charges. Water meters are customary in France and the trend is moving towards measuring each household's consumption separately. In the French system, there exist sewerage charges depending on consumption (in 1998, the average charge was 1.32 Euro per cubic meter), (Schönbäck and others, 2002), non-recurring contributions to the initial investment cost for connection, as well as increased charges for heavy polluters and reduced charges for entities producing sewage which is particularly inexpensive to treat (Rudolph and others, 1998). In addition a pollution charge (*redevance*) is levied, which is used to create the assets of the *Agences de l'Eau* (River Basin Agencies) which in turn are used to finance water resource protection projects. Between 1992 and 1996 the sewerage charges rose by 90 percent, while the water price grew by only 31 percent. In 1996, the average yearly sewerage bill for a standardized household (consumption of 120 cubic meters of water) amounted to 148.49 Euro (Rudolph and others, 1998). By 2000, it had risen to 166.05 Euro. The average yearly costs of sewerage disposal per person in 2000 were 69.19 Euro (Schönbäck and others, 2002).

In examining the prices and charges for organizational dependency, one will notice that the privatized systems (or systems delegated to private enterprises) in 1996 were 16 percent more expensive (23 percent more expensive in 1991) than the systems operated by municipalities. This finding may originate from the fact that privatization has generally taken place in mid-sized cities which carry higher per capita costs, and may have been at a point in time when investments became necessary or when sewerage services became too expensive for the municipality. In addition, profit-seeking on the part of private enterprises is seen as a further reason for the increase in charges.

Revenue generation and use

In 1996, the total annual revenue generated by the sewage charge amounted to 1.5 billion Euro. The revenue is earmarked to finance water resource protection and investments in water supply equipment.

Exceptions and comments

Subsidies continue to remain quite important in the French system. 40 percent of the financial means of the *Fonds National pour le Developpement des Adductions d'Eau* (FNDAE) is spent on sewerage systems and 98 percent of it on subsidies for investments (Rudolph and others, 1998). Sewerage services are generally not subject to VAT payments; however, municipalities can pay a reduced VAT on sewerage services and at the same time reclaim VAT paid on goods and services bought in. As far as applied rainwater collection and treatment is also under municipal responsibility. The resulting costs must be carried by the general municipal budgets and may not be included in the calculation of sewerage charges.

5.3.4 Austria

Administration and organization

Austria has comparatively low connection rates (only 75,7 percent of the population is connected to the sewer system) and higher sewerage charges. These findings can partly be attributed to the fact that the Alps cover 60 percent of Austria's surface area, and 56.7 percent of the population lives in communities with less than 10,000 inhabitants. Due to its geography, Austria's connection rates vary quite noticeably from region to region. It is assumed that an overall

connection rate of 85 percent is the maximum to be achieved within economically feasible boundaries (Rudolph and others, 1998).

Water management in general is the responsibility of the federal Ministry of Agriculture and Forestry. However, legal matters pertaining to water are under the jurisdiction of the districts, and sewerage services are a municipal function. The Water Law allows for the formation of local water associations *(Wassergenossenschafte*n, WG and *Wasserverbände*, WV) when these prove more effective in achieving objectives regarding water. Around one half of all municipalities are members of such an association.

Charge

The structure of sewerage charges varies greatly even within the various Austrian *Länder*: The Styria alone has 29 different models. On the one hand, water meters are quite common, allowing a volumetric charging system. Yet on the other hand, there are alternative systems in Austria with charges independent of consumption. In Lower Austria (Niederösterreich), for example, the sewerage charges are based on the size of the home, not on water consumption.[16] There are also charging schemes based on the number of toilets in a home or on population equivalents. Industrial indirect emitters generally pay the same charges as households. In general, charges are mainly based on the metered supply of water. In 2000, the charge for sewage treatment was in-between 0.30 Euro and 2.88 Euro per cubic meter of drinking water provided, 1.73 Euro per cubic meter on average. In cases where the charge is calculated according to the size of the built-on area, rates varied between 0.58 and 10.39 Euro per square meter (average 0.79 Euro per

[16] Under this circumstance, for instance, owners of vacation homes who may not regularly consume water nonetheless regularly pay for the fixed costs of sewerage services.

square meter). In the Land of Tirol, there is also a non-recurring fee for connection to the sewerage system of 726 Euro (Schönbäck and others, 2002). With charges differing widely across municipalities, the average yearly costs of a fictitious household[17] for sewage disposal was 209.68 Euro in 2000. The average yearly costs of sewerage disposal per person amounted to 83.87 Euro.

Revenue generation and use

There is no detailed information available on the use of the revenue generated by the Austrian sewerage charge. It is designed as a cost-covering charge, however, and thus the revenue is likely to be used in the sewerage and wastewater treatment sector.

Exceptions and comments

Government subsidies are intended to keep the sewerage charges per household below the politically significant level of 363.36 Euro per year. Municipalities carry the cost of rainwater collection and treatment (as far as applied).

[17] Size of flat 80m^2, two adults, one child, one toilet, one bathroom, yearly consumption 150m^3.

Table 4: Sewage Collection and Treatment in Selected European Countries

Country	Objective of charge	Unit of measurement	Tax rate (in Euro)	Revenue collecting authority/ administration	Use of revenue	Comments (exception, etc)
Austria	Cost-covering charge	Different models exist (structure of sewerage charges varies greatly even within the various Austrian *Länder* and the Styria alone has 29 different models): - m^3 of drinking water provided - sewerage charges based on the size of the home - number of toilets in a house	2000: between EUR 0.30 and 2.88 per m^3 of drinking water provided (EUR 1.73 per m^3 on average; or between EUR 0.58 and 10.39 per m^2 of built-on area; additional fees differ between the municipalities (e.g.: in Niederösterreich, dirty water and rainwater are also levied with a charge)	Municipalities	Revenue is probably used to finance sewerage collection and wastewater treatment	- Sewage charges vary between municipalities; in 2000, the yearly costs of a "fictitious" household were EUR 209.68 on average; the yearly costs per capita were EUR 83.87 - Government subsidies are intended to keep the sewerage charges per household below the politically significant level of 5,000 Austrian Shillings (EUR 363.36)
Denmark	Cost-covering charge	Charges are payable for waste water management of sewage to local authorities: charge is determined by a connection charge (fixed amount on initial connection to treatment plant) and a combined charge for sewerage and treatment services	1997: average tariff was 1.57 EUR/m^3	Municipalities; collected on an annual basis; annual revenue generated by the tax: ~ EUR 590 million.	Revenues are used to finance sewerage and collective treatment plants	- Collective treatment plants are completely financed by charges (no government funds) - About 90% of the population is connected to primary and secondary treatment - Construction and operation of the plants is financed solely by the revenues of sewerage charges – fully user financed
France	Cost-covering charge; generation of revenue for water resource	Charges consist of a fixed amount and an amount based on water usage (metered consumption)	1998: 1.32 EUR/m^3	Municipalities with private sector involvement; revenue generated in 1996: EUR 1.5	Revenue is earmarked to finance water resource protection and water supply	In 2000, the yearly costs of a standardized household were EUR 166.05 on average; the yearly costs per capita were EUR 69.19

Country	Objective of charge	Unit of measurement	Tax rate (in Euro)	Revenue collecting authority/ administration	Use of revenue	Comments (exception, etc)
	management objectives			billion	equipment	
Germany	Cost-covering charge	Main charge is based on metered consumption of freshwater; municipalities may collect additional fixed contributions	1997: 2.36 EUR/m^3	Municipalities	Revenues are earmarked to finance collective treatment infrastructure	

Sources: Speck, 2000; Buckland and Zabel, 2002; Rudolph and others, 1998; OECD, 2002; Schönbäck and others, 2002

5.4 Comparison of Water Bills

In order to assess how different environmental economic instruments such as water taxes and charges play out taken all together, it would be interesting to compare the water bills of representative users such as households, agricultural farms or industrial firms in the different countries under observation. It might be of particular interest to evaluate the affordability of water services by looking at the ratio of water prices to average disposable income, that is to assess how strongly charges affect users under the given system.

However, there are a variety of well-founded drawbacks or problems related to such a comparison. The main difficulty is that the necessary data are not readily available in a comparable format, and that harmonizing them requires a substantial research effort and is subject to large potential errors, so that it may not yield reliable results.

The charging systems may differ in (Rudolph and others, 1999; Kraemer and others, 1998b):

- The extent of services and costs comprised in the water bills;
- Relative contributions of fixed and consumption-dependent components;
- The presence or absence of non-recurring connection fees;
- The type of taxes/charges applied;
- The objectives of the charges applied (cost recovery, incentive);
- The role of state subsidies;
- Whether water prices are subject to value added tax (VAT), and the level of VAT;
- The extent to which depreciation of installations is in the price.

Data quality and availability in general also vary between countries. As Rudolph and others (1999) point out, it is easier to collect comprehensive data in centralized systems, whereas in federal states like Germany, charges and bills already vary greatly between regions.

When looking at the tables below (Table 5 - Table 7), it is also important to note that affordability measures, which might be of particular interest to Latin American and Caribbean countries in relation to poverty issues, are based on average bills and average incomes only and thus mask regional differences and income distribution.

When comparing household bills across countries, the problem arises that the "typical" or "standardized" households for which statistics are calculated differ between countries (number of persons, amount of annual water consumption/sewage disposal, size of area) (Kraemer and others, 1998b; Schönbäck and others, 2002). So it is often more convenient to refer to bills per capita.

Because of the substantial difficulties outlined above, it was not feasible within the scope of this study to newly collect and evaluate data for a comparison of water bills. Therefore, the following paragraphs will give an overview of available data. The interested reader should refer to the studies cited for more in-depth information on this subject (OECD, 1999d; Kraemer and others, 1998b; Rudolph and others, 1999; Schönbäck and others, 2002).

5.4.1 Sewerage Charges

A study comparing European sewerage charges conducted earlier by *Ecologic* in cooperation with the *Beratungsbüro für Wassertechnik und Management*, Wien (Rudolph and others, 1999) uses the annual bill for sewerage services per year and per capita connected to the sewage collection system. Table 5 shows the relevant data for several EU Member States from 1996 to 1998 (first row). To provide information about the level of the charges in relation to income, the same study presents the annual average sewerage bill per person as a percentage of per capita

GNP (third row). In the fourth row, the annual charges are corrected for several distorting factors, such as direct or indirect subsidies, connection fees, VAT rates, and others.

Table 5: Annual Sewerage Charges per Capita in Some EU Member States (1996-1998)

	Germany	Denmark	France	Austria
annual charges in Euro per capita connected to sewerage system	109	93	68	154
GNP/inhabitant*annum (EUR)	20 605	21 348	17 852	19 803
annual charges in % of GNP	0.76	0.58	0.68	0.72
annual harmonized charges in Euro per capita connected to sewerage system	122	123	117	142

Source: Rudolph and others, 1999.

From the systems reviewed in section 5.3, clearly Austria and Germany have the highest average sewerage bills, both in absolute figures and in percentages of GNP. There are, however, no dramatic differences in bills or in affordability.

The harmonized annual charges, which give an estimation of what the different charges would amount to under the same circumstances, differ considerably from the original data. This is an indicator of the underlying variability of charging system and thus of the challenges posed to any attempt to compare these data.

5.4.2 Water Supply Prices

In 1998 a report was prepared by *Ecologic* on European prices for water supply (Kraemer and others, 1998b). Table 6 shows water prices in terms of both average value and estimated maximum/minimum value for each Member State, as well as the average annual bill per household and per capita. This table may serve as an illustration for the aforementioned challenges to data compilation. The values are not directly comparable, since they are not

available for each country for the same year. Moreover, mean values were not calculated by the same method in all cases. Because of the limited data availability, it is likely that the interval of charges within countries is actually higher than indicated here. Nevertheless, the figures are able to give some idea of the scale of prices and annual bills.

Table 6: Water Prices and Average Annual Bills in Some EU Member States

	Water prices in EUR/m ^{3}			Average bill in EUR/annum		
Member State	**Year**	**Interval**	**Mean value**	**per household**	**per capita**	**persons per household**
Denmark	1993	0.18 - 0.84	0.41	N.A.	28	-
Germany	1996	0.93 - 2.02	1.46	130	72	1.8
England and Wales	1995	0.51 - 1.43	0.87	138	59	2.3
France	1994	0.06 - 1.86	1.02	133	54	2.5
Italy	1992	0.10 - 0.67	0.36	112	38	2.9
Netherlands	1995	N.A.	1.38	174	69	2.5
Spain	1992	0.005 - 1.28	0.20	N.A.	N.A.	-

Source: Kraemer and others, 1998b.

It is interesting to note that Germany, while having relatively high water prices per cubic meter, does not differ significantly from other countries with respect to annual bills. This suggests that water consumption in Germany is more economical than in other Member States (Kraemer and others, 1998b).

Table 6 also shows that the variability of prices within countries is greater than the variability between countries. It appears that regional differences within or between Member States have greater influence on the costs of water supply and water prices than legal and institutional differences between Member States.

A study published by the OECD in 1999 (OECD, 1999d) compares the average affordability of household water supply bills across countries by relating them to GDP per capita and to household income, respectively.

The first column of Table 7 relates to water supply prices only. The data are based on a 1996 household water bill survey which was conducted by the International Water Services Association (IWSA) to establish the average public water supply bill of a standard four person household in a number of cities in each of the participating IWSA members. The results exclude VAT and other consumption/sales taxes. The average bill for a household of four in each country is then divided by the GDP per capita for the same year. While the absolute magnitude of the resulting data series is not relevant, it provides an indicator of relative average affordability across the OECD.

In the second column, the water prices per cubic meter are listed.

The third column presents information from the country submissions in response to enquiries made for the study. The figures in this column include both water supply prices and sewerage charges. They are presented as percentages of household incomes or expenditures.

Table 7: Average Affordability of Water Prices and Sewerage Charges

	Average prices for public water supply for a family of four, relative to GDP, based on IWSA data (1996) in EUR	Prices for public water supply in EUR/m ^{3} (year)	Sum of average water prices and sewerage charges as proportion of household incomes (Y) or expenditure (E) (1997/98)
Hungary	3.62	0.28 (1997)	> 3%[18] (Y)
Portugal	2.25		
Czech Republic	2.17	0.35 (1997)	
Germany	1.32	1.50 (1997)	
Luxembourg	1.30	0.89 (1994)	1.0-1.5% (Y)
Netherlands	1.13	1.31 (1998)	1.6%
Austria	1.13	0.94 (1997)	1.0-1.3% (Y)
France	1.12	1.23 (1996)	
Belgium	1.09	1.49 (1997) (Flanders)	
England and Wales	1.05	1.23 (1998-9)	1.3% (Y)
Spain	1.02	0.59 (1994)	1.0%[19] (Y)
Finland	0.97	1.16 (1998)	
Denmark	0.68	1.00 (1995)	
Sweden	0.59	0.89 (1998)	
Norway	0.45		
Italy	0.43	0.40 (1996)	

Source: OECD, 1999d.

The comparison of affordability and absolute water prices draws attention to the fact that low prices in international terms (Hungary, Czech Republic) can actually represent high water charges relative to per capita incomes (GDP). Similarly, water supply charges that are high in international terms (Denmark, France, the Netherlands, England and Wales, Sweden) do not necessarily reveal water charges that are the highest in relation to per capita incomes.

In terms of analyzing the effects of economic instruments, it would be revealing to disentangle the contributions each instrument makes to the total household bill, that is how taxes and charges that do not directly apply to household users, such as abstraction taxes and effluent charges, are

[18] Figure exceeds 3% "in many regions" in the low -income categories.
[19] Barcelona only (which has relatively high charges within Spain).

passed on to them through their water bills. However, this would require further research and is beyond the scope of this review.

5.5 Prices and Charges in Industrial Effluent Disposal

Charges for the discharge of effluents into natural waters are collected in seven Member States of the European Union.[20] Four of these systems will be reviewed here, namely the cases of Germany, France, Denmark and the Netherlands. Denmark and Germany levy charges only on direct discharges, leaving operators of sewage treatment plants to pass the cost of the charges on to their clients, the indirect emitters. France and the Netherlands follow a conceptually different approach by charging indirect emitters directly and either exempting the operators of sewage treatment plants from paying effluent charges (France) or granting generous reductions (the Netherlands). Either way, the indirect dischargers are brought into the charging system and have to pay their share.

In general, all of the four countries base their calculation of effluent charges on the amounts of certain pollution parameters discharged within a specified period of time. However, the charging systems differ considerably with regard to the exact calculation methods applied and the substances included. Furthermore, the types of effluent subject to effluent charges and the actors obliged to pay differ between the effluent charging systems.

As introduced in section 4, economic instruments can fulfil different functions. This preposition is exemplified in the case of the effluent charging systems of the four countries under investigation which clearly differ with respect to their main objective. The German and the

Danish system have an incentive focus, while the French and the Dutch charging systems mainly aim at revenue generation.[21]

5.5.1 Germany

The design of the German effluent charge mainly aims to provide strong incentives for pollution abatement. Industrial plants of all sizes with any quantity of discharge are subject to the effluent charging system. Sewage treatment plants are equally liable to the effluent charging scheme and no reductions or exceptions apply to them. Their costs are recovered through the sewerage charges paid by households.

The municipal authority issues permits for small discharges and the regional administration for larger discharges that is large sewage treatment plants or industry. The conditions for permits for industrial discharges are based on general emission limit values (ELV). These ELV depend on the "Best Available Technologies" (BAT). BAT- derived emission standards take the state-of-the-art technologies available for production processes and pollution abatement in the various industrial sectors into account. The environmental quality of receiving waters plays a complementary role.

In Germany, effluent charges are levied on direct discharges of effluents into natural waters. The definition of direct discharges includes:

- Industrial effluents;
- Agricultural discharges;
- Discharges from STP (sewage treatment plants);

[20] Belgium, Denmark, Germany, Spain, France, the Netherlands and the United Kingdom.
[21] Unless stated otherwise, the information presented in this section is based on Hansen and others, 2001.

- Discharges and leakage from landfills;
- Direct rainwater discharges;
- Minor effluents such as domestic sewage from decentralized treatment facilities.

No effluent charge is levied on rainwater from industrial plants not exceeding the size of three hectares. Rainwater from railway is exempted likewise.

To provide adequate incentives for being effective in directing and encouraging pollution control measures, charges must be set sufficiently high. German charging levels are set high enough for acting as deterrents to water pollution and have motivated considerable investment in pollution abatement measures. The charge of 35.79 Euro (1998) per pollution unit[22] is uniform across the entire country. Individual charges are based on the values stated in the permit and based on the following general formula:

$$EC = f(a_i; pu_i) \quad 1 \leq i \leq n$$

where *EC* is the effluent charge for one year, a_i is the charge rate for a certain pollutant, pu_i stands for the number of pollution units discharged in one year and *n* is the number of pollutants entering into the calculation. Dischargers conduct self-monitoring and the permit-issuing water authority has the responsibility of inspection. The frequency of compliance monitoring by the water authority depends on the authority except for sewerage treatment plants, for which the Urban Waste Water Treatment Directive specifies the monitoring intervals. The German system allows for rate reductions in several cases:

- If effluents meet the BAT derived ELV, the charge is reduced by 50 percent, which creates strong incentives to invest in abatement technologies;

[22] 1.5 pollution units approximately correspond to the 'toxicity' of the untreated waste water generated by one inhabitant per year.

- Charges are reduced when the monitored values are lower than stated in the permit;
- Pollutants that are subject to the effluent charge but do not exceed specified threshold values or dilution factors are not included in the calculation;
- Charges can be offset against investments in pollution abatement or expenditures for sewage treatment plants, to promote the removal of dangerous substances from industrial discharges and to support the adoption of BAT.

The total revenue generated by the effluent charge is quite high (365 million Euro in 1999), especially given the possibilities for offsetting the charge against investment, resulting in reduced revenues. At present, of the countries considered here, only Germany operates a system where revenues generated by the effluent charge may under certain conditions be sufficient for offsetting investment in water resource protection and management. Revenues are collected on an annual basis. As the *Länder* are the competent authorities for water management and legislation, they are the recipient authorities and in addition responsible for the distribution of revenues. Revenues from the effluent charge are earmarked for a range of water management activities, such as subsidies for the investments in water pollution control and cost coverage for other quality improvement measures. The revenue is thus used to maintain and improve water quality and also fulfils a financing function.

5.5.2 France

The French effluent charging system has been established to raise funds for water quality management, and for covering water pollution control by the authorities and investments into sewage treatment plants. The design of the system therefore aims foremost at providing a financing function. To a lesser degree, it sets incentives to reduce water pollution by furthering the adoption of BAT and the building of sewerage treatment plants.

The French effluent charging system applies to direct discharges into surface waters and indirect discharges into the public sewer system. Indirect industrial and household discharges into the public sewerage system are thus included in the effluent charging system. Non-domestic dischargers (large industries) are charged for direct discharges and households and small and medium sized enterprises (SME) are charged indirectly (water companies pay the charge for their clients and pass the incurred costs on to them).

The responsibility for issuing discharge permits depends on the type of discharger. The Regional Directorates for Industry and Environment (DRIRE) issue permits for industrial dischargers, while the *Préfets de Département* are responsible for sewage treatment plants. The permit conditions for industrial discharges are based on sector-specific ELV (set by a ministerial decree) and the water agencies provide incentives to introduce BAT through bonuses. Pollution fees are collected from the households by the municipalities (or concessionaires in case of delegation) via the water bill, while the Water Agencies collect the pollution levy from industry.

Several exception regulations exist with regard to effluent charges:

- municipalities with less than 400 inhabitants are exempted from the charges;
- discharges from sewerage treatment plants into natural waters are exempted from the charge.

French effluent charges differ across the six regional water agencies and also according to the size of the urban area (Buckland and Zabel, 2002). Charges differ between regions. For industry, charges are based on the quantity and quality of effluents discharged[23] and are calculated on the basis of actual measurement as determined by self-monitoring and compliance monitoring.

[23] For an exact equation, please refer to Buckland and Zabel, 2002.

In total, the French effluent charging system generated a revenue of 1260.0 million Euro in 1999 (OECD, 2002). The authorities receiving the revenue are those issuing the permits. The money from all effluents is collected into one “basket”, so that the revenue is relatively high and used for a variety of tasks, such as the building and upgrading of public sewerage systems, water management in general, monitoring and measures to improve water quantity and quality. The earmarking is hence relatively general.

In the French system premiums for good environmental performance can be granted, which sets additional incentives for pollution abatement.

5.5.3 Denmark

The Danish effluent charging system mainly aims to provide strong incentives for pollution abatement. It is a fiscal instrument as the revenues generated by the tax are not earmarked and added to the general government budget.

The municipal authorities issue permits for small discharges and the regional administration for larger discharges that is large sewage treatment plants or industry. The conditions for discharges emphasize the importance of the environmental quality of receiving waters in addition to the consideration of ELV. Like in Germany, effluent charges are only levied on direct dischargers of effluents into natural waters.

Several exceptions are granted from paying the Danish effluent charge. The discharges from mussel plants, fish farms and overflows from combined sewage collecting systems and stormwater discharges are exempt from all payments. Furthermore, rates reduced by 70 percent to 97 percent exist for entire sectors, namely the fishing, cellulose, vitamin, and pigment industries.

The Danish effluent charge is calculated according to the following equation:

$$EC = 2.67EUR * x\ kg\ N_{tot} + 13.35EUR * y\ kg\ P_{tot} + 1.47EUR * z\ kg\ BOD_5$$

with x, y and z being equal to the total amount of Nitrogen (N_{tot}), Phosphorus (P_{tot}) and biochemical oxygen demand (BOD_5) discharged per year. Charges are calculated on the basis of actual measurement as determined by self-monitoring and compliance monitoring; charges for small discharges are based on standard rates (estimates). Only in Denmark are charges for major dischargers collected on a quarterly basis, while revenues collected for minor discharges are transferred to the regional offices of the Ministry of Taxation once a year.

By setting high charges for nitrogen and phosphorus, the Danish effluent charging system promotes the reduction of nutrient inputs into natural waters. BOD_5 reduction is not effectively promoted, as its effluent charge is relatively low.[24]

In 1999, the effluent charge generated a revenue of 37 million Euro. The recipient of the revenue is the Danish Ministry of Taxation rather than the authorities competent for water management and regulatory aspects. Revenues generated by the effluent charge are thus not earmarked in Denmark, but constitute a contribution to the general budget.

5.5.4 Netherlands

The main objective of the Dutch effluent charging system is the fulfillment of a financial function, namely the generation of revenue for quality management of local and state waters. The division of tasks and responsibilities for water management and regulation in the Netherlands is unique, with the type (size) of the receiving water being the determining factor. While the Water

[24] This argumentation builds on the fact that it is not possible to control for single parameters separately but only to influence the composition of effluent output of a production process.

Management Authority (*Rijkswaterstaat*) is responsible for the state waters (that is, the main rivers), the management of regional waters is carried out by the water boards.

The division of the competence to issue permits for discharges mirrors the division of responsibilities for water management. Hence the Water Management Agency issues permits for discharges into state waters, while issuance of permits for discharges into regional water is under the authority of the water boards. Like in the Danish system, the conditions for discharges emphasizes the importance of the environmental quality of receiving waters in addition to the consideration of ELV. Furthermore, environmental policy negotiated agreements play an important role

The effluent charge applicable to discharges into state waters is a flat rate of 31.76 Euro per pollution unit. The rates for discharges into regional waters differ between water boards and are higher than for state waters (39.03 Euro per pollution unit on average in 1999). Individual charges are calculated on the basis of actual measurement as determined by self-monitoring and compliance monitoring. For small discharges, charges are based on standard rates (estimates).

The revenue includes effluent charges from households and from indirect and direct industrial emitters. In 1999, total revenue amounted to 900 million Euro. Effluent charges paid for discharges into state waters are administered and collected by the state water authority, while fees for discharges into local and regional waters are managed by the Water boards. Like in France, the earmarking of revenues is rather broad and the charging system provides funds for a variety of tasks, such as subsidies for investment in sewerage services and water pollution control (financial function).

Table 8: Industrial Effluent Disposal in Selected European Countries

Country	Effluent charging system	Collecting authority	Effluents / tax base	Tax rate	Actors paying	Exceptions
Denmark	Effluent tax introduced in 1997. Direct dischargers pay on the basis of volume solids discharged into all types of natural waters; the tax is calculated and collected on a quarterly basis; total revenue in 1999: EURO 37 million; Instrumental-incentive charge.	Regional offices of *Skatteministeriet* (Danish Ministry of Taxation) collect charges from industry and STP operators. Local councils collect effluent charges from small direct dischargers.	All direct discharges into all types of natural waters except rainwater discharged directly.	Charge is calculated according to formula taking pollution load of Phosphorus, Nitrogen and BOD_5 into account (see text)	All direct dischargers: sewage treatment plants, industrial dischargers and units located in sparsely build-up areas which are not connected to the sewer system.	Discharge of rainwater, stormwater discharges and discharges of groundwater or surface water. Mussel plants, fish farms, if the source of water supply and the receiver are identical.
Germany	Federal effluent charge introduced in 1976 (charge collected since 1981). Incentive charge. Federal effluent charges act last amended in 1998.	*Umweltministerien der Länder* (State Environment Ministries) they may also delegate the collection of charges to the municipalities.	All direct discharges into natural waters (including groundwater): industrial and STP discharges, rainwater, agricultural discharges, minor effluent releases and domestic sewerage.	1998: EUR 35.79 per pollution unit (pu)	Any effluent discharger.	(§10 *AbwAG*) Water that has not been changed in character or use. Water used for mining and discharged into artificial waters. Discharge of rainwater under certain conditions.
France	Distributive charging scheme (*redevance pour pollution*) introduced in 1964. The revenue is returned to the polluter in the form of subsidies for pollution abatement.	Municipality, or in case of delegation the concessionaire collects the "*redevance*" (included in the	All discharges to surface waters and sewers are subject to the charge.	Charges are based on pollutants; differ between regions	Households (water bills), industry and agriculture. Non-domestic dischargers (large industries) are	Effluent charges from STP. Municipalities < 400 inhabitants.

Country	Effluent charging system	Collecting authority	Effluents / tax base	Tax rate	Actors paying	Exceptions
		water bill) from the households. *Agence de l'Eau* receive the *redevance*.			charged for direct dischargers, and households and SME are charged indirectly - water utilities pay the charge for SME and pass them on to the client.	
Netherlands	Water Pollution Charges (pollution levy →into state waters / pollution tax → into local waters) apply to all direct and indirect dischargers (industry, agriculture, households). Financing quality management of local and state waters (incl. STP).	*Bureau Verontreinigings-heffing Rijkswateren* (Office for Pollution Taxes State Waters)	Industrial and STP discharges (STP operators only pay 10% of the tariff for industry), agricultural discharges, effluents and leakage from landfills, minor effluent releases and domestic sewage.	1999: EUR 31.76/pu for discharges into state waters; EUR 39.03/pu on average for discharges into regional waters	Discharges to surface waters and sewerage systems are liable to the charge.	No exceptions. Note: information from database1 indicates that the discharges from STP are exempt, but questionnaires sent to officials states that charges are merely reduced.

Source: Hansen and others, 1998.

5.6 Subsidies in the Water Sector

As the definition of subsidies in section 4 already revealed, environmental subsidies constitute a large field of study, encompassing a variety of possible schemes and measures. The following section, therefore, aims at giving an introductory overview on some subsidy schemes currently operating. The examples presented are mostly drawn from European countries (EU Member States and accession countries). Box 6 additionally introduces the case of New Zealand, which removed all agricultural subsidies in 1984.

5.6.1 Subsidies Related to Environmentally-Friendly Farming

Most countries operate financial transfer schemes that, rather than regulate, offer incentives to farmers and other landholders to achieve a desired environmental outcome. It has been questioned whether these measures can be regarded as subsidies, as they are often made in return for an environmental benefit. However, as subsidies for environmentally friendly farming are part of the overall incentive structure that influences water-relevant behavior of farmers, they are included in the analysis conducted here. In the following (see Table 9), four different compensation schemes are presented as an exemplification.

Table 9: Subsidies Related to Environmentally-Friendly Farming

Country	Conditions related to payments for environmentally-friendly farming	Effects / objectives
Czech Republic	Given to farmers that experience losses due to cultivation limitations in protection zones for drinking water abstraction	
UK	Nitrate Sensitive Area scheme (NSA): payments range from EUR 79 per hectare for restrictions on nitrogen fertilizers, to EUR 843 for the conversion of arable land to native species grassland A total of EUR 5.1 million was paid in 95/96; the Ministry of Agriculture, Fishery and Food introduced farm waste grants for the installation or improvement of farm waste facilities	The NSA aims at reducing the loss of soil nutrients from agricultural practices The farm waste grant was introduced to help farmers to comply with the EU Nitrate Directive (91/676/EC)
Ireland	Rural Environmental Protection Scheme (REPS) Grants are provided to farmers who adopt nutrient management plans for the purpose of protecting water quality	
Sweden	a) 1989/1990: compensation payments for cultivation of nitrogen-fixing crops (Gotaland and Svealand) b) 1989: a temporary compensation scheme for farmers who convert all or a part of their acreage to organic production	a) In order to reduce the use of pesticides by introducing more efficient active ingredients and by lowering dose-rates

The **Czech Republic** operates a subsidy scheme under which financial transfers are made to farmers that experience losses due to cultivation limitations in protection zones for drinking water abstraction.

In the **UK**, the Ministry of Agriculture, Fishery and Food operates a group of subsidy schemes that aim to protect and enhance the quality of the rural environment. Among the most important are the Nitrate Sensitive Area scheme (NSA), which aims to reduce the loss of soil nutrients from agricultural practices, and the implementation of the European Union Nitrate Directive.

The NSA compensates farmers who voluntarily change their farming practices in ways which significantly reduce the leaching of nitrates. Payments within this scheme range from 79 Euro per hectare for restrictions on nitrogen fertilizers, to 843 Euro for the conversion of arable land to native species grassland (1995/96). In 1995/96, a total of 5.1 million Euro was paid to farmers.

The implementation of the European Union Nitrate Directive requires the designation of Nitrate Vulnerable Zones (NVZ), in which farmers are obliged to change their farming practices. In order to help farmers comply with the restrictions on the spreading of livestock manure in NVZ, the Ministry of Agriculture, Fishery and Food reintroduced farm waste grants for the installation or improvement of farm waste facilities (Kraemer and Buck, 1997).

The Department of Agriculture, Food and Forestry in **Ireland** operates a Rural Environment Protection Scheme (REPS), under which - among other purposes - grants are provided to farmers who adopt nutrient management plans for the purpose of protecting water quality (Egan, 1996).

From 1988 onwards, **Sweden** initiated a variety of compensation schemes for farmers in order to supplement existing regulations regarding limitations of the use of pesticides, fertilizer, and manure. In 1989 and 1990, for example, compensation payments for cultivation of nitrogen-fixing crops was granted in Gotaland and Svealand. In order to reduce the use of pesticides by introducing more efficient active ingredients and by lowering dose-rates, farmers were encouraged by this compensation to test improved field crop sprayers. Furthermore, a temporary compensation scheme was introduced in 1989 for farmers who converted all or part of their acreage to organic production (Bergvall, 1996).

New Zealand reports that there are currently no government subsidies for farmers to improve environmental performance (see Box 6). Instead, it is considered necessary to remove distorting price signals that lead to environmental ‘bads’ before introducing measures to assist farmers for the provision of environmental ‘goods’ (Shepherd 1996).

Box 6: Case Study New Zealand - Effects of the Removal of Agricultural Subsidies

In 1984 and subsequent years, New Zealand removed virtually all direct and indirect support for agriculture. Affected measures were:

- output price assistance for agricultural products;
- input subsidies for fertilizer and pesticides;
- subsidies for irrigation and drainage schemes;
- land development loans and subsidized credits;
- tax concessions;
- free government services to farmers;
- subsidies for soil conservation and flood control.

While these measures were largely taken for economic reasons, it was also considered necessary to remove distorting price signals, and to address environmental 'bads' before offering governmental assistance to farmers for the provision of environmental 'goods'.

The decline in income that resulted caused difficulties for rural communities. Farmers reacted by cutting back on all discretionary expenditures (fertilizer use, non-essential repairs and maintenance, new land development, new equipment). They also laid off labor and did more work themselves. Credit mediation and writing off about 20 percent of the total farm sector debt helped to limit the number of farms being sold to about 5 percent.

The removal of government support had a number of environmental implications:

- In some cases the financial stress of farmers led to short-term exploitation of the resource base;
- The development of marginal lands virtually ceased;
- Livestock numbers declined;
- The use of fertilizers and other agricultural chemicals decreased;
- Forestry plantings continued to increase;
- The previously constant increase in demand for irrigation water stabilized.

Overall, the New Zealand experience implies that the removal of subsidies may be a necessary, but not a sufficient, condition to redress the environmental impact of agriculture. The remaining externalities still have to be targeted through domestic environmental policies.

Source: (Shepherd, 1996)

5.6.2 Other Water Subsidies

While compensation payments for environmentally friendly farming constitute a common subsidization scheme, most countries operate additional subsidies to set incentives within the framework of water management.

In **Norway** and a number of other European countries**,** there are some subsidies for the building of new and the upgrading of existing water plants (Sjoholt, 1996). In **Denmark**, municipal and private water works generally seek to cover the full amount of capital and operational costs via water tariffs and charges. As of 1993, the average price for water was 0.414 Euro per cubic meter. Generally, the water price per cubic meter is the same for all types of consumers and remains constant regardless of consumption. However, there are some examples of quantity discounts for industrial users. In regard to the tax on water abstraction that recently has been introduced as part of the "green tax reform" (see section 5.1.1), industrial water users can deduct this tax on water consumption on their VAT-proceeds (Wallach, 1996; Andersen, 1996). Assumed, that the additional costs imposed upon consumers by the tax on water consumption still do not cover all of the environmental costs involved, this tax exception, in principle, could be regarded as a subsidy. However, although methodologically consistent, the inclusion of exceptions from environmental taxation schemes in the concept of subsidy seems problematic, as the non-inclusion of environmental costs into water prices is the norm in OECD member countries and full recovery of economic costs of water services is still the exception.[25]

5.7 Tradable Permits in Water Resource Protection and Management

Despite the growing importance of water resource allocation issues in many countries, little emphasis has so far been placed on the economically efficient allocation of water. Only three states have accumulated substantial experience with water-based tradable permits, namely Chile,

[25] If environmental costs are not taken into account in water prices, this constitutes de facto an indirect subsidy, as costs are incurred but not recovered (see also section 4.5).

the US and Australia (in both the US and Australia tradable permit schemes exist in more than one state).

While the EU has adopted a provision to allow for water trading (Kramer and Banholzer, 1999), it has not yet been applied anywhere so that the postulated process of policy learning cannot be observed. Therefore, the following section will present two case studies on the systems operated in Chile and Australia only and discuss their accumulated experience. The intention of this section is to give the reader a brief introduction to the field. For a more detailed discussion and review of existing tradable permit schemes, the interested reader is referred to Kraemer, Interwies and Kampa (2002) or Kraemer and Banholzer (1999).

5.7.1 Chile

Chile moved to tradable water permits soon after its transition in 1973 to a market oriented society. The introduction of tradable property rights to water can be termed a “natural extension” of the initiated reforms that stressed open trade, the power of markets and economic liberalization, as it aimed at strengthening property rights, a more efficient water use and introduced market principles (Holden and Thobani, 1996).

While the Chilean water market has been in operation since 1976 following the privatization of previously state-owned land and water resources, the passing of the Chilean Water Code in 1981 made the system more effective. According to the law’s provisions, the state grants existing water users property rights to both surface and ground water without charge. New or unallocated rights are then auctioned off. Water rights are completely separate from land rights and their property status is based on the property laws of the civil code and, except for a few restrictions, they can be transferred or sold to anyone for any purpose at freely negotiated prices. Accordingly, water

usage and the allocation of rights are independent of pre-determined priorities and market forces alone determine the allocation of water and its use.

The acquisition of water rights requires notification in a public register and the presumptive use of the acquired right either as consumptive or non-consumptive, permanent or temporary must be recorded. Different regulations apply for the different uses (Holden and Thobani, 1996):

- *Permanent consumptive use*: rights are defined in volumetric terms. In cases where the demand for water exceeds the available quantity so that not all permit holders can be fully satisfied, water is distributed proportionately.
- *Temporary consumptive rights*: these rights are only considered after all permanent consumptive rights have been met.
- *Non-consumptive rights*: are granted in cases where the water is returned to its source at a specified location and time (for example for hydropower stations).

While non-consumptive rights account for the largest water use, the number of consumptive permit holders is about twice as high.

5.7.2 Australia

The Australian States of New South Wales, South Australia, Victoria and Queensland have established legislative provisions for transferable water use rights. However, there is still no example in Australia of a free market for trades in water rights, and a number of restrictions are imposed by water management authorities. There are restrictions on the spatial transfer of water use, volume controls, and environmental considerations such as the preservation of river flow, control of salinity, and protection of wetlands and river ecosystems. The water authorities facilitate trades rather than participate in the water market, although they usually are empowered

to veto trades if the conditions are unacceptable. Most authorities monitor trades and keep registers of buyers and sellers (James, 1997).

The New South Wales Environment Protection Authority (NSW EPA) has introduced a pilot system for salinity control in the Hunter Valley, and a number of Australian States are considering tradable discharge rights (James, 1997). Tradable rights have also been introduced for the Murray-Darling Basin, providing for salinity trades between New South Wales, Victoria and South Australia (inter-state trading). New South Wales is adopting a supplementary scheme, but this scheme is limited in scope and potential impact.

An important factor in the development and diffusion of the use of tradable permits for water resource allocation and water pollution control has been the co-operation over the river Murray and its tributaries through the River Murray Commission (later the Murray-Darling Basin Commission) established originally by the River Murray Waters Agreement.

5.7.3 Policy Recommendations

Kraemer, Interwies and Kampa (2002) enumerate several points to be considered for the effective initiation and operation of a tradable permit scheme.

- First of all, the definition of property rights and a transparent initial allocation mechanism are vital to the success of any trading scheme.
- Secondly, in most cases, the schemes of water tradable permits need to consider the regional physical scale for the development of a market, and bear in mind the specific framework of each region.
- Thirdly, successful trading regimes tend to be built on pre-existing institutions and are integrated into traditional regulatory regimes. This often includes the combination of tradable permits with other economic instruments (for example taxes, charges) in order to form instrument mixes for more effective water management.

- Finally, the success and effectiveness of water trading markets depend on the frequency of trades and the number of market participants.

5.8 Liability and Risk Allocation

In the case where no set of environmental liability laws applicable to the water sector exists, so that damage to the aquatic environment is borne by society in general, all other efforts to effectively establish the polluter-pays-principle are undermined. Environmental liability laws, which act as a believable threat that anyone who causes environmental damage must pay for its repair, provide enormous incentives for prevention and avoidance.

In the following Box 7, the case of Sweden will be exemplified. Its legislative framework underwent major structural changes over the last years as a reaction to a perceived lack of adequate tools for reacting to infringements of environmental laws.

Box 7: Environmental Liability Law in Sweden

Swedish environmental legislation has undergone major structural changes over the last years. On 1 January 1999 the new Environmental Code (EnvC) came into force which replaces and extends 15 former acts and implements all relevant EC legislation. The code aims to "promote sustainable development, so that present and future generations will be guaranteed a safe and healthy environment" (Swedish Environmental Protection Agency, 2000).[26]

With the EnvC, a new approach is being followed, namely to determine the actions to be taken for avoiding damage and for promoting sustainable development on the basis of the effects an action has instead of its nature.

Along with the establishment of the new EnvC came a change in procedural rules. Five regional environmental courts have been instituted that have two basic functions: First, they are entitled to grant permits for potentially harmful activities, and second they determine whether an environmental damage (property damage, personal injury and economic loss) has been caused by environmental pollution. The granting of permits must be in accordance with an Environmental Quality Standard (EQS) set by the government that outlines the highest permitted concentration of a substance in water within a fixed geographical area.

Environmental interest groups with more than 2000 members that existed for at least three years have the right to appeal against permit or exemption decisions taken by the court.

The most important principle enacted through the EnvC is the precautionary principle, a natural extension of the polluter-pays-principle: everyone must take necessary precautions to prevent and reduce damage to human health and the environment.

Failure to comply with the requirements as set by the EnvC is subject to penalties ranging from fines to two years of imprisonment. Operators, whose actions caused disturbances to the environment and resulted in personal or financial losses, are under duty to pay compensation. Furthermore, the law requires environmental repair: Those who currently carry out an operation which causes pollution on land or water are liable for the repair of any environmental damage caused by the operation. This also applies retroactively to those who have carried out a polluting operation after 30 June 1969[27].

Since the early 1990s, there has been extensive discussion in the EU about a community-wide applicable environmental liability regime. In 1993, the Council of Europe concluded the "Convention on Civil Liability for Damage Resulting from Activities Dangerous to the

[26] Source: http://www.internat.naturvardsverket.se.
[27] Source: http://www.law500.com.

Environment" (Lugano Convention)[28], which aimed at making possible the adequate reparation for damage resulting from activities that are a hazard to the environment. It is based on strict liability and recognizes the role of environmental NGOs as important actors. It has, however, not entered into force so far (as of 13 November 2002[29]), as the condition (three ratifications) has not been fulfilled.

Also in 1993, the European Commission drafted a Green Paper on responsibility for environmental harm, which elicited the comments of several Member States, environmental protection organizations and associations of industries. The White Paper on Environmental Liability that was published in February 2000 (European Commission, 2000c) examined how the polluter-pays principle, one of the key environmental principles in the EC Treaty, can best be implemented, and how a Community regime on environmental liability should be designed. It concluded that drawing up a Directive would be the best way to set up a Community regime for environmental liability.

As a result of the discussion following the publication of the White Paper, the European Commission produced a proposal for a Directive on Environmental Liability in January 2002 (European Commission, 2002a). The aim of the proposal is to adopt a comprehensive European regime for the prevention and remedying of environmental damage, and to ensure that the affected areas are cleaned up, which is not always guaranteed under the differing national laws (CES, 2002). The main provisions of the proposed Directive will be shortly reviewed here.

[28] Source: http://conventions.coe.int/.
[29] Source: http://conventions.coe.int/Treaty/EN/CadreListeTraites.htm.

Box 8: The Proposal for an EU Directive on Environmental Liability

The proposed liability regime applies to environmental damage and to any imminent threat of such damage. The system is based on public law and thus excludes civil liability and traditional damage (such as personal injury and damage to property). The reason given for this is that natural assets are in most cases not privately owned, and that the loss of natural assets normally affects society as a whole (European Commission, 2002b). The Directive would have a closed scope of application linked with European environmental legislation. Environmental damage should be defined "by reference to the relevant provisions of Community environmental law" (European Commission, 2002a). Environmental damage thus includes damage caused to the aquatic environment (according to the Water Framework Directive), biodiversity (regulated by Community legislation on nature conservation), protected areas (under national/regional legislation) and soil contamination which causes harm to human health. The proposed regime would not apply to diffuse or non-specific source damages such as forest damage caused by acid rain.

The proposed regime imposes mostly strict liability (with several defenses), which implies that liability is based on causation irrespective of fault. The decisive factor is whether damage has occurred, not whether it has been caused by incorrect or negligent behavior.

The actors potentially liable under the Directive for the costs of preventing or restoring environmental damage are the operators of risky or potentially risky activities which are listed in Annex I of the proposal (e.g. chemical industry). Activities not included in the list can also be liable if they cause damage to biodiversity, but only if the operators are found to be negligent (fault-based liability).

Public authorities are charged with enforcing the regime. It is their responsibility to ensure that operators undertake or finance measures to restore or prevent environmental damage. This entails the need to conduct investigations, to assess damage or the danger of damage and to determine the most appropriate preventive or restorative measures. Competent authorities are designated by each Member State. If the operator is unable to pay for all or part of the necessary measures or cannot be found ("orphan damages"), the Member States have to ensure that the measures are taken, and may set up alternative financing mechanisms (such as financial guarantees, securities or collective funds).

Environmental public interest groups, alongside with legal and natural persons likely to be adversely affected by environmental damage, are entitled to require action to be taken by the public authorities or to challenge their decision before courts (access to judicial review).

Liability is prospective and not retroactive, which means that pollution that occurred within a Member State prior to the adoption date of the EU-liability regime will be dealt with under the Member State's legislative provisions.

Exemptions: The proposal does not cover environmental damage resulting from an armed conflict, a natural disaster, emissions allowed to the operator by permit, authorization or laws or regulation (permit-defense), or activities which were not considered harmful according to the state of scientific knowledge at the time the activity took place (European Commission, 2002d).

In the comments on a working paper preceding the proposal, some regret has been expressed by the Member States that civil liability and traditional damage are not covered any longer, and there is concern about potential financial consequences to public authorities in relation to "orphan damages" that is when the polluter cannot pay for restoring the damage (European Commission, 2002a). Discussions are still going on regarding the issues of permit defense and whether financial security should be mandatory or optional.

The proposal is currently undergoing a legislative procedure at the end of which the European Parliament and the Council of Ministers will jointly adopt the new Directive. It is thus likely to enter into force within the coming two or three years.

Sources: European Commission, 2002a, b, c and d; EEB, 1998.

5.9 Financial Arrangements in Water User Associations

The German 'Water Association Act' allows for the formation of so-called water user associations. They are self-financing institutions for the construction and finance of water infrastructure. Their scope of operation includes the allocation of services among users, sewerage, the promotion of co-operation between agriculture and water management and other water management functions (Kraemer and Jäger, 1997).

The operation of these water associations is financed purely through the members' fees. Members control the association according to democratic principles with voting rights weighed according to the economic importance of water use or water pollution. For members who do not directly abstract or discharge water, voting rights can be based on the benefits derived from the associations activities or the economic burden the association imposes on the member (Kraemer and others, 1998a). Association statutes can provide for an association committee (*Verbandsausschuss*), consisting of elected members acting on behalf of all members, to assume functions of the general assembly.

A water association can be established by the unanimous decision of all interested parties and subsequent approval by the supervisory authority, or by majority decision of interested parties

and approval including the enforced participation of additional members. The approval for the construction of a water association may be denied if the proposed association's objectives are already or could better be fulfilled by another corporation. All those who benefit or can expect to benefit from the association, are involved in the establishment of an association. In cases where non-members benefit from the association, they can be required to make a financial contribution. Furthermore, associations have the right to use all land needed for their operations and can even expropriate property. However, anyone suffering a direct economic loss because of an association's activities is entitled to a compensation.

Water associations can themselves become members of, cooperate with, or transfer part of their responsibilities to other associations, thus creating networks of associations. Upon the fulfillment of certain circumstances, associations can be dissolved, either by decision of its members and the approval of the supervising authority, or by order from the authority (Kraemer and others, 1998a). To date, River Basin User Associations are exclusively found in the German states of Lower Saxony, Brandenburg, Saxony-Anhalt, Schleswig-Holstein, and Mecklenburg-Western Pommerania. Provisions for their establishment are made by the respective state Water Management Act, which clearly prescribes maintenance of inland waters as a public duty.

Activities of such associations, however, only include management and maintenance of second order watercourses as defined by the water acts. The first order river maintenance and management remains in the owner’s hands, which in most cases is the federal state or the *Länder*.

In the following Box, the case of the River Basin User Association *Hunte* in Lower Saxony will be presented.

Box 9: River Basin User Associations in Lower Saxony

One of the 115 River Basin User Associations in Lower Saxony is the *Unterhaltungsverband 'Hunte'* named after the main watercourse in the Hunte precipitation area. It was first established in 1965 based upon the Lower Saxony Water Act. Pursuant to Paragraph 100 of the amended Water Act of 1990, the association constitutes a Water Management Association in accordance with the Water Associations Act.

The River Hunte rises near the *Mittellandkanal* and is a tributary of the River Weser. From its source it runs northwards and then joins the Weser at Elsfleth north of Bremen. Responsibility for the Hunte river basin is shared between four associations, with the *'Unterhaltungsverband Hunte'* being in charge of the upper catchment area. The total length of this second order water system is 794 km draining an area of 99,330 hectares covering approximately 4 rural districts *(Landkreise*). Competency for supervising the association's work and activity lies with the rural district authority of Diepholz.

Real-estate ownership in the catchment area is a necessary requirement for becoming a member. To date, the Hunte association has approximately 17,250 individual members. Additionally, two neighboring water management associations serving the downstream reaches of the Hunte watershed also hold a membership. This linkage provides a platform for close co-operation with regard to watercourse maintenance and management along the Hunte river basin.

The association's main duty according to its statute - and required by state law - is to properly maintain watercourses so as to support the natural drainage regime. Accordingly, keeping the functional status of all managed catchment waters is a central issue. Fieldwork activities of the association range from the mowing of slopes or river bed maintenance to river bank stabilization and clearing of drainage ditches. In addition, the association operates several dams/water retaining works, locks, and bucket elevators in the catchment area. Co-ordination of all necessary activities is achieved through a maintenance and management plan listing the material and staff required. The plan is drawn up on an annual basis. Assessment of the work of the association takes place annually in the form of an inspection tour by members of the supervising authority *(Verbandsschau).*

Source: Kraemer and others, 1998a.

The Water Associations West German Canals (*Wasserverband Westdeutsche Kanäle - WWK*) constitutes a further example of institutional arrangements for inter-basin management (or 'inter-sub-basin management') allowing the integration and development of shipping canals, power station cooling, water supply, and ecological needs in densely populated and heavily industrialized areas.

Box 10: The *Wasserverband Westdeutsche Kanäle*

To maintain shipping on the Dortmund-Ems-Canal linking the industry in the Ruhr area to the port of Emden (completed in 1899), the Rhine-Herne-Canal providing a link to the Rhine (1914), and later on the Wesel-Datteln-Canal serving the northern part of the Ruhr Area (1931, see map) the Datteln-Hamm-Canal in the East (1914) was used to bring Lippe river water of good quality from Hamm into the canal system to replace the water used in the operation of locks. The availability of good water in the canals lead to an increase in demand as industrial users were attracted. In effect, Lippe water was transported through the canals to water users – power stations, mining pits and industry – but also agriculture and drinking water production (groundwater recharge). A minimum flow of 7.5 m^3 per second was left in the Lippe.

In 1968, the Federal Republic of Germany as the owner of the canals and the *Land* North Rhine-Westphalia signed an Agreement concerning the Improvement of the Lippe Flow, the Feeding of Water to the West German Shipping Canals and Water Supply. Compared to the previous arrangements, the agreement brought two important changes. One was the increase in pumping capacity at the canal locks to cover the operational water need and to pump water from the Ruhr at Duisburg (and from the Rhine if need be) for the benefit of water users along the canal system. The other change was that the minimum flow of the Lippe was increased to 10 m^3 per second and changes were made so that up to 4.5 m^3 per second of canal water can be pumped into the Lippe to increase its flow in the interest of water supply and river ecology.

The canal and Lippe water regime can now be operated in two modes. The first is the abstraction of Lippe water to feed the canals and provide water for abstraction; the second is to reverse flow and pump canal water, Ruhr water, and *in extremis* Rhine water, up into the Lippe (see map). During the extremely dry accounting period from November 1990 to October 1991, a total of 199 million m^3 was taken from the Lippe when flow was sufficient, and 33.3 million m^3 were added to the river when the flow was low (WWK, 1993). Water for industry amounted to 79.0 million m^3 and a further 83.2 million m^3 were provided for non-consumptive use (cooling).

In order to raise the capital investment required, the *Land* instigated the establishment of the Water Associations West German Canals, with the *Lippeverband*, 37 water users (abstraction only) and 7 public water suppliers being members; another 20 small users are not members. The Water Association West German Canals also operates and manages the infrastructure. The annual turnover or budget of the association is around DM 5 million. Since 1982, water quality in the canals is monitored even though this is not strictly within the remit of the association. Changes to be agreed in association's statutes over the next few years may provide a basis for measures to improve the ecological quality of the Lippe.

5.10 Concluding Remarks on Economic Instruments in Water Management in the EU

As the presented case studies have demonstrated, the European experience with economic instruments in water management is varied and extensive. While some instruments are used in all or the majority of European countries (sewerage charges, water prices), others find no application

at all (tradable permits). In most cases, economic instruments fulfil more than one function and they are often intended to provide incentives for a more environmentally-friendly behavior. Revenues generated are often earmarked and reemployed for further water management activities, or used as an additional source of finance for the general government budget. This second option allows for a reduction in other taxes and may shift the tax burden from economic "goods" (labor) to economic "bads" (pollution).

6 The European Water Framework Directive

The *European Water Framework Directive* (WFD)[30] is one of the first environmental policy Directives of the European Community that explicitly draws on economic instruments for achieving its objectives. Economic approaches integrated into the Directive foremost include the polluter-pays and the cost-recovery principles.

While economic principles are to play an important role, Article 1 of the Directive also makes it clear that the WFD is not intended as a one-dimensional "economization" of European water management by stating that "water is not a commercial product like any other but rather a heritage which must be protected, defended and treated as such."

The purpose of the WFD (Article 1) is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. Its key objective is to establish "good water status" for all waters by 2015.

The main provisions of the Directive include

- the promotion of sustainable water use;
- the reduction of groundwater pollution;
- the mitigation of the effects of floods and droughts.

The WATECO guidance document

The EU Member States, Norway and the European Commission agreed on a common strategy approach for the implementation of the WFD. Accordingly, several European Working Groups of

experts and stakeholders have been created to prepare "guidance" documents on the main issues of the Directive for ensuring concerted actions and parallel developments across Member States. One of the groups, the WATECO group (WG 2.6) dealt with the Economic Analysis of water uses and produced the WATECO guidance document. The paper is of a legally non-binding character but directs the efforts undertaken in the different Member States (WATECO, 2002).

The Economic Instruments in the WFD and Their Rationale

For a first overview, the economic requirements integrated into the WFD can be grouped into three broad categories:

- The economic analysis of water uses (regulated by Article 5 and Annex 3 of the Directive);
- The justification of exceptions and the declaration of heavily modified water bodies;
- Water pricing that ensures an adequate cost recovery for water services.

Different time horizons apply for these three categories. The *economic analysis of water uses* involves setting up of an inventory of water uses, a process which has to be completed until 2004. The *justification of exceptions and the declaration of heavily modified water bodies* have to be included in the river basin management plan for 2009, while a system of *water prices that fulfils the principle of cost-recovery* for water services has to be operational by 2010.

As indicated by the time horizons, the economic analysis is the first task to be tackled by Member States. Firstly, the analysis must provide sufficient information to determine whether water services meet the condition of cost recovery. Secondly, it should enable a decision on which

[30] Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in field of water policy. The full text of the Directive can be downloaded in English, French, Spanish and Portuguese from the following webpage: http://europa.eu.int/eur-lex/en/search.

combination of measures allows to restore the good status most cost-efficiently. The economic analysis will be reviewed until 2013 and from then on regularly every 6 years.

According to the WATECO document (WATECO, 2002), water services include

- abstraction, impoundment, storage, treatment and distribution of surface water or groundwater;
- waste water collection and treatment facilities, which subsequently discharge into surface water.

The definition has deliberately been constructed very broadly and makes no distinction between private and public provision.

Three different types of costs of water services have been identified by the WATECO working group, namely operating, environmental and resource costs. *Operating costs* include maintenance and capital costs as well as internalised environmental costs, for example water abstraction charges. *Environmental costs* relate to damages to the environment caused by the provision of water services. As only those costs that are associated with the provision of water services are to be considered the definition excludes damage caused by diffuse pollution. Finally, *resource costs* are scarcity or opportunity costs that result from excess demand for water.

The economic analysis can answer two questions with respect to these three cost categories. Firstly, whether the costs are met by user payments or by subsidies, and secondly whether all cost types are paid by the users of a specific service or only the direct operating costs.

The condition of cost-recovery for water services is anchored in Article 9 of the WFD and constitutes the second task on the agenda for Member States. Until 2010, they have to ensure that users pay their share of the costs of the provision of water services. The information gained through the economic analysis is to form the basis for the necessary calculations.

7 Relevance of EU Experience for Latin American Countries

The preceding chapter has provided additional evidence of the advantages of using economic instruments in the water management sector. The following sections try to build a bridge between the European experiences with economic instruments and their capacity to provide a solution to the challenges posed to water management in Latin-American countries.

First, the major challenges faced by the water sector in Latin America will be presented and then the obstacles will be discussed that presently impede the introduction of economic instruments. The challenges that Latin-American countries face can broadly be grouped into five categories:

- Institutional and administrative challenges
- Human resource constraints
- Financial challenges
- Lack of data
- Social challenges.

As a next step, different approaches practiced in the region to address these challenges and to implement economic instruments will be presented. On the basis of these examples, a list of relevant factors that have proven to be important for a successful implementation will be developed.

7.1 Challenges to the Implementation of Economic Instruments

Institutional and administrative challenges

One of the greatest impediments to the introduction of economic instruments in Latin America are deficiencies in the administrative and institutional settings. The biggest challenge in this respect is that the delivery of water services is still predominantly managed through a sectoral organization which is typically ill-funded, overextended and therefore inadequate for the provision of quality services.

The creation of adequate institutional capacities including the legal framework under which water use and management take place is urgently needed. Attempts to modify water laws have been made in several Latin-American countries, but progress in this respect is generally slow. In many instances, water resource management legislation includes provisions which may no longer be relevant and may actually constrain new management initiatives.

A second major challenge to innovations in water management is the fact that most Latin-American countries still lack effective monitoring and enforcement procedures and struggle with a confusion of roles among different administrative bodies that result in overlapping mandates among related sectoral agencies. With lines of responsibility and accountability being unclear, the prerequisites for the implementation of sophisticated charging systems are not met. In consequence, actual management (water pollution control, operation and maintenance of some waterworks) is in many cases still very poor (Dourojeanni, 2001). The lack of integrated river basin management constitutes thus a key challenge for the region.

A third factor to be considered is that although attempts have been made over the last years to increase the degree of integration between the environmental and other governmental sectors, inter-linkage remains weak both, on an inter-sectoral as well as between federal and regional

levels. As Box 11 outlines, fiscal federalism may intensify the problem of impairment of objectives and coordination unless certain prerequisites are met.

Furthermore, water management is often still carried out in a top-bottom manner with little participation of locals and key stakeholders, reducing the system's transparency, the perception of problems, and their inter-linkages. With exchange being limited to a small group of actors, the optimal allocation between competing uses and the determination of a proper economic valuation is difficult to achieve.

Box 11: Fiscal Federalism

For a centralized state, it might be difficult to adapt policies to the individual needs of different regions in the country, especially if the surrounding conditions vary considerably. The local level can be better equipped for understanding regional needs and interests due to the more immediate exchange with the citizens concerned by the policy.

However, several problems often go along with fiscal federalism. In the case of Brazil, Afonso (2001) reports that tax competition among states or regions through different incentives for enterprises has contributed to the misallocation of capital. Furthermore, differing sale taxes or personal income taxes may have influenced spending patterns and the allocation of labor between states. He concludes that decentralization may in some cases be market constraining rather than market enhancing as it leads to a fragmentation of the domestic market.

Decentralization can lead to a confusion about roles and responsibilities when two or three different levels step in to pursue similar objectives. Precise and final decisions would be required on which functions and taxes are under the responsibility of the national or the sub-national level, which is in many cases not possible.

Stringent macroeconomic coordination can be difficult within a decentralized structure characterized by a high degree of autonomy, as sub-national governments might be less willing to comply with policies to sustain macroeconomic stability, but act purely in their own instead of the nation's interest. In light of this argument, it can be difficult to reconcile greater fiscal decentralization with national economic policy objectives.

Co-ordination is of vital importance for ensuring a coherent and effective interaction among all relevant actors and administrative levels. The coordination of fiscal policy in a counter-cyclical sense becomes more difficult within a decentralized structure. At times, sub-national governments may pursue expansionary fiscal policy at the time when the national government follows a contradictory policy. This argument applies in particular if local governments face soft budget constraints and can count on being bailed out by the state. (Afonso, 2001).

Tanzi (2000) points to the fact that the existence of a decentralized fiscal structure has often been a major impediment to needed tax reforms. The assignment of taxes is difficult in a federal system, due to administrative considerations related for example to economies of scale in tax administration, access to information, tax competition and others. In the case of Argentina, a turn-over tax is levied at the provincial level. The central government has tried to eliminate this tax which creates great distortions in the economy and to replace it with more efficient revenue sources for many years (Tanzi, 2000). However, as the tax generates substantial revenue at the provincial level, the federal structure has made it difficult to reach a consensus for reform, especially as changes affect the provinces differently.

A further challenge related to fiscal decentralization is the issue of transparency. Local governments often cannot provide good data on a timely basis, which complicates the conduct of fiscal policy and the analysis and evaluation of public sector operations.

Finally, one of the main functions of a national government is to redistribute income from richer to poorer regions. When regional disparity is high and income levels vary greatly among regions, so that one region has to subsidize another on a significant scale, it becomes difficult to pursue an effective policy of income redistribution within a federal system.

Human resource constraints

Water resource management is often hindered by a lack of adequate staffing at all levels. The sector faces a persistent difficulty of keeping qualified workers and cannot rely on expertise available in the private sector. Integrated river basin management along with stakeholder participation has the capacity to offer a remedy to this shortcoming by bringing together different experts and through the facilitation of discussions and knowledge transfers (Huber, Ruitenbreek and Seroa da Motta, 1998).

A more general problem is that public awareness on the nature of the problems and on the current situation is low so that the imperative need for improvement does not reach an adequate level of recognition.

Financial challenges

The environmental sector in Latin America faces serious budgetary problems, as the necessary investments on the infrastructural and operational level are very capital intensive, especially with costs of additional water provision being continually on the rise (World Bank, 1998). Economic instruments can help in generating the required resources for reforms and restructuring. At the moment, water is often supplied at below-cost prices, which increases the challenge for water companies to increase connection rates and finance maintenance and infrastructural upgrading. Charging for water services can provide operators with sufficient funds for carrying out their operations and maintenance activities and furthermore serve as a proper signal to water users on the opportunity cost of their water use (San Martin, 2002). However, most instruments require certain capacities before they can be put to work. For the implementation of “correct pricing” for example, accurate consumption metering and efficient and correct billing mechanisms must be in place (San Martin, 2002). Budgetary constraints can thus act as a serious constraint to the

introduction of measures that in the short run require infrastructural investments and only in the medium and long run generate financial revenues.

Lack of data

Water resource management is often hindered by a lack of adequate and reliable hydrological, meteorological and water quality data as well as information on socio-economic indicators of water use efficiency (IDB, 1998a). The persistent lack of assessment and monitoring of the quantity and quality of the existing resource is a major shortcoming for its appropriate utilization and an impediment to proper management.

Due to a lack of reliable inventories, databases and information on water uses and users, major deficiencies exist with respect to supervision and pollution control, as well as with regard to the measurement of contamination. Until adequate measurement systems have been put into place, charging for pollution is not feasible (Dourojeanni, 2001).

The lack of systematic and qualified monitoring poses serious challenges to the enforcement of environmental legislation and the implementation of economic instruments.

Social challenges

Safe access to clean water and a proper disposal of waste water constitute an important contribution to public health by reducing the spread of water-borne diseases. Especially among low income groups, the rate of piped water coverage has to be increased. Extending coverage rates for water supply and sanitation will affect the living conditions of the poor in three ways: Firstly via better health and increased potential labor productivity, secondly through considerable

cash savings (water from trucks is much more expensive), and thirdly through reduced time use in bringing the water to the household (San Martin, 2002).

Market-based instruments have in principle the capacity to mitigate the discrimination against low income groups in terms of access by generating financial means for extending connections to these user groups. However, in order to achieve a socially compatible outcome, possible negative consequences of water service charges for the poor must be balanced by a complementary effective redistributive scheme.

7.2 Existing Experience with Economic Instruments in Latin America

Subsidies

The economic instruments most commonly applied in LAC countries are subsidies and tax exemptions (UNEP, 1999). For example, credit and tax incentives are offered for environment-related investments e.g. in Brazil, Mexico and Colombia to cover abatement investments or clean technology adoption in the industrial sector (Huber, Ruitenbreek and Seroa da Motta, 1998). They may, however, not develop their potential in terms of environmental effects if the enforcement of standards is limited so that there is little incentive for firms to demand financial support for measures to meet these standards. Also, companies may not put the money received to its intended use if their investments are not adequately monitored. This illustrates the necessity of an adequate institutional and legal framework for the implementation of economic instruments.

Charges for water supply and sewerage

Regarding water pricing, including charges for sewage collection and treatment, the coverage of users is limited and pricing policies often do not achieve cost-recovery objectives. Therefore their

environmental effectiveness may be minimal (UNEP, 1999). In order to convey economic signals about decreasing water availability through water prices and to promote a more rational use of the resources, Peru and Central American countries are making advances to assess the value of their water resources (UNEP, 1999).

In two Brazilian states, Sao Paulo and Rio de Janeiro, sewage tariffs are levied by sanitation companies on industrial users. The charges are based on the content of organic matter and suspended solids. In the greater Sao Paulo Region, considerable revenue has been raised through the charge, although only partial coverage has been achieved (only 95 big firms have been included by the sanitation company) because of monitoring difficulties. It is reported that pollution abatement measures have been induced by the pollution-based tariff system (Huber, Ruitenbreek and Seroa da Motta, 1998).

Effluent Charges

Effluent charges have been in place in Mexico and Colombia since 1991 and 1974, respectively, and are under discussion in Jamaica and Brazil (Huber, Ruitenbreek and Seroa da Motta, 1998; San Martin, 2002). In Mexico the pollution charges are tied to wastewater rights: an amount is paid for the right for each cubic meter of discharge, collected from those who exceed determined standards for organic matter and suspended solids. The charge level varies with both water quality and total discharges. A simplified approach based on volume alone is used for discharges below 3000 cubic meters.

The success of the charge has so far been limited. The system requires monitoring resources that are beyond the current financial capacity of the CNA (National Water Commission). The amount of revenue raised has been substantially reduced by insufficient enforcement. Thus the charges

actually collected represent only a minor percentage of the potential revenue. Additionally, a lack of public participation and of proper analyses of potential impacts of the charge lead to a fierce opposition by polluters. Nevertheless, Mexico's pollution charge is one of the first instruments in the region that is based on the polluter-pays principle. It is designed to induce behavioral change through incentive setting.

The Colombian charges for effluent discharges and water use, although in place since 1974, have only been applied in few cases and have been subject to similar problems to those in Mexico. In 1993, new legislation changed the former cost-recovery design of the charge to a scheme based on criteria of full environmental costs. However, this new system will pose even greater challenges to implementation and may entail high administrative costs, so the new charges may not be implemented according to the exact terms of the law (Asad and others, 1999).

According to Huber, Ruitenbreek and Seroa da Motta (1998), pollution charges may create perverse incentives in some Latin American countries, that is have a negative environmental effect despite being intended to improve the environmental situation. Pollution charges based on the concentration of substances rather than on volumes or total loads will induce polluters to dilute effluents and thus increase water consumption instead of making them reduce the pollution load. A careful design is therefore important for triggering the intended user response.

Tradable permits

Chile is the only country in the Latin American region that has extensive experience with tradable water permits (see section 5.7.1). Chile has a long tradition in water property rights, which is believed to be the basis for the political acceptance and enforceability of the system. As section 5.7 pointed out, the assurance and acceptance of water property rights is, next to an effective

administrative and legal system, seen as a prerequisite for a functioning trading system. It is suggested in the literature that other countries planning to implement a similar system take this into account and carefully review the Chilean example (Asad and others, 1999).

Legal redress and advocacy

Successful liability legislation requires adequate enforcement. Since in many Latin American and Caribbean countries courts are heavily backlogged, liability might be complemented or replaced by consumer advocacy through voluntary measures or public pressure (Huber, Ruitenbreek and Seroa da Motta, 1998).

In Trinidad and Tobago, for instance, the corporate PetroTrin established a voluntary policy of full compensation for environmental damages after a series of uncontained well blowouts in the 1980s that caused a significant public outcry as no assistance was received by the population. This voluntary policy provided the company with an incentive to improve blowout prevention devices on wells.

In Colombia, consumer action is enhanced by innovative economic instruments: Anyone pursuing environmental liability judicial action is entitled to receive a payment that amounts to 10-15 percent of the total compensation. Since its introduction in 1992, this financial incentive has been reported to have increased the number of actions taken to court significantly.

The Brazilian water management reform

As a example of recent developments in the water management sector of Latin America, the case of Brazil will be presented. The new Federal Water Resource Law that was passed in 1997 fosters

the integration of economic instruments and promotes an integrated approach to the planning and management of water resources.

Box 12: Water Management in Brazil

Background

Water management in Brazil has suffered from many of the problems common in Latin American countries, one of which is lack of institutional capacity. Historically the system was characterized by sectoral management with strong influence of the hydropower sector, which was kept under the control of government owned companies. During planning of projects (e.g. construction of big dams) externalities caused to the environment or the economy were not considered (Kelman, 2000). After the democratization process in Brazil in 1986, discussion about institutional reorganization of the country followed in order to address problems such as the lack of integration among water sectors (irrigation, hydroelectricity, water supply), the uncontrolled urbanization processes, and the occurrence of droughts in the Northeast.

The 1997 Water Law

In January 1997 the Federal Water Resources Law was adopted, which introduced new approaches to water management. The concepts promoted by the Law include (Kelman, 2000)

- planning and management of water uses at river basin scale; decentralization of the management process;
- stakeholder participation;
- controlled and coordinated issuance of water permits for intakes or for dilution of effluents;
- development of Water Resources Plans;
- status of water as an economic good that should be charged for appropriately in order to (i) achieve rational allocation (ii) create the financial resources necessary for the improvement of the river basin;
- the use of water required to meet people's basic needs shall have priority before other uses.

Institutional reform

The Law provides for the creation of River Basin Committees ("water parliaments") which are composed of members of bulk water users, government officials (of Federal, State and Municipal level) and NGOs. River Basin Committees need to be established only in the presence of actual or potential conflict over water. The establishment of these Committees should serve as a means to achieve the goal that decision-making take place at the river basin level with effective participation by stakeholders. By the representation of government, users and society, this system creates the necessary conditions for integrated water management. It is the responsibility of the River Basin Committees to

- promote discussion of water-related issues;
- coordinate the work of the entities involved;
- arbitrate conflicts;
- approve the Water Resources Plan, and monitor its execution;

- suggest the fees to be charged.

The associated executive branches of the River Basin Committees are the Water Agencies. A single Agency may serve as the executive office for one or more River Basin Committees. They are responsible for the technical work required to support the work of the River Basin Committees, such as conducting studies to evaluate water availability, assessing new projects, and ensuring adequate allocation of withdrawal rights (Porto and Porto, 2002). The Agencies are also responsible for database management. They maintain registers of water resources, as well as a roster of the users of water resources. Additionally they collect fees for water use and assess proposals for projects to be financed (Dourojeanni, 2001).

Water pricing reform

The institutional reform initiated by the new Water Law was accompanied by water pricing reforms. A system of bulk water pricing was introduced, which allows for charges to be levied on the collection of water from natural sources, or alternatively, on issuing the water permit. This levy is thus comparable to water abstraction charges in European countries (see section 5.1). Its goal is to balance water demand and supply by sending an economic message to users that they might be constraining the use of others (Porto and Porto, 2002), and to provide funding to create and sustain the River Basin Committees. The 1997 Law guarantees water users the right to retain control over the revenue generated by stipulating that not more than 7.5% of financial resources collected in a basin can be transferred out of the basin.

Summary

From the examples outlined above, it becomes clear that experience with economic instruments in water management already exists in Latin American and Caribbean countries, although some of the systems are somewhat rudimentary, with little coverage or a pricing policy that neither covers the capital costs nor incorporates environmental and social externalities. Still, systems are in place that can be built upon and expanded.

7.3 Relevant Factors for Successful Implementation of Economic Instruments

From the information presented on the use of economic instruments in Latin America, as well as from the reviewed literature, it is possible to extract a number of elements that have proven to be

useful tools or prerequisites for the successful implementation of economic instruments in the Latin-American water management sector:

- Capacity building
- Spatial organization (river basin management)
- Decentralization and Integration
- Participation
- Full cost pricing
- Cross-subsidization
- Public education programs
- Earmarking of revenues
- Transparency

It is generally recognized that in order to address the problem of weak enforcement, institutional capacities, both in terms of human resources and financial resources, need to be strengthened, and that competencies of authorities have to be clearly defined. Institutional capacity building can be simplified by a decentralized approach that involves small institutions with limited spatial jurisdiction (Huber, Ruitenbreek and Seroa da Motta, 1998).

Decentralized entities, such as the river basin organizations proposed by Dourojeanni (2001), also enable the active involvement of all local users and stakeholders in the management process. Participation of all stakeholders, in turn, promotes an integration of the different water sectors, and thus, a coordinated management of the resource that takes all demands and needs into account and balances economic interests and environmental protection concerns.

It is a common view across the literature that users are willing to pay for their water use when they are guaranteed a safe and reliable water supply in return (Asad and others, 1999; Huber, Ruitenbreek and Seroa da Motta, 1998; Porto and Porto, 2002). A full cost recovery approach is increasingly recognized as being essential for service expansion, as well as for taking

environmental costs into account. Such an approach may require the establishment of cross-subsidization schemes to assist low-income groups.

Huber, Ruitenbreek and Seroa da Motta (1998) also point out that non-regulatory mechanisms such as public education programs should be made use of, as they may improve compliance without adding to administrative costs.

In order to improve water allocation and conservation and to establish effective environmental taxes, it is necessary to have a system of monitoring and metering which allows for volume-based charges to be levied and which raises consumers' awareness (Asad and others, 1999).

It is consistently emphasized that earmarking revenues is likely to make the implementation of economic instruments such as water pricing more successful in Latin-American countries. If charges collected were transferred to the central government and incorporated into the general budget, users would feel "taxed" which could spur their rejection of the system (Porto and Porto, 2002).

Another aspect that plays a potentially important role for public acceptance of economic instruments is their transparency: It has to be clear and as easily understandable as possible what is charged for and why. With respect to bulk water pricing in Brazil, Asad and others (1999) also requests that subsidies, where they are necessary for equity reasons, be made transparent. He suggests that users should receive water accounts that show the full cost of providing the bulk water, and the value and source of the subsidy being applied. While mitigating the impact of charges on low-income households, this measure would still create or maintain awareness of how much water resource management really costs. It would also help governments to assess the cost effectiveness of subsidy programs.

7.4 Discussion on the Relevance of EU Experience for Latin American Countries

As the discussion in this Chapter has shown, the use of economic instruments in water management is not new to the Latin-American region. The generally relevant factors, which can be derived from these cases, indicate that the Latin-American experience with economic instruments is likely to be of particular interest when addressing the specific problems of the region. Furthermore, the list of relevant factors reveals a close resemblance with those issues stressed in the presentation of the European experience earlier on. Therefore, while European approaches may not be applicable to all cases and may need to be modified to meet the specific circumstances in Latin-American countries, there are nevertheless lessons to be learned. In the following, a non-exhaustive list of issues will be presented that can provide instructive impulses:

- There is growing consensus that integrated water resources management (IWRM) is crucial in order to solve Latin America's water-related problems (IDB, 1998a and b). Integrated management is a prerequisite for successfully implementing environmental taxes, as the design of an equitable and fair system (for example of supply charges or abstraction taxes) requires that all uses be taken into account. The European experience, for instance from the implementation process of the Water Framework Directive (WFD) can serve as an instructive example for a reorganization of procedural and organizational issues towards the integrated management of water resources. Observing how the EU Member States proceed in order to fulfil the demands of the WFD can be instructive. Furthermore, the implementation process of the WFD exemplifies the promotion of public participation, increased transparency and more extensive and reliable reporting.
- Based on the Latin-American case studies, earmarking of revenues is recognized as an important factor for the successful implementation of economic instruments (see Box 1). The European experience reinforces this conclusion: Many European countries use earmarking of revenues, and it is assumed that the resistance to a charge is smaller if the responsible authorities retain control of funds collected and use them for environmental programming or investments in the water sector. The more transparent the use of revenues collected is, the easier it is to raise public support for a new scheme.

- While the EU experience in water pricing and with regard to subsidies is certainly relevant on a technical and organizational basis, differences in social settings must be considered. The social challenges water sectors in less developed Latin-American regions face require water pricing policies to be carefully blended with complementary cross-subsidization or compensation schemes.
- Sewerage charges are common in all European Member States. While the same cautions apply here as to water pricing, increasing the coverage of households connected to the sewerage system could be supported by carefully designed charging schemes that aim at recovering the costs. Charges would provide operators and administrations with the necessary funds for the required investments. Increasing the access of poorer population groups to the sewer system is furthermore desirable from the point of view of health of the population.

Finally, the European experience may be drawn upon particularly with respect to economic instruments that so far have not or only in few cases been applied within Latin America (for example abstraction taxes, pollution taxes).

7.5 Options for Inter–Regional Cooperation

A direct exchange between European and Latin-American actors from all relevant stakeholder groups would be even more enlightening than a general comparison of the systems. Facilitating and strengthening the cooperation between European and Latin-American actors and intensifying the exchange of experience and ideas would offer an opportunity for more direct case-specific support and advice by relevant actors in the field.

On a technical-scientific level, exchange is already taking place in a more or less institutionalized way through workshops, conferences or dialogues, leading to the import of expertise and a continuous exchange of information on relevant technical or scientific advances and developments.

An important area where inter-regional cooperation has so far been limited is the exchange of experiences among regulators and officials on economic, environmental and health issues. In these areas, considerable gains of cooperation can be expected through furthering the flow of information among all relevant actors.

In general, steps should be taken to promote capital investment and to encourage different forms of private sector actions to help build capacities. Private European enterprises can fulfil an advisory function, thereby importing their expertise in the field.

As section 7.2 indicated, integrated river basin management should be promoted in areas with a high intensity of water use. The examples of river basin organizations for instance in the mining areas in Europe can serve as instructive cases (for example the Water User Associations in Germany).

Many of the relevant studies prepared by the OECD in the field of water management have been strongly influenced by its European members and therefore have a European focus, making them not directly transferable to the Latin-American context. Yet, Mexico as a member country may function as the linking part between the OECD and those Latin-American countries or regions within these countries that have already reached relatively high industrialization levels. Although not universally applicable, many of the OECD's recommendations for Mexico offer valuable insights and allow for a conversion to other Latin-American countries.

Finally, the existing lines of cooperation within the EU–MERCOSUR framework should be used and extended to direct cooperation with regard to environmental topics in general and water management issues in particular.

8 Conclusion

This report has been prepared in order to compile information about existing economic instruments in European water management in terms of different methods of implementation and their corresponding effects. It makes this information available to the Regional Policy Dialogue to support discussions about the introduction or expansion of economic instruments in Latin America. Rather than trying to be comprehensive, it presents a selection of relevant or representative case studies.

This report builds on previous efforts and is likely to be of particular interest to those seeking to draw out lessons learned from the European experience. As the discussion in section 7.5 has shown, some of the various European systems may prove useful by providing information about possible options for the design of economic instruments. The European experience may be drawn upon particularly with respect to economic instruments that so far have not or only in few cases been applied within Latin America.

In many cases, impediments to the introduction of economic instruments such as major divergences from the outlined prerequisites, like severe deficiencies in the administrative and institutional setting, will have to be addressed before the implementation of economic instruments becomes feasible. At times, the instruments may also have to be designed so as to take these challenges into account and to balance possible negative effects.

As the various case studies based on European and on Latin-American experiences have rendered clear, important benefits may be derived from the use of economic instruments. Yet, it must be kept in mind that generalizations are always feasible only to a limited degree: A strict analysis of all relevant factors and the incorporation of all relevant actors is required to guarantee an optimal result in each specific case.

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