Economic instruments for mobilising financial resources for supporting IWRM

Additional information and illustrations for the OECD initiative

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Introduction

Integrated Water Resources Management (IWRM) is seen as crucial for sustainable governance and healthy aquatic ecosystems. Sound financing concepts and principles are at the core of successful IWRM. However, the general challenges that exist for IWRM also apply for financing:

- There is diversity of water-related purposes, services, functions and costs to be defined and dealt with.

- There are different policies and stakeholders to be coordinated and multiple viewpoints to be considered.

- There is the question of who pays what while considering equity concerns in the burden sharing.

- This is especially relevant as the costs involved can be very high, and also very scaterred between different water uses and organisations.

- IWRM has to take into account a broad range of natural and human environments from wetlands to treatment plants.

Overall, "all encompassing policy frameworks for financing can hardly be found" (Mattheiss, Strosser, Rodriguez, 2010). There are, however, instruments and mechanisms in place that help collating financial resources finances that are allocated to the water sector as support to IWRM.

This note aims at presenting some information and examples on economic instruments that help raising financial resources for IWRM. Because of the limited human resources available for this task, the intention is not to develop a comprehensive note on financing water management, but to complement infomration and data already available in:

- The background note to the OECD expert meeting on financing and economics that took places in Paris March 15-17 2010;

- The different contributions and presentations made at the workshop in particular those illustrating the application of instruments in selected countries and bringing quantitative figures in terms of revenues collected and their allocation to different functions of IWRM.

Review of economic instruments for financing

General issues

The emphasis of this paper lies on instruments that are aimed at generating financial resources that can be reused in water management improvements and in supporting the different functions of Integrated Water Resource Management (including information and communication, institutions, research, etc.). This paper does not focus on instruments that are only cost-recovering (like subsidies/direct cost recovery fees). The most commonly used economic instrument for quantitative water management are tariffs for drinking water. However, this is a widely studied field almost practiced everywhere and it usually does not generate surplus. There has been a recent review on water pricing in selected OECD countries (OECD 2010). However, this report does not contain information and data on the total revenues collected from these economic instruments and on how funds collected are eventually used for supporting specific functions of IWRM.

There are taxes and charges on water abstraction, their level being differentiated by water source (groundwater or surface water) and/or by the type of user depending on countries. Although not commonly used in the EU, tradable water rights systems constitute an example of an innovative economic instrument which is increasingly being discussed in various policy forums in Europe. However, the establishment of water markets is a complex undertaking which is not free from certain risks. Additional instruments include the allocation of subsidies for building alternative storage and reduce water abstraction.

Water quality management, and the economic instruments developed for reducing polluting discharges, distinguish between point sources and diffuse sources. For handling point sources, tariffs for sewage and wastewater services as well as effluent charges are commonly applied. Wastewater tariffs are often based on the volume of drinking water used. In the Netherlands, however, wastewater tariffs are only based on the size of the household. In the case of Germany, the share of stormwater flowing into the sewer is increasingly considered when designing tariffs.

Diffuse pollution sources are more difficult to handle as polluters are often not easy to identify. Economic instruments applied include pesticide taxes (found in Scandinavian countries) with the tax level being based on retail prices or on the weight of the active ingredient in the product. Voluntary agreements constitute another form for limiting diffuse pollution from agriculture. They involve compensation payments for e.g. organic farming practices. Since very recently, tradable permits for polluting discharges into the aquatic environment are considered by some European countries, this instrument being already applied outside the EU.

Morphological issues and ecological restoration became of increasing interest in the water management sector due to the implementation of the Water Framework Directive. However, only little information about economic instruments applied for this issue is available. Economic instruments are applied as part of funding programmes for the nature conservation activities in Natura 2000 areas, or as part of schemes aimed at mitigating impacts of hydropower plants. Additional examples include the establishment of ecological accounts or schemes for managing financial compensations for biodiversity damage.

There are also economic instruments for managing excess water, an area where only few economic instruments are applied in Europe as most of the strategies in place are technical or regulatory. Examples include storm water taxes, subsidies for the creation of wetlands or for afforestation or income tax reduction for the installation of rainwater harvesting and reuse systems. In several countries, subsidy schemes for promoting green-roofs are also put in place to reduce storm water runoff.

Abstraction charges & taxes

Besides tariffs for water services, many countries apply charges or taxes on water abstraction to manage water quantity issues. Abstraction charges and taxes are in place in a number of OECD countries.

Different systems can be found, varying by country and sector. They target in priority households and industry[1]The agricultural sector may sometimes benefit from lower rates (Seine Normandie river basin, France) or of possible implicit exemptions (Netherlands)[2]. Charges are volumetric in most cases, with the user paying a unitary rate per cubic meter abstracted (e.g. Germany, Estonia, the Netherlands, Bulgaria). Other structures are for example fixed charges per hectare for non-metered agricultural abstraction (Seine-Normandy river basin, France) or nominal license fees linked to an abstraction permit regime (United Kingdom) (EEA 2005). The charges are often further differentiated by user type or source and vary often between regions. The Baltic countries for example differentiate between different ground water layers and the catchment area (see case study below). Abstraction charges and taxes are mostly collected by regional or local authorities and are designed with the objective of providing funding for water ressources management or for watershed protection activities (OECD 2010). While the value ranges are

[1] Although special tariff arrangements for industry are rather common and partly justified by economies of scale, e.g. in Germany and France (Mattheiss, LeMat, Strosser, 2009)

[2] The justification for that is often based on the value of cultural landscape, the lower cost for water service provision and social and historical arguments. However, the different levels of application of the same instrument for different sectors, and the exemptions given to agriculture, is rarely well spelt out in policy documents, as it often emerges from pressures from lobby groups in the political process..

quite broad on a relatively low level, often significantly higher charges are imposed for groundwater (often better quality and more difficult to restore) than on surface water.

In the Australian Capital Territory (ACT), a water abstraction charge was introduced in addition to water tariffs in 1999 with the goal to represent a sustainable price for water in the long term. The charge therefore comprises not only the costs for water supply but it seeks to establish a scarcity value (taking into accound the alternative uses) and to cover the environmental impact and management costs (ICRC 2003), caused by damage to the ecosystem downstream, degradation to water for downstream users, damage to fisheries, and the effects of changes in the peak load flows. The money is collected by ACTEW, a government-owned holding company which operates the water network. It is paid then to the ACT Government (ACTEW 2010). It is treated as direct cost to consumers separated from operating costs. And it is therefore shown seperately on water bills.

Belgium's Flanders region uses groundwater charges with unitary rates per cubic meter increasing as the total amount of groundwater pumped increases (OECD 2010). They also vary according to the aquifer and the existing pressure head of the groundwater. A higher charge is applied for drinking water companies. The revenues go into a fund for the protection of ground waters (Salman 1999). For surface water abstraction, a decreasing block system is used and charges are lower than for groundwater.

The application of abstraction charges in France was initiated with the 1964 water law at the scale of 6 river basin water agencies with the purpose of revenue collection for the investment programmes of the water agencies (Strosser & Speck 2004). Although the basic principles for the abstraction charge are the same, their implementation in the 6 water agencies differs to account for differences in water resources, water uses, environmental concerns, etc. A detailed example for the Seine-Normandie is given in a separate case study below.

In Germany, abstraction charges have been introduced since the end of the 1980s and are now in place in 11 of the 16 Federal States. While their original objective was mainly the decrease of abstractions, the implementation of the Water Framework Directive is also taken today as a justification to the charge (UBA 2008). The money is collected by regional administrations and goes usually into the state budgets, where it is usually earmarked (apart for two of the Federal States). Revenues are generally used for restoration and maintenance of surface water, protection of groundwater and the promotion of economical water use (UBA 2005). This includes in some cases compensation for farmers using less fertilizer to support groundwater quality. In Lower Saxony, water related research projects in agriculture and forestry are also financed as well as the renaturation of floodplains. In North Rhine-Westphalia, the revenues are used for the administration and for supporting the implementation of the Water Framework Directive.

In the Netherlands the provinces are empowered to levy a groundwater charge. The rate differs between the provinces but it is comparably low. The revenues are earmarked to provincial expenditures in the field of water resources. In addition, there is a groundwater tax on the national level (see below). There is no specific levy for surface water abstraction.

For pure taxes on water abstraction which merge into the general state budget, only few examples can be found. They have been introduced 1993 in Denmark and 1995 in the Netherlands (MHSE 2001, Ecotec 2001). The Danish tax is quite high but applies to domestic users and some service businesses only. While the Dutch groundwater tax is relatively low, it does not exempt industry. However, farmers are only charged if the abstracted amount exceeds 40 000 m^3/year. The taxes have been introduced as part of a greening of the tax system, mainly for raising revenues and do not rely on any valuation of the environmental pressures from water abstraction. Also Mexico levies an abstraction tax which is differentiated by user type and source (OECD 2010).

Table 1: Abstraction charges and taxes in different OECD countries

Country	Source of water	Unitary rate	Total Annual Revenues	Payers	Appropriation of funds
Australia (Australian Capital Territory) (ACT 2009, ACTEW 2010)	All sources of water	0.49 USD/m^3 urban water supply, 0.21 USD/m^3 all other licenses	USD 23 million (2009)	All users	Full cost recovery (Water supply, scarcity values, environmental costs)
Belgium (Flanders) (OECD 2009, OECD 2010)	Groundwater	0.08 USD/m^3	USD 25,7 million (2007)	All users; except drinking water (higher charge)	Fund for the protection of ground waters
Denmark (Ecotec 2001)	All sources of water	0.84 €/m^3	€ 209 million (2000)	Domestic users only	General taxation
France (Seine-Normandy) (AESN 2008, Strosser & Speck 2004)	Surface water (basic rate) Groundwater (basic rate)	0.00071 €/m^3 abstracted, 0.04 €/m^3 consumed 0.024 €/m^3 abstracted, 0.04 €/m^3 consumed	€ 64,8 million (2008)	All users	Water management in the river basin (water treatment, water protection, research, administration), international cooperation projects
Germany (11 of 16 Federal States) (OECD 2010, UBA 2005, Gaulke 2010)	All sources of water	Range from 0.015 €/m^3 (Saxony) to 0.31 €/m^3 (Berlin)	Range from € 1.7 million (Mecklenburg-Vorpommern) to € 86 million (Nordrhein-Westfalen); 376.1 million € from all 11 states together (2008)	All users, except fishery and low amounts (less than 2000 – 10000 m^3) – depends on Federal State	Depends on Federal state, e.g. Nature conservation, protection of ground and surface water, reforestation, soil protection and decontamination
Netherlands (OECD 2009, CFE 2001)	Groundwater	0.1883 €/m^3	€ 184 million (2006)	All users; farmers only if more than 40000 m^3/a	General taxation
Netherlands (Provinces) (OECD 2010, VROM 2006)	Groundwater	Range from 0.081 – 2.54 €/m^3 (2003)	€ 14 million	All users	Expenditures in the field of water resources, anti-hydration studies

Pollution charges & taxes

Pollution charges refer to the chemical quality of water bodies and became a common instrument to control point source pollution, next to widely spread tariffs for sewage and waster water. They are used even more frequently in OECD countries than abstraction charges (OECD 2010).

The charges are usually calculated based on volume and pollution content of the effluents. Different pollutants are important in this regard, e.g. general organic pollutants (BOD, COD), nutrients (nitrates and phosphorous), heavy metals and suspended solids. Often the charges are differentiated according to the sector (industry, agriculture, municipalities). Several countries also take the vulnerabiliy of the recipient water body into account (Mexico, Poland, Hungary). In some cases, the use of "state of the art" technologies can lead to rebates as, for example, in Germany (see case study below) and Hungary. In contrast also, non-compliance fees have to be paid for discharges in several countries (e.g. Bulgaria, Estonia, Poland, Sloval Republic and Hungary) if the pollution concentration exceeds permitted levels. This fee can be up to ten times higher than the charge rates (Ecotec 2001). The number of measured pollutants varies, but often complex systems of pollution charges are used (EEA 2005, Speck et al. 2006). In Romania for example, "the number of chargeable pollutants increased from two to more than 30 different pollutants between 1991 and 2002" (Speck et al. 2006).

Whereas some schemes cover only direct discharges (e.g. Denmark, Germany, Spain and United Kingdom), others include indirect discharges (e.g. Belgium, France, Netherlands). In most cases fees/charges are collected at the local level, only seldom at river basin level (e.g. France) and in some instances (e.g. Czech Republic, Slovak Republic) nationally (OECD 2010). Earmarking water pollution charges for covering the emerging costs (treatment, licensing, monitoring, enforcement) and for environmental investments is common. Mostly the money remains therefore on the local level. In eastern European countries national environmental funds or foundations are often in place (e.g. Szech Republic, Sloval Republic, Estonia) which ensure the utilisation of the money for environmental measures (EEA 2005). In some countries (e.g. Belgium, France and the Netherlands), the levies shall also provide funding sources for water-related investments. Also the idea to provide stronger incentives for reducing water pollution became more prominent in the last years and is foreseen for example by Australia and Hungary.

Conjointly with the introduction of the abstraction charges due the the "green" tax reform in 1993, Denmark introduced as well a waste water tax, whose revenues accrue to the national treasury. As part of the political compromise in parliament, a substantial sum (€ 9.38 million) was devoted to an independent Water Fund, the purpose of which is to finance projects which protect groundwater resources (Ecotec 2001).

In France pollution charges were introduced conjointly with the abstraction charges on river basin level in 1964. They charge per pollutant varies according to user and water river basin agency. Non-domestic discharges are controlled through water quality permits which sets limits on the concentration and volume of effluents (OECD 1997). At the request of the companies or authorities they can be based on direct-measurements. Companies need to acquire a permit prior to any discharge into water. Charges apply to any source discharging at least the equivalent of a population of 200. The revenues remain on river basin level mixed with those from other charges and are used for water management in the basin and to a small part for international development projects (for further details see below the case study on abstraction charges in the Seine-Normandie river basin).

The German scheme introduced in 1976 is based on pollution units and closely coupled with obeyance of emission standards. The revenue raised by the tax is spent by the Länder authorities on municipal sewage treatment, water quality programmes and on administration (Ecotec 2001). Further details can be found below in a separate case study.

A Dutch waste water levy came into effect in 1971 as a full-cost recovery scheme based on revenues from emission charges (in accordance with the polluter-pays principle). The tax base is not the hydraulic load (cubic meters of waste water), as is the case with conventional user fees, but the specific pollutants discharged (Ecotec 2001). The levy applies to all direct and indirect discharges of organic material, nitrogen, mercury, cadmium, copper, zinc, lead, nickel, chromium and arsenic. Revenues cover the cost of sewage treatment and support in-house pollution abatement in industry. They do not cover the costs of the sewer network, which is financed by a separate municipal fee.

Table 2: Water pollution charges and taxes in different OECD countries

Country	Basis of calculation	Unitary rate	Total Annual Revenues	Payers	Appropriation of funds
Belgium (Flanders) (OECD 2009; OECD 1999)	Pollution unit/pollution content	€24.29 per p.u. (1999)	USD 250.1 million (2007)	Direct and indirect dischargers	Environmental policy in general
Czech Republic (OECD 2009, OECD 2010)	Pollution content	Varies according to the cost of pollution abatement	USD 17.5 million USD (2007)		State Environmental Fund
Denmark (OECD 2009, Ecotec 2001)	Pollution content	1.48 €/kg of BOD, 2.69 €/kg of N, 14.78 €/kg of P	USD 33.2 million (2007)	Direct dischargers; only domestic users and industry, reduced tax for 6 types of industry	General budget, partly devoted to an independent Water Fund (groundwater protection)
Estonia (OECD 2009, Ecotect 2001)	Pollution content		USD 4.8 million (2006)		Environmental measures
France (Seine-Normandie) (AESN 2008, OECD 2010, OECD 1997)	Pollution content/users	Vary for different substances and users, based on permits	€ 643,7 million (2008)	Direct and indirect dischargers	Water management in the river basin (water treatment, water protection, research, administration), international cooperation projects
Germany (Ecotec 2001)	Pollution unit/pollution content	€ 35.79 per p.u. (2010)	€ 367 million (1998)	Direct dischargers	Municipal sewage treatment, water quality programmes
Hungary (OECD 2009, Ecotec 2001)	Pollution content		USD 6.1 million (2006)		General budget, earmarked
Netherlands (OECD 2009, Ecotec 2001)	Pollution unit/pollution content	29€ per p.u. (state waters), average of 37€ per p.u. (Water Boards)	USD 1579 million (2006)	Direct and indirect dischargers	Finance water and wastewater management activities, covers the costs of sewage treatment
Korea (OECD 2009)	Pollution content		USD 5.3 million (2006)		
Romania (OECD 2009, Ecotec 2001)	Pollution content		USD 2.5 million (2006)		Central budget, earmarked for water fund

p.u. = pollution unit

To adress diffuse pollution of water bodies, there are not many instruments in place which raise revenues (mainly subsidies and information instruments are used). However, some countries apply pesticide and/or fertilizer taxes. The goal is usually to produce positive environmental effects by reducing consumption and to raise revenues, mostly earmarked to support the agricultural sector or for environmental projects, often focusing on soil and groundwater protection.

Pesticide taxes are levied for example in Denmark, Norway, Finland, Sweden, France, Belgium and some U.S. states. Whereas the tax applied in Norway is based on the recommended area doses of the different products, it depends in Denmark on the price of each product (see case study below). In Sweden, France and Belgium the tax rate relates to the weight of the active

ingredient. In Belgium, all agricultural uses of pesticides are exempted (OECD 2007; see also Peace & Koundouri 2003). The tax in Sweden was introduced in 1984 as an environmental charge, whose revenues were used to finance the pesticide action programmes. The steep rise in the levy 1994 occasioned its transformation into a tax which contributes now to the general state budget, from where the action programmes are now financed (Ecotec 2001).

Few countries (e.g. Sweden and the U.S. state Montana) also apply a tax on artificial fertilizers. The tax in Sweden was introduced, as the pesticide tax, in 1984 as a charge. While most of the charge revenues generated between 1984 and 1995 were used for research and various environmentally oriented projects (fertilizer managelent, agricultural and forestry sector), since 1994 (see above) only a small proportion of revenues have been channelled to environmental projects. A fertilizer tax also existed in Austria and Finland, but was abolished when both countries joined the EU in 1995 (Ecotec 2001).

Table 3: Pesticide and fertilizer taxes in different OECD countries

Country	Basis of calculation	Unitary rate	Total Annual Revenues	Payers	Appropriation of funds
Austria (until 1994) (Ecotec 2001)	Weight (artificial fertilizer)	0.47 €/Kg of N, 0.25 €/Kg of P_2O_5, 0.13 €/Kg of K_2O	€ 85.5 million (1994)	Wholesalers	Support and promote grain production sector, soil conservation (secondary)
Denmark (OECD 2009, Schou & Streibig (after 1999))	Maximum retail price (pesticide)	-	USD 81,7 million	Manufacturers and importers	Agriculture related activities, support research into alternatives to pesticides
Norway (OECD 2009, Schou & Streibig (after 1999))	Recommended area doses (pesticide)	-	USD 11,8 million	Wholesalers	Finance selected environmental projects
Sweden (OECD 2009, Soederholm 2004, Schou & Streibig (after 1999), Ecotec 2001)	Weight of active ingredient (pesticide) Weight (artificial fertilizer)	2.27 €/Kg 0.19 €/kg of N, 3.1 €/g of Cd	USD 51 million (both)	Manufacturers and importers	General state budget, allocated partly for environmental improvements in agriculture

Box 1: Comparison of revenues from charges/taxes and costs for programs of measures

To give a rough estimation of the relative importance of the revenus, a comparison with the total yearly costs for the Programs of Measures (PoM) of the European Water Framework Directive (Dworak et. al. 2010) is given for some examples below:

- The calculated yearly costs of the PoM from 2010 - 2021 in all river basins of the Netherlands amount to 268.2 million €. Compared to revenues of about 1234 million € from pollution charges and about 184 million € from abstraction charges in 2006 the costs could be covered several times.
- For the Seine-Normandie river basin the yearly costs of the PoM from 2010 - 2015 are estimated at 1980 million €. Revenues in 2008 were 64.8 million € for abstraction and, 643.7 million € for pollution charges.
- Average financial needs of the Federal State Hesse for the whole PoM from 2010 - 2027 amounts to 130.5 million € per year (Graefe 2009). There are no abstraction charges levied in Hesse. Pollution charges for whole Germany amount at € 367 million (1998). The population of Hesse is with around 6 million inhabitants about 13.4 % of the population in Germany.
- Period 2010 - 2015 in Baden-Wuerttemberg 181 million € per year. Revenues from abstraction charges amounted to 85 million € in 2008 (Gaulke 2010).
- In Belgium's Flander region the PoM for Meuse and Scheldt will cost between 3.6 and 4.8 billion € per year from 2010 - 2015. Revenues in the region in 2007 were 197 million € for pollution charges and 20.3 million € for abstraction charges.

Other taxes and charges applied to water users/the water sector

In addition to tariffs for water services, pollution charges/taxes and abstraction charges/taxes, countries have established different fees and charges for individual water users/uses. Some of these are illustrated below, although information on these instruments in particular in terms of total revenues collected is often not directly available.

Hydropower fees

Capturing economic rent from resource developers and delivering it back to the resource owners (the public) is common practice in the oil and gas, mining, forestry and fishing sectors. It is rare, however, in the hydroelectric power sector, where governments typically regulate tariffs such that the resulting rent flows to electricity consumers in the form of lower tariffs (Rothman 2000). Hydropower producers are also often granted reduction or exemptions from taxes due to support of renewable energies (e.g Germany, France, Denmark). However, fees for hydropower plants exist in some countries, with different intentions and approaches.

- In the Swiss hydropower sector the cantons (which hold the rights over the water power use) can raise water fees to an actual maximum of 54 Euro/kW gross capacity, which is set by federal law. Generally, the cantons fix the water fees at this maximum level (Banfi et al. 2005). Today, it amounts on average to about 0.73 cent/kWh electricity produced and thus makes up 15–20% of the production costs per kWh. The water fees are not earmarked but of great importance for the finances of the municipalities and cantons (revenue can make up 25% of the total fiscal income, in the case of single municipalities even 70–90%).

- In Sweden, hydropower is subject to a real estate tax (Statsrådet 2009). This taxes was raised, together with a capacity-based tax for nuclear power, at the beginning of 2008 due to the increased "windfall profits" these generation sources had been making. Also Finland is preparing a proposal on the taxation of windfall profits, establishing that the tax should be set no later than the beginning of 2011 (Statsrådet 2009). It is targeted at hydro and nuclear power taken into use before 1997. Also Norway imposes since 2009 a "grunnrenteskatt" tax on hydropower plants in order to cut their profits by 30%. The revenues goe mostly to the communes, a small part to the country (Finansdepartementet 2010). Almost 99% of the nation's power is hydro-based.

- Examples outside of Europe include Brazil, which instituted in 1989 a charge of 6 percent of revenues from hydroelectric generation, except for small producers and for industries generating their own power (Rothman 2000). Colombia imposes a tax on the value of the energy produced. In 1991, the tax was set at 4 percent of the value of the electricity. Of that, half was used for electrification of local areas near the hydroelectric facility, and half was used for more general environmental protection. Also China has a charge for hydroelectric production which varies between cities and provices (Rothman 2000). Furthermore, over the past decades, several initiatives on privincial level raising funds for protection of water quality and quantity were developing throughout China, led by local governments. In these initiatives also hydropower producers are levied, but also urban supply companies, industrial and mining enterprise, who pay the highest fees. Revenues are earmarked for watershed protection (Porras & Neves 2006).

Table 4: Hydropower fees in different OECD countries or enhanced engagement countries

Country	Basis of calculation	Rate	Total Annual Revenues	Payers	Appropriation of funds
Switzerland (Banfi et al. 2005)	Gross capacity (kW)	Max. 54 €/kW	€ 328 million (2001)	All hydropower plants	Budget of municipalities and cantons
Norway (Finansdepartementet 2010)	Average of the individual power plant's total production over the last 7 years	1,6 €/MWh	-	All hydropower plants	Mainly budget of municipalities, small part to the general state budget
Finland (planned from 2011) (Statsrådet 2009)	Production	1-10 €/MWh	€ 33-330 million (estimated)	Big hydropower plants	General state budget
China (provincial level) (Porras & Neves 2006)	Production	Varies, e.g. 0,0001 $/kWh (Guangdong), 0.0012 $/kWh (Liaoning), 0,1 $/kWh (Guangxi Zhuang)	$ 120,000 (Guangxi Zhuang)	All hydropower plants	Watershed forest management and planting

Navigation fees

In the United Kingdom the Environment Agency (2010) claims the costs incurred for use of waters by vessels through navigation fees. This is done through a system of licensing and

registration. The money received is spend on improving and maintaining waterways and lock structures while also maintaining facilities such as sewage disposal, water points and electricity charging points. Such navigation fees exist also in France, in Switzerland...

Administrative License Fees

The state of British Columbia in Canada charges a licence fee for water abstraction (OECD, 2010). It is a regulatory fee for major water users for access to the resource which is related to the cost of administration. Total revenues are about USD 5,5 million (OECD, 2009).

Fees for extracting material from the river bed

Hawke's Bay Regional Council (2008) charges Gravel Extraction Charges from the river bed. The financial contribution is established in the Regional River Bed Gravel Extraction Plan with charges based on $ per cubic metre extracted per annum (from 0.20-0.80 $).

A charge for extraction of materials from watercourses is levied in Montenegro. Total revenues amount to USD 0,3 million in 2006 (OECD, 2009).

Fishing fees

Fishing and angling fees are in place in most countries. The revenues they deliver, however, are often used for enhancing the fish stock with limited use for improving the overall ecological status of rivers and lakes. There is increasing use of these funds for rehabilitating aquatic habitats. For example, the Australian state of New South Wales (Government of New South Wales, 2008) charges a Recreational Fishing Fee. The revenues are placed into the Recreational Fishing Trusts and spent on improving recreational fishing in NSW as well as education and aquatic habitat protection and rehabilitation. These trusts are regulated by law and overseen by two committees made up of recreational fishers - one for saltwater and one for freshwater. Revenues aimed for aquatic habitat protection and rehabilitation in 2009/2010 amounted to about 450 000 AUS $.

Stormwater/rainwater collection fees

Stormwater or rainfall taxes exist in a number of Northern EU Member States and Germany (see case study). In Germany, a rainwater tax is levied in a number of communities, the tax being based on the impervious surface of a property which drains water into the public sewage system. Collecting rainwater with a rain barrel or infiltration system is then likely to reduce sewage costs, and also improve the functioning and effectiveness of wastewater treatment in case of storm. In the city of Dresden, stormwater fees amount to 1.04 €/m^2/year. The revenue collected is used to finance collective projects aimed at promoting reuse of rainwater for municipal use or the organisation of promotion campaigns for the use of source control techniques.

Forest and Water Source Environment Tax

Japan offers an inspiring example of financing water protection projects. The Forest and Water Source Environment Tax has been introduced in Japan in 2008 by 29 “prefectures” (among a total of 47) by 2008. In most of the prefectures, the tax focuses on forests. In Kanagawa, however, it focuses on water sources in river basins (Otsuka 2008). The tax imposes an additional residence tax to inhabitants, with its revenues being used exclusively for promoting water resource protection projects. To ensure that revenues are used only for aquatic ecosystem conservation and restoration, the launching of the tax has been accompanied by the creation of a special water account and water fund.

Searching for inspiring illustrations

Although most attention is often given to service use tariffs and to environmental charges and taxes applied to the water sector (pollution and abstraction), as these are the most commonly applied instruments for raising financing revenues, the review of countries' experiences shows a wide diversity of economic instruments applied to water issues. Some of these are part of other sector policy instruments (e.g. urban development, agriculture, energy...), but they have a positive impact on water resources and raise financial resources that can support IWRM. This stresses the need for inter-sectoral approaches to IWRM in general including in the field of financing.

The following pages attempt to illustrate a diversity of instruments and their applications undertaken by different countries for financing IWRM. These include:

- **Financial compensation for environmental services** in France; displaying a modern economic approach to water management where water users are requested to contribute financially to the support by dames to ecological river flow in the Loire river basin;

- The **pesticide tax** in Denmark, stressing a relatively successful example of eco-taxation applied to the agriculture sector.

- Economic mechanisms for **storm water management**, a water management issue that receives increasing attention from government and local authorities including in the context of climate change. The paper provides a short review of European experiences with regard to storm water management and flood control.

- **Water abstraction charge** in the Baltic countries, illustrating a rather common instrument that is applied following key principles such as the polluter-pays-principle, the adaptation to the vulnerability of water resources (tax levels being differentiated by sources of water), and the search for increasing water efficiency.

- **Pollution charges** for direct discharge of wastewater in Germany, an additional exemple of the enactment of the polluter-pays-principle on pollution from urban areas.

- *Working for Water*: **payment for watershed enhancement** in South Africa, the instrument linking poverty alleviation with watershed enhancement that is partially financed through high-water-use-tariffs.

- **Abstraction charges** in the Seine-Normandie River Basin (France); are combined with higher consumption charges. The example shows the diversified revenue calculation.

- **Support to ecologically friendly hydropower plants through favourable electricity tariffs**, an instrument that does not involve financial transfert via the government as the transfert takes place directy between the hydropower/energy company and energy consumers. .

Financial compensation for environmental services, France

Objective:

The French Water Act of 2006, which translates the Water Framework Directive into French law, contains an article (article 82) that allows a River Management Organisation to implement compensations for environmental services, that would work as a charge (i.e. revenues are earmarked). A compensation for environmental services was implemented by the EPTB[3] Loire to ensure an adequate contribution by water users to the financing of the costs linked to the ecological river flow support by dams. The compensation is levied according to the water consumption, but with different levels depending on the water use sector and its location along the river.

Description:

The charge was implemented in 2006 through a decree, following a public survey that highlighted the general interest to use and maintain the two large dams of Naussac and Villerest to support the ecological flow of two rivers, the Allier and the Loire river. Water abstractors which are targeted by this charge include: farmers, drinking water companies and industry. By definition of an earmarked instrument, the revenue collected equals the costs linked to the change in dam operation. Therefore, the unitary compensation is calculated every year and adjusted with an "annual rate". The following formula is used to calculate the compensation owed by each water user:

Compensation = volume * annual rate * user rate * seasonal rate * geographical rate

With: *Volume:* maximum volume abstracted within the past 3 years
Annual rate: fixed every year according to the foreseen expenses
User rate: Drinking water=1; Industry=0.8; Agriculture=0.4
Seasonal rate: Agriculture=1; Drinking water and Industry=0.5
Geographical rate: depends on the location of the withdrawal (ranges between 0.5 and 1)

The compensations are part of EPTB Loire budget. For 2007, a provisional budget of 4 million Euros (VAT excluded) coming from the compensation was estimated.

Relative importance:

Such an instrument is not yet widely used in France (only one additional example could be identified[4]). However, the idea of using a similar instrument is widely discussed today, especially at the scale of local river catchment organisations.

Stakeholders involved:

The EPTB Loire collects the financial compensation from water users. A few hundred users are concerned. State's Departments are not involved.

Sources: Etablissement Public Loire (2007); [8]

[3] Etablissement Public Territorial de Bassin
[4] The SAGE Nappes Profondes de Gironde implemented a very similar compensation system.

The pesticide tax in Denmark

Objective:

Pesticide taxes have been introduced in Denmark in order to influence their use by farmers and to reduce the total consumption. The taxes help furthermore responding to public concerns related to the use of pesticides.

Description:

The Danish tax on pesticides has been first introduced in 1986. It is a relatively "crude" type of tax, being based on the maximum retail price of the product. Each pesticide product sold in Denmark has therefore to carry a label indicating its maximum legal price. This is then used as a basis for the tax calculation. The levy is imposed on domestic manufacturers and on importers in case the product is sold for use in agriculture. It does not apply for exports. The revenues generated by the tax are channelled to the agricultural sector. They are used to reduce the tax on the value of land, to feed special funds administered by farmer's organisations, and to finance R&D related organic farming.

The tax is accompanied by the Danish authorisation system for pesticides, which keeps the most harmful products off the market. Furthermore, a phasing out of the pesticides use on public areas by 2003 took place.

Pesticides category	Tax rate
Insecticides and soil disinfectants	54% of retail price, excluding tax
Herbicides, fungicides and growth regulators	33% of retail price, excluding tax
Wood preservatives, algaecides, rat poisons and microbiological agents, etc.	3% of wholesale value, including tax

Tax rates of the Danish pesticide tax (OECD 2007)

Stakeholders involved and institutional issues

In Denmark, the Ministry of Taxation is the responsible authority for managing the tax. The charges have to be paid by the manufacturers, but the majority of the price increase has been passed on to farmers. The system based on prices of the products is relatively cumbersome to handle for the producers and importers of pesticides but facilitates significantly the administrative tasks of the tax authorities. Although more fine-tuned ways to calculate the tax exist, which can give farmers an incentive to choose the least environmentally harmful pesticide products, the described system can be defended by reduced demand of administrative efforts and the fact that the most harmful products are anyway kept off the market.

Relative importance:

The annual revenues from the pesticide tax in Denmark varied between 40 and 60 million € over the period 1996-2002. Potatoes, sugar beets and fruits are the most affected products by the pesticides tax, due to their high treatment frequency and pesticide dependency.

The Danish tax rates are said to have helped to reduce overall consumption by 15-20 %, with the largest decrease for herbicides. However, since many factors affect the use of pesticides and the tax was introduced in a moment when the level of consumption already was falling, it is difficult to determine the real, isolated impact of the tax.

Source: OECD 2007, Söderholm 2004, Sjöberg 2005

Economic mechanisms for storm water management – a review of European experiences

Objective:

Flood control can be managed through different techniques (see below). To finance the implementation of these techniques, different strategies are developed in the Member States. This case study proposes to review the economic mechanisms and instruments used in six member states to deal with flood management.

Description:

Managers dispose of two methods for stormwater control: (i) conventional drainage systems with end-op-pipe treatment installations and (ii) source control methods[5] . If end-of-pipe installations were broadly used before, institutions in charge of storm water management in Europe are now developing more source control methods.

A similar system is in place in Sweden, Denmark and Germany. In Sweden and in Germany, a fee per m^2 of impervious surface is charged to the property owners (the Drainage fee in Denmark and the Storm water fee in Sweden). In Denmark, the storm water fee is part of the drainage fee[6], charged accordingly to the water consumption. In Denmark and Sweden, the property owner who implements source control techniques pays a smaller fee (Sweden) or gets a refund up to 40% of the fee (Denmark). The situation is different in Germany. For example, in Dresden (see main text of the bnote also) where the stormwater fee amounts to 1.04 €/m^2/year, the money collected is used to finance collective projects such as the reusing of rainwater for municipal use or the organisation of promotional campaigns for the use of source control techniques. In those countries, private and public owners are targeted (the latter is taxed for roads).

The situation is different in France. Special permits have to be issued for all important projects concerning rainwater discharge, artificial infiltration and creation of impervious areas of more than 5 hectares. No tax is charged to all property owners of impervious surfaces. Flood control is rather managed at municipality level with multifunctional installations (e.g. the Seine St Denis County who uses sport facilities or green spaces that can be flooded in case of rain) or the creation of wetlands upstream the city (e.g. the urban municipalities of Limoges agglomeration co-funded the construction of wetlands in the upstream rural municipalities). A stormwater fee is under discussion.

The existing national policy in the UK consists in funding only reduction of flood vulnerability and not flood protection. A fee is charged when pollutions are emitted in flood zones. The fees are reduced if the developer follows the Environmental Agency's technical guidance. Municipalities can then assign stricter obligations to the developers.

[5] Non-structural measures such as street cleaning, education, etc. or structural techniques such as filter drains, porous asphalt, etc.

[6] The Danish drainage fee is split into one part allocated to wastewater management (60%) and a second to stormwater management (40%)

	Pilot projects	Regulation restrictions	Discharge control	Discharge fees/penalties	Stormwater fees	Tax brakes/ fees reductions	Public subsidies	Information campaigns
Sweden	+	+	+		+	+		+
Denmark	+	+	+		+	+		+
Germany	+	+	+	+	+		+	+
France	+	+	+	+		+	+	+
UK	+	+	+	+	+	+		+

Methods applied in different countries to promote source control techniques (methods can be different between the cities)

Stakeholders involved:

In Sweden and Denmark, a public company is responsible for water management (drinking water, sewage, flood control, etc.) at municipality level. National departments (Sewage Department, Drainage Department, Street Department...) are also involved in stormwater management. In Germany, the federal system allows every Land to choose its own policy. The important stakeholders involved in stormwater management include the Water Authorities (who collect fees for every discharge to the water bodies) the Verbände (river managers who offer technical guidance) and the municipality (that implements the source control techniques in public areas and promote them in private sectors). In France, large scale coordinators such as Water Agencies, Counties and Regions often sponsor source control techniques. In the United Kingdom, most of the urban projects are managed by private companies.

Source: E. Chouli et al. 2007

Water abstraction charge in the Baltic countries

Objective:

In addition to the charge paid by the consumer, a water abstraction charge was introduced in the Baltic countries. This charge depends on the source of the water (groundwater, surface water, mineral water) and the region. The charge structure allows getting closer to the polluter-pays-principle, generates revenues and encourages the efficient use of water.

Description:

In Estonia, the charge for the abstraction of water ranged between 0.0016 and 0.42 €/m3 in 2005, as shown below:

Source of water	Type of extraction/area	Charge in €/m3
Underground water	Most upper ground level	0.028
	Lowest ground level	0.042
	Extracted from mines and quarries	0.0045
Surface water	From Tallinn catchment area	0.021
	From Tallinn catch. Area for cooling	0.0032
	From other area	0.013
	From other area for cooling (Narva Power Plant)	0.0016

This charge is not applied to all uses. Irrigation, water used for fishing ponds and energy generation activities based on water are for instance not charged.

Latvia and Lithuania use the same type of water abstraction charge system. Surface water is charged 0.003€/m3 in Latvia[7] and 0.0003€/m3 in Lithuania[8]. Groundwater charges range in the same amounts for both countries (0.01 and 0.014 €/m^3). Mineral water is charged with a much higher price in Lithuania (1.2 €/m^3) than in Latvia (0.29 €/m^3).

As for Estonia, the fee is not applied to all users in Latvia. Hydroelectric power stations, fish ponds and the reuse of water in industry are free of charge. In Latvia, agriculture is not exempted. In Lithuania, only land users using water on their own land for domestic purposes are exempted.

Stakeholders involved:

In Estonia, the charge on water abstraction was introduced by the Water Law. The charge levels are set by governmental regulations, in particular by the Ministry of Environment. The charge was introduced in Latvia through the Law on Natural Resources in 1996. For Lithuania, the principles of a charge on water abstraction are established in the Law on the State Natural Resource Tax. Charge rates are indexed quarterly according to the consumer price index.
The revenues from the charge are divided equally between the state (Ministry of Finance) and the respective local municipalities

Relative importance:

The abstraction charge generates revenues close to 3 million € for the Lithuanian budget. Around 90% of this stream is generated by surface water abstraction for energy production (cooling of the Ignalina nuclear power station).
In general, the abstraction charge gave good results in the Baltic countries. For example, it stimulated the reduction of the large leakages identified in the Latvian water supply companies' networks in the 1990s.

Source: Speck et al. 2006

[7] Charge level in 2004
[8] Charge level in 2002

Pollution charges for direct discharge of wastewater in Germany

Objective:

The pollution charge was established in Germany in order to regulate the direct discharge of wastewater into a waterbody. It aims to apply the polluter-pays principle as required by the Water Framework Directive. Furthermore it is targeted to provide incentives for reducing the amount and the noxiusness of wastewater.

Description:

The Wastewater Charges Act has been enacted in 1976 (Abwasserabgabengesetz, AbwAG). It has provided a basis for the first eco-tax which is levied at Federal level as a steering instrument. It applies the polluter-pays principle as direct dischargers (municipalities, industry) have to bear at least some of the environmental costs related to their use of water (indirect dischargers are affected by the tax via the ordinary waste water user fee). The charge varies with the quantity and harmfulness of the substances contained in the discharged water. It has been increased several times from DM 12 initially in 1981 to DM 70 in 1997 (now € 35.79) per unit of noxiousness. One unit of noxiousness corresponds approximately to the noxiousness of the untreated wastewater of one inhabitant per year. The equivalent units of pollutants for one unit of noxiosness are shown in the figure below[9].

No.	Evaluated pollutants and groups of pollutants	The following units of measurement correspond to one unit of noxiousness	Threshold values according to concentration and annual quantity
1	Oxidizable substances in Chemical Oxygen Demand (COD)	50 kilograms of oxygen	20 milligrams per litre and 250 kilograms annual quantity
2	Phosphorous	3 kilograms	0.1 milligrams per litre and 15 kilograms annual quantity
3	Nitrogen as the sum total of individual amounts of nitrate nitrogen, nitrite oxygen and ammonia nitrogen	25 kilograms	5 milligrams per litre and 125 kilograms annual quantity
4	Organohalogen compounds as adsorbable organic fixed halogens (AOX)	2 kilograms of halogen, calculated as organic fixed chlorine	100 micrograms per litre and 10 kilograms annual quantity
5	Metals and their compounds		and
5.1	Mercury	20 grams	1 microgram 100 grams
5.2	Cadmium	100 grams	5 microgram 500 grams
5.3	Chromium	500 grams	50 microgram 2.5 kilograms
5.4	Nickel	500 grams	50 microgram 2.5 kilograms
5.5	Lead	500 grams	50 microgram 2.5 kilograms
5.6	Copper	1 000 grams of metal	100 microgram per litre 5 kilograms annual quantity
6	Fish toxicity	6,000 cubic metres wastewater divided by G_{EI}	G_{EI} = 2

The rate is reduced of 75% if certain minimum requirements according to the best available technology[10] are met. Furthermore, certain types of investment designed to improve wastewater treatment may be offset against the charge. Exemptions from the charge are e.g. given for wastewater from watercrafts, discharge in underground layers which are naturally not suitable for drinking water supply and other special cases.

[9] G_{EI} is the dilution factor at which wastewater is no longer toxic in the fish egg test

[10] Definitions according to the Federal Water Act (Wasserhaushaltsgesetz, WHG §23, §57)

Stakeholders involved:

The Länder are responsible to decree implementation laws which set certain details. The funds are collected by the Länder who can also mandate the Kreise (districts) to execute the law (e.g. Bavaria, Brandenburg). Revenues are earmarked for measures to preserve and improve water quality (e.g. construction of treatment facilities, retention basins, research and development, monitoring, direct measures in waterbodies, etc.). They can also be used for covering the administrational costs.

Relative importance:

Total revenues in 1998 were about 367 million €. The competitiveness effects of the tax itself is quite limited, as the tax amounts to just 3 per cent of the total water pollution control costs in industry and therefore prevents the law to seriously take account of the polluter-pays principle. The introduction of reduced charges in linking with minimum requirements in 1997 led to a loss of incentives to reduce the pollution more than the required values. Modifications in the charges need to run through an expensive parliamentary process, instead of e.g. beeing adjusted by an independent institution. The law in its actual state is therefore only a penalty tax (for non-compliance with standards) and does not fulfill its original purpose.

Since the tax interacts with other standards in a complex way the environmental effects of the tax cannot be clearly specified. When assessed with countries without a tax instrument, it is clear that it plays a significant role even in its limited function as a penalising tax. However, charges have been too low from the beginning to show strong effects. Last this measure concentrates on point sources from direct dischargers (80% of the enterprises beeing indirect dischargers and therefore beeing only indirectly affected by the tax).

Source: AbwAG, BMU 2006, EEA 2005, Troja 1998, Ecotec 2001

Working for Water: Payment for watershed enhancement in South Africa

Objective:

Working for Water (WfW) is a government-led programme that aims to alleviate poverty by providing employment on watershed enhancement projects, involving mainly the removal of invasive alien plants. It seeks to address environmental externalities by payment of water users.

Description:

The programme was launched in 1995 and administered by the Department of Water Affairs and Forestry. The annual budget is currently R500 million (about US$66 million). Most of the funding comes from the government's poverty relief fund, but about 10–15% comes from water users with an annual contribution of the Department of Water Affairs of about R58 million. Also contributions from a public company and some local governments take place. In Hermanus municipality, for example, a block rate tariff was introduced to control high water use and a significant percentage of the revenues collected transferred to the WfW programme.

The water price charged to its users (33,000 domestic, industrial, agricultural and forestry water users) includes a "water resource management fee". This fee covers clearing of alien invasive plants as well as planning and implementation, pollution control, demand management, water allocation and water use control. Charges for clearing alien invasive plants are levied in 13 of the country's 19 water management areas. Problems of water scarcity and reduction in stream flow have been attributed to the spread of invasive alien plants that consume large amounts of water and cause other environmental problems such as flooding, fires, erosion, siltation and strain on native species.

The Pricing Strategy was changed in 2007. Since 1999, a portion of the costs could be applied to urban-industrial and agricultural irrigation water users in a Water Management Area, linked to the water resources management charge. Charges were typically between R0.01/m3 and R0.05/m3 for urban users and only 10% of this for agriculture, due to a 90% subsidy arrangement. With the 2007 Pricing Strategy, this was shifted to a willing user arrangement, where stakeholders and users in a catchment area with infestation could agree to fund the alien clearing with charges calculated on the relative use by each user, possibly supported by subsidies where available. Additional water made available above that required to address environmental and over-allocation needs could be allocated to those contributing financially to the clearing.

Programme costs are 10% in management fees, 30% in materials and transport and 60% salaries.

The planning and implementation of WfW has somewhat suffered from its diverse water resource, biodiversity and social development mandates, but its broader success has lead to the implementation of a Working for Wetlands initiative funded entirely from the fiscus.

Relative importance:

The WfW programme in South Africa is one of the very few schemes in developing countries with strong hydrological evidence supporting its impacts. The impacts of this programme on water flow have been estimated at 48–56 million cubic metres of additional water per annum. The scheme has also had a positive effect on employment.

Other benefits include: Revenues from timber, avoided costs for Water Boards, restoration of productive potential of the land.

Source: Porras et al. 2008, Porras & Neves 2006, Pegram & Schreiner 2009

Abstraction charges in the Seine-Normandy River Basin, France

Objective:

The application of abstraction (and pollution) charges in the water sector was initiated with the 1964 water law which promoted water management at the river basin scale and created the 6 river basin water agencies in France. The purpose of these environmental charges is revenue collection for supporting the management and investment programmes of the water agencies (without consideration of incentives).

Description:

In the Seine-Normandie river basin the abstraction charge is combined with a consumption charge – thereby putting a higher charge burden on consumptive use as compared to abstraction. Specific ratios estimating water consumption per hectare are applied to non-metered agriculture (thus creating a fixed charger per hectare). In case of metered water abstraction for irrigation use the volume is multiplied by a so-called *use coefficient,* which reduces this rate to account for the special socio-economic conditions of agriculture. For industries for which consumption is unknown (e.g. if they have their own sewerage and wastewater treatment), coefficients specific to each industry type are applied for transforming abstraction into consumption. An additional regulation charge rate applies to areas where large works are required for restoring water resource – and also to water abstraction taken during periods of the year know for their more acute water scarcity problems (between June 1 and 31 October). A charge for special activities is taken in areas of the basin requiring interventions and actions for restoring the quality of the aquatic environment on top of what is generally required in other parts of the river basin. As shown by the following table a further differentiation is made according to the source and the geographic area where abstraction takes place (split into four zones).

Abstraction source	Regional zone	Basic charge rate		Regulation charge rate		Charge rate for special activities	
		Abstraction	Consumption	Abstraction	Consumption	Abstraction	Consumption
Surface water	1	0.71	39.78	-	-	-	-
	2	0.71	39.78	0.71	39.78	-	-
	3	0.71	39.78	-	-	0.41	27.85
	4	0.71	39.78	0.71	39.78	0.41	27.85
Groundwater	1	24.17	39.78	-	-	-	-
	2	24.17	39.78	-	-	-	-
	3	24.17	39.78	-	-	16.93	27.85
	4	24.17	39.78	-	-	16.93	27.85

Abstraction and consumption charge rates for industry and households in the Seine Normandie river basin in 2004 (in €/1000m^3)

Relative importance:

Total revenues of the abstraction charge in the basin were 64.8 million € per year, a rather small amount as compared to revenues of the pollution charges (643.7 million €/y). Both charges make about 80% of the revenues of the agency. The greatest share of this budget is used for water treatment measures (584.8 million €/y) and water supply (119.9 million €/y), the latter including a small contribution to international development projects. Research, monitoring and restoration are supported with about 78 million €/y and a small amount is spent on governance and public relations (7.5 million €/y).

Source: Strosser & Speck 2004, AESN 2008

Support to ecologically friendly hydropower plants through favourable electricity tariffs

Objective:

The instrument aims at promoting the new building and the extension of hydropower plants in Germany, taking environmental and nature conservation objectives into account.

Description:

The measure is based on the German Renewable Energy Sources Act (EEG) from 2000 (amended in 2004 and 2008) and fixes certain remuneration for energy produced through hydropower plants complying with certain conditions. In accordance with the terms of the Water Framework Directive, a good ecological status has to be reached after the building or the modernization of the plant. Alternatively, the ecological status must have – compared to the previous status – significantly improved. The criteria applied relate for example to biological continuity, the presence of areas with shallow water and to guaranteed low water flows. The plants have to comply also with certain conditions concerning their location: New plants must be built in a spatial relation to fully or partly existing barrages or weirs.

Part of production	New plants (cents/kWh)	Modernized plants (cents/kWh)
Until 500 kW	12.67	11.67
500 kW to 2 MW	8.65	8.65
2 MW to 5 MW	7.65	8.65

Remuneration for plants up to and including 5 MW

Augmentation of production	Expanded plants (cents/kWh)
Until 500 kW	7.29
Until 10 MW	6.32
Until 20 MW	5.8
Until 50 MW	4.34
Over 50 MW	3.5

Remuneration for increased power production for plants > 5 MW

The remuneration paid depends on the energy output of the plant. A difference is made between plants generating up to and including 5 MW and plants generating more than 5 MW as well as between modernized and new plants.
The remuneration is paid for 20 years. Smaller plants are paid higher remunerations per kWh than bigger plants to ensure their profitability. Plants producing more than 5 MW are – after their modernization – only paid for the increased part of production. The rates decrease every year for 1%.

Stakeholders involved and institutional issues:

The electricity operators in Germany are obliged to connect facilities which produce renewable energy to their net and to remunerate them according to the EEG. As the costs are allocated to the consumers, no government funds are involved. Since the law has been adopted, regular reports have been elaborated which led to further amendments.

Relative importance:

In 2007, the predominant part of the hydropower produced in Germany stemmed from plants which were not remunerated according to the EEG. In order to increase incentives, the rates for small hydropower plants have been augmented in 2008. In 2006, the electricity consumer paid in average 0.5 cent/kWh for the promotion of renewable energies.

Sources: BMU 2005, BMU 2008a, BMU 2008b, GP 2007

Conclusions

The review stresses the diversity of economic instruments that can be applied to collect revenues for different functions of IWRM. The information available on total revenues and how these are effectively been allocated and used is not easily made available nor published. Indeed:

- While policy documents describing new instruments often highlight their goals in terms of effectiveness and efficiency, data on total revenues collected from a given instrument and how these are being allocated are rarely available or accessible. As a result, it is also difficult to know whether the instruments are really effective in supporting and financiag a wide range of water management functions;

- This is particularly true for instruments that are not "mainstream" instruments, i.e. instruments other than abstraction and pollution charges. As a result, while the literature shows a large diversity of instruments in place (for example in European countries), information on revenues and how these are used is often limited to revenues from abstraction and pollution charges[11]. This might be explained by the more limited revenues collected from other instruments (as compared to revenues collected from abstraction and pollution charges) that do not lead to the need for systematic collection and (more importantly) reporting.

Clearly, applying these instruments to other contexts and situations for collecting revenues for IWRM might need adaptations in their design, in particular in terms of: charge levels, exemptions (for different sectors, levels of use, sensitivity of water ecosystems, etc.), use of revenues, policy process to establish a new instrument (who needs to get involved, which studies to be carried out to justify charge levels, etc.) and adaptations in the institutional setup and monitoring that might be required for the operational implementation of the instruments.

[11] The same applies to the OECD database.

Bibliography

AbwAG “Abwasserabgabengesetz in der Fassung der Bekanntmachung vom 18. Januar 2005 (BGBl. I S. 114), das durch Artikel 12 des Gesetzes vom 31. Juli 2009 (BGBl. I S. 2585) geändert worden ist”, Germany

ACT (Australian Capital Territory Government) (2009): Budget 2009-2010, http://www.treasury.act.gov.au/budget/budget_2009/index.htm

ACTEW (2010): Water Abstraction Charge, http://www.actewagl.com.au/water/networks/wac.aspx

Banfi, S, Filippini, M., Mueller, A. (2005) : An estimation of the Swiss hydropower rent. Energy Policy 33 : 927–937

BMU (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit) (2006) „Water Resource Management in Germany. Part 1 – Fundamentals“, Berlin, Germany, http://www.umweltdaten.de/publikationen/fpdf-l/3770.pdf

BMU (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit) (2008a) „Erneuerbare Energien 2007“, Berlin, Germany

BMU (2008b) „Vergleich der EEG-Vergütungsregelungen für 2009“; Bundestagsbeschluss zum EEG vom 06.06.2008, Berlin, Germany

BMU (2005) „Leitfaden für die Vergütung von Strom aus Wasserkraft“ Berlin, Germany

CFE (Confédération Fiscale Européenne) 2010 : Environmental Taxes in the Netherlands, https://www.cfe-eutax.org/taxation/environmental-taxes/netherlands

Chouli, E. (2007) "Applying storm water management in Greek cities: learning from the European experience”, in: Desalination 210, p61–68

Dworak, T.; Berglund, M.; Thaler, T.; Fabrik, E.; L.; Amand, B.; Grandmougin, B.; Ribeiro, M. M.; Laaser, C.; Matauschek, M. (2010): Assessment of agriculture measures included in the draft River Basin Management Plans - Summary Report.

Ecotec (2001): Study on the Economic and Environmental Implications of the Use of Environmental Taxes and Charges in the European Union and its Member States”, Brussels, Belgium & Birmingham, UK, http://ec.europa.eu/environment/enveco/taxation/environmental_taxes.htm

EEA (European Environmental Agency) (2005) Marked based instruments for environmental policy in Europe”, EEA Technical report, No 8/2005, Copenhagen, Denmark

Environment Agency (2010) “Navigation charges“ In: http://www.environment-agency.gov.uk/business/regulation/38795.aspx

Etablissement Public Loire (2007) “La redevance soutien d’étiage”, France

Finansdepartementet (2010) : Kraftverksbeskatning. http://www.regjeringen.no/mobil/nb/dep/fin/tema/skatter_og_avgifter/bedriftsbeskatning/kraftverksbeskatning.html?id=449525

Gaulke, A (2010) : Das Wasserentnahmeentgelt in Deutschland – aktuelle Entwicklungen in den Bundesländern. WRRL Seminar : Wasserpreise Ökosystemdienstleistungen - ökonomische Instrumente der WRRL. GRÜNE LIGA e.V., Bundeskontaktstelle Wasser. http://www.wrrl-info.de/docs/vortrag_sem34_gaulke.pdf

Government of New South Wales (2008) “Aquatic habitat protection and rehabilitation” In: http://www.dpi.nsw.gov.au/fisheries/recreational/fees/aquatic-habitat-protection-and-rehabilitation

Graefe, A. (2009): Finanzbedarf Wasserrahmenrichtlinie Hessen. http://www2.hmuelv.hessen.de/imperia/md/content/internet/wrrl/4_oeffentlichkeitsbeteiligung/offenlegung2008_bwpl_mp/informationsveranstaltungen/finanzbedarf_neu090324.pdf

Hawke's Bay Regional Council (2008) “Resource Management Charges” In: http://www.hbrc.govt.nz/WhatWeDo/Consents/ResourceManagementCharges/tabid/158/Default.aspx

ICRC (Independent Competition and Regulatory Commission) (2003): Issues Paper, Water Abstraction Charge, July 2003, http://www.icrc.act.gov.au/__data/assets/pdf_file/0011/16769/issuespaperwacreport8of2003cw.pdf

OECD (1997): Evaluating Economic Instruments for Environmental Policy, Paris, France

OECD (1999): Economic instruments for pollution control and natural resources management on OECD countries: A survey, Paris, France

OECD (2007) “Instrument mixes addressing non-point sources of water pollution”, COM/ENV/EPOC/AGR/CA(2004)90/FINAL, Paris, France

OECD (2009): Water taxes, Excel database

OECD (2010): Pricing Water Resources and Water and Sanitation Services, Paris, France

Otsuka, K. (2008) “Market-based Instruments in Water Environmental Policy: The Experiment and its Challenge in Japan”, Presentation held during the International Workshop on Emission Trading Programs, November 9-12, 2008, Nanjing, China; http://www.csfee.org.cn/uploadfile/2008pwjygjyth/%E6%97%A5%E6%9C%AC%E7%9A%84%E6%B0%B4%E7%8E%AF%E5%A2%83%E7%AE%A1%E7%90%86%E7%BB%8F%E6%B5%8E%E6%94%BF%E7%AD%96%EF%BC%8DIDE-JETRO%EF%BC%8DKenji-OTSUKA.pdf

Pearce, D. & Koundouri, P. (2003) “Fertilizer and Pesticide Taxes for Controlling Non-point Agricultural Pollution”, The World Bank Group – Agriculture and Rural Development & IFPRI, London, UK

Pegram, G., Schreiner, B. (2009): Financing water resource management. South African Experience. Case Study Report, Final Draft. EU Water Initiative – Finance Working Group / Global Water Partnership Southern Africa

Porras, I, Neves, N. (2006): Markets for Watershed Services -Country Profile, South Africa-Working for Water. http://www.watershedmarkets.org/documents/South_Africa_Working_for_water.pdf

Porras, I, Neves, N. (2006): Markets for Watershed Services -Country Profile. China (Local Watershed Protection Schemes). http://www.watershedmarkets.org/documents/China-Local_schemes.pdf

Porras, I., Grieg-Gran, M., Neves, N. (2008): All that glitters. A Review of payment for watershed services in developing countries. Natural Resource Issues No. 11. International Institute for Environment and Development. London, UK.

Rothman, M. (2000), Measuring and apportioning rents from hydroelectric power developments, World Bank Discussion Paper, No.419.

Salman M. A. Salman (1999): Groundwater: legal and policy perspectives: proceedings of a World Bank seminar, World Bank, Washington

Schou, J.S. & Streibig, J.C. (*after* 1999) „Pesticide Taxes in Scandinavia", Article I Pesticide Outlook, Denmark, http://files.foes.de/de/downloads/tagungvilm2005/scandinaviastudy.pdf

Sjöberg, P. (2005) "Taxation of pesticides and fertilizers", Master's Thesis, Lulea University of Technology, Lulea, Sweden, http://epubl.ltu.se/1404-5508/2005/101/LTU-SHU-EX-05101-SE.pdf

Söderholm, P. (2004) "Extending the Environmental Tax Base. Prerequisites for Increased Taxation of Natural Resources and Chemical Compounds", The Swedish Environmental Protection Agency, Sweden

Söderholm, P. (2004) "Extending the Environmental Tax Base. Prerequisites for Increased Taxation of Natural Resources and Chemical Compounds", The Swedish Environmental Protection Agency, Sweden

Speck S., Andersen M.S., Nielsen H.O., Ryelund A. and Smith C. (2006), The Use of Economic Instruments in Nordic and Baltic Environmental Policy 2001-2005, National Environmental Research Institute, Denmark

Statsrådet (2009) : Windfall profits of electricity producers to be cut. Government Communications Unit. Press release 97/2009. http://www.vn.fi/ajankohtaista/tiedotteet/tiedote/fi.jsp?oid=258092&c=0&toid=1946&moid=2173

Strosser P. And Speck S. (2004), Environmental taxes and charges in the water sector, a review of European experiences. Final report of a study for the Water Agency of Catalonia (Spain).

Troja, M. (1998) "Umweltpolitik und moderne Oekonomik. Der Beitrag der Neuen politischen Oekonomie und der Neuen Institusionenoekonomik zur Erklaerung umweltpolitischer Entscheidungsprozesse", Muenster: Lit, Germany

UBA (Umweltbundesamt) (2005): Übersicht über die Länderregelungen zu Wasserentgelten, http://www.umweltbundesamt.de/wasser/themen/oekonomie/Tabelle_Wasserentnahmeentgelte_Laender.pdf

UBA (Umweltbundesamt) (2008): Wasserentnahmeentgelte, http://www.umweltbundesamt.de/wasser/themen/oekonomie/Wasserentnahmeentgelte.pdf

VROM (Dutch Ministry of Housing, Spatial Planning and the Environment) 2001 : The Netherlands' Environmental Tax on Groundwater - Questions and Answers, Netherlands, http://www2.minvrom.nl/docs/internationaal/Qawater1.pdf

VROM (Dutch Ministry of Housing, Spatial Planning and the Environment) (2006)

Internet

[8] http://www.agglo-grandroanne.fr/site_acces.asp?IdPage=8388&ccf